Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of
Lot 1: 400 kV Ratmate Substation and works at Lapsiphedi and New Hetauda Substations
Lot 2: 400 kV
New Butwal Substation
Lot 3: 400 kV New Damauli Substation

MCA-N/ETP/CB/004

ADDENDUM #9
Issued on: 04 September 2023

This Addendum No. 9 modifies respective portions of the Bidding Document issued on 24 March 2023 and amended through Addendum No. 1 on 04 April 2023, Addendum No. 2 on 30 May 2023, Addendum No. 3 on 06 June 2023, Addendum No. 4 on 10 July 2023, Addendum No. 5 on 12 July 2023, Addendum No. 6 on 18 July 2023, Addendum No. 7 on 17 August 2023, Addendum No. 8 on 24 August 2023. The changes, as indicated below, are effective on the date of issuance of this Addendum.

Except as expressly amended by this Addendum, all other terms and conditions of the Bidding Document - issued on 24 March 2023 and amended through Addendum No. 1 issued on 04 April 2023, Addendum No. 2 on 30 May 2023, Addendum No. 3 on 06 June 2023, Addendum No. 4 on 10 July 2023, Addendum No. 5 on 12 July 2023, Addendum No. 6 on 18 July 2023, Addendum No. 7 on 17 August 2023, Addendum No. 8 on 24 August 2023 remains unchanged and shall remain in full force and effect in accordance with their terms.

SN	Pages/Paragraph	Amendments
1.	Part 1: Page 47, Section II. Bid Data Sheet, ITB 1.1	Name of this procurement is: **Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of** **Lot 1: 400kV Ratmate Substation and works at Lapsiphedi and New Hetauda Substations,** **Lot 2: 400kV New Butwal Substation and** **Lot 3: 400kV New Damauli Substation** Identification number of this procurement is: **MCA-N/ETP/CB/004** The lots comprising this procurement are: **Lot 1: 400kV Ratmate Substation and works at Lapsiphedi and New Hetauda Substations,** **Lot 2: 400kV New Butwal Substation and** **Lot 3: 400kV New Damauli Substation** The scope of work has been classified into two categories. (i) Base Scope of work, (ii) Option Scope of work with some additional work in the Base

SN	Pages/Paragraph	Amendments
		Scope of work. The Employer shall exercise either Base Scope, or part or full of Option Scope of work based on the fund availability. The detailed scope of work for Base and Option are clearly described in B1.1-Project Specific Requirement (PSR) of the bid document. The Bidders are requested to quote the price as per the price schedule attached in Section IV of bid document. Irrespective of the Base Scope or Option Scope (or part of it) to be selected by the Employer, the scope of work shall include construction of the entire GIS buildings, control buildings, station services, and site preparation and grading for the full scope of work, as shown on the single line and layout drawings. **has been replaced by:** Name of this procurement is: **Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of** **Lot 1: 400kV Ratmate Substation and works at Lapsiphedi and New Hetauda Substations,** **Lot 2: 400kV New Butwal Substation and** **Lot 3: 400kV New Damauli Substation** Identification number of this procurement is: **MCA-N/ETP/CB/004** The lots comprising this procurement are: **Lot 1: 400kV Ratmate Substation and works at Lapsiphedi and New Hetauda Substations,** **Lot 2: 400kV New Butwal Substation and** **Lot 3: 400kV New Damauli Substation** 1) The detailed scope of work is clearly described in B1.1-Project Specific Requirement (PSR) of the bidding document. The Bidders are requested to quote the price as per the price schedule attached in Section IV of the bidding document. The scope of work shall include construction of the entire GIS buildings, control buildings, station services, and site preparation and grading for the full scope of work (i.e. Option Scope of work), as shown on the single line and layout drawings.
2.	Part 1, Section II. Bid Data Sheet, ITB 12.2, Page 49 and 50	1) Letter of Technical Offer 2) Bid Security (Bank Guarantee) 3) TECH-1: Design Proposal 4) TECH-2: Method Statement 5) TECH-3: Environmental, Social Gender, Health & Safety Methodology 6) TECH-4: Work Program 7) TECH-5: Project Management Organization

SN	Pages/Paragraph	Amendments
		8) TECH-6: Construction Equipment 9) TECH-7: CVs of Key Personnel 10) ELI-1: Bidder Information Sheet 11) ELI-2: Joint Venture/Association/Subcontractor/Key Suppliers/Other Key Vendors Information Sheet 12) ELI-3: Government-Owned Enterprise Certification Form 13) CON-1: History of Contract Non-Performance and Litigation 14) CON-2: Compliance with Sanctions Certification Form 15) FIN-1: Financial Situation 16) FIN-2: Average Annual Turnover (Design and Construction) 17) FIN-3: Financial Resources 18) FIN-4: Current Contract Commitments/Works in Progress 19) EXP-1: General Design Experience 20) EXP-2: General Construction Experience 21) EXP-3: Similar Design Experience 22) EXP-4: Similar Construction Experience 23) EXP-5: Environmental and Social (E&S) Management and Gender and Social Inclusion Experience 24) EXP-6: Health and Safety (H&S) Management Experience 25) REF-1: References of MCC-Funded Contracts 26) REF-2: References for Contracts Not Funded by MCC 27) TECH-8: Manufacturer's Authorization 28) TECH-9: List of Proposed Subcontractors 29) TECH-10: List of Proposed Manufacturer and/or Supplier 30) TECH-11: Technical Data Schedule 31) Written confirmation of authorization to sign on behalf of the Bidder as per ITB 21.5 and/or 21.6 (b) 32) Documents as per requirements of ITB 5.7 (In case of Joint Venture) 33) Business/ firm registration certificates 34) Written certification from the Government as per the requirements of ITB 5.11(d), if applicable, otherwise the Bidder shall include in its bid a statement confirming that no Government Employees have been proposed by the Bidder. 35) Country of origin for services proposed under the Bid 36) Draft Contractor's COVID-19 Risk Mitigation Plan 37) Filled Appendix to Letter of Financial Offer **Has been amended to read as:** 1) Table of Content: Table of Content of PDF file must identify the PDF

SN	Pages/Paragraph	Amendments
		page number (page number/total page number) of the content. 2) Letter of Technical Offer 3) Bid Security (Bank Guarantee) 4) TECH-1: Design Proposal 5) TECH-2: Method Statement 6) TECH-3: Environmental, Social Gender, Health & Safety Methodology 7) TECH-4: Work Program 8) TECH-5: Project Management Organization 9) TECH-6: Construction Equipment 10) TECH-7: CVs of Key Personnel 11) ELI-1: Bidder Information Sheet 12) ELI-2: Joint Venture/Association/Subcontractor/Key Suppliers/Other Key Vendors Information Sheet 13) ELI-3: Government-Owned Enterprise Certification Form 14) CON-1: History of Contract Non-Performance and Litigation 15) CON-2: Compliance with Sanctions Certification Form 16) FIN-1: Financial Situation 17) FIN-2: Average Annual Turnover (Design and Construction) 18) FIN-3: Financial Resources 19) FIN-4: Current Contract Commitments/Works in Progress 20) EXP-1: General Design Experience 21) EXP-2: General Construction Experience 22) EXP-3: Similar Design Experience 23) EXP-4: Similar Construction Experience 24) EXP-5: Environmental and Social (E&S) Management and Gender and Social Inclusion Experience 25) EXP-6: Health and Safety (H&S) Management Experience 26) REF-1: References of MCC-Funded Contracts 27) REF-2: References for Contracts Not Funded by MCC 28) TECH-8: Manufacturer's Authorization 29) TECH-9: List of Proposed Subcontractors 30) TECH-10: List of Proposed Manufacturer and/or Supplier 31) TECH-11: Technical Data Schedule 32) Written confirmation of authorization to sign on behalf of the Bidder as per ITB 21.5 and/or 21.6 (b) 33) Documents as per requirements of ITB 5.7 (In case of Joint Venture)

SN	Pages/Paragraph	Amendments
		34) Business/ firm registration certificates 35) Written certification from the Government as per the requirements of ITB 5.11(d), if applicable, otherwise the Bidder shall include in its bid a statement confirming that no Government Employees have been proposed by the Bidder. 36) Country of origin for services proposed under the Bid 37) Draft Contractor's COVID-19 Risk Mitigation Plan Filled Appendix to Letter of Financial Offer
3.	Part 1: Page 51, Section II. Bid Data Sheet, ITB 15.6 (a)	The prices for Plant, Goods and Equipment to be supplied from abroad **shall** be quoted on DDP-Works Site in Nepal Basis. The Employer will provide tax exemption documents where required. If required, documents as per MCA-Nepal tax exemption process attached under Section V (Employer's Requirement) shall be submitted minimum 45 days before arrival of the Goods, Material, Plant and Equipment at Nepal's border. Tentative list of Goods, Material, Plant and Equipment to be imported shall also be submitted to MCA-Nepal on an annual basis for each Nepalese Fiscal Year. The Contractor shall also be responsible for custom clearance and all other associated charges (inside and outside Nepal, including loading, unloading) to bring all required Goods, Material, Plant and Equipment to Works Site. **has been replaced by:** The prices for Plant, Goods and Equipment to be supplied from abroad **shall** be quoted on DDP-Works Site in Nepal Basis. The Employer will provide tax exemption documents where required. If required, documents as per MCA-Nepal tax exemption process attached under Section V (Employer's Requirement) shall be submitted minimum 60 days before arrival of the Goods, Material, Plant and Equipment at Nepal's border. Tentative list of Goods, Material, Plant and Equipment to be imported shall also be submitted to MCA-Nepal on an annual basis for each Nepalese Fiscal Year. The Contractor shall also be responsible for custom clearance and all other associated charges (inside and outside Nepal, including loading, unloading) to bring all required Goods, Material, Plant and Equipment to Works Site.
4.	Part 1: Page 54, Section II. Bid Data Sheet, ITB 35.1	**Delete ITB 35.1.** "Though the evaluation of Bids shall be based on total cost of Base scope plus Option scope of work, the Employer reserves the right to exercise either Base Scope of work or Option scope of works or Base scope plus a portion of option scope of work."

<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td>5.</td><td>Part 1, Section III. Qualification and Evaluation Criteria,</td><td>Section III. Qualification and Evaluation Criteria is amended as per Attachment #1 of this Addendum.</td></tr>
<tr><td>6.</td><td>Part 1, Section IV. Bid Submission Forms, Page 109</td><td>Form TECH-7: CVs of Key Personnel is amended as per Attachment # 2 of this addendum.</td></tr>
<tr><td>7.</td><td>Part 1, Section IV. Bid Submission Forms, Page 126</td><td>Form FIN-1: Financial Situation and Form FIN-2: Average Annual Turnover (Design and Construction) is amended as per Attachment # 3 of this addendum.</td></tr>
<tr><td>8.</td><td>Part 1: Page 147 (PDF Page 635 of 1019), Section IV. Bid Submission Forms, Letter of Financial Offer</td><td>
<table>
<tr><th>Lot</th><th>Base Price in USD</th><th>Option Price in USD</th><th>Total Bid Price (Base Plus Option in USD)</th></tr>
<tr><td>Lot 1</td><td></td><td></td><td></td></tr>
<tr><td>Lot 2</td><td></td><td></td><td></td></tr>
<tr><td>Lot 3</td><td></td><td></td><td></td></tr>
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has been replaced by:
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<tr><th>Lot</th><th>Total Bid Price (USD)</th></tr>
<tr><td>Lot 1</td><td></td></tr>
<tr><td>Lot 2</td><td></td></tr>
<tr><td>Lot 3</td><td></td></tr>
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</td></tr>
<tr><td>9.</td><td>Part 1: Page 166 (PDF Page 654 of 1019), Section IV. Bid Submission Forms, Breakdown of Rates and Prices Schedules</td><td>ii. The Bidders shall complete the Price schedule for the lot(s) (both for Base scope and Option scope) they are applying for and submit the completed one with financial bid.

has been replaced by:

ii. The Bidders shall complete the Price schedule for the lot(s) they are applying for and submit the completed one with the financial bid.</td></tr>
</table>

<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td>10</td><td>Part 1: Page 166 (PDF Page 654 of 1019), Section IV. Bid Submission Forms, Breakdown of Rates and Prices Schedules</td><td>Delete
vii. The Price Schedule Contains, Price Schedule for Base scope and Price Schedule for Option scope. Option scope consists of Base scope plus additional scope. The Employer reserves the right to exercise either Base Scope of work or Option scope of works or Base scope plus portion of option scope of work.</td></tr>
<tr><td>11</td><td>Part 1: Page 168 (PDF Page 656 of 1019), Section IV. Bid Submission Forms, PRICE SCHEDULE</td><td>
<table>
<tr><th>Lots</th><th colspan="2">Price Schedule</th></tr>
<tr><th></th><th>Base</th><th>Option</th></tr>
<tr><td>Lot 1</td><td>221031_Lot1_RAT_PS_Base.pdf</td><td>221123_Lot1_RAT_PS_Option.pdf</td></tr>
<tr><td>Lot 2</td><td>221031_Lot2_NBW_PS_Base.pdf</td><td>221123_Lot2_NBW_PS_Option.pdf</td></tr>
<tr><td>Lot 3</td><td>221031_Lot3_NDM_PS_Base.pdf</td><td>221123_Lot3_NDM_PS_Option.pdf</td></tr>
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<tr><th>Lots</th><th>Price Schedule</th></tr>
<tr><td>Lot 1</td><td>230820_Lot1_RAT_PS.pdf</td></tr>
<tr><td>Lot 2</td><td>230820_Lot2_NBW_PS.pdf</td></tr>
<tr><td>Lot 3</td><td>230820_Lot3_NDM_PS.pdf</td></tr>
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<tr><td>12</td><td>Part 1: PDF Page 657 to 955 of 1019), Section IV. Bid Submission Forms, PRICE SCHEDULE</td><td>The Price Schedule is amended as Attachment #4.</td></tr>
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<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td>13</td><td>Part 2-Employer_s Requirement, B11_PSR</td><td>221123_Lot1_RAT_PSR.docx

221123_Lot2_NBW_PSR.docx

221123_Lot3_NDM_PSR.docx

has been replaced by:

230820_Lot1_RAT_PSR.docx

230820_Lot2_NBW_PSR.docx

230820_Lot3_NDM_PSR.docx

The files are included as Attachment#5 to this addendum.</td></tr>
<tr><td>14</td><td>Part 2-Employer_s Requirement, B11_PSR, Lot2_NBW_ DWG, System_ DWG</td><td>NBW_100_1_Rev_8.pdf

NBW_101_1_Rev_3.pdf

has been replaced by:

NBW_100_1_Rev_9.pdf

NBW_101_1_Rev_4.pdf

The files are included as Attachment#6 to this addendum.</td></tr>
<tr><td>15</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 1-Technical Data Schedule, 1. Auto Transformer Specifications, Page 5 (PDF Page 151 of 1019), 18 Bushing</td><td>1. AUTOTRANSFORMER SPECIFICATIONS

1.1 SINGLE-PHASE AUTO TRANSFORMER

<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Data</th><th rowspan="2">Comments</th></tr>
<tr><th>Required</th><th>Offered</th></tr>
<tr><td>18</td><td colspan="5">Bushings</td></tr>
<tr><td>18.1</td><td>- Rated Voltage</td><td colspan="4"></td></tr>
<tr><td>18.1.1</td><td>• HV</td><td>kV</td><td>420</td><td></td><td></td></tr>
<tr><td>18.1.2</td><td>• IV</td><td>kV</td><td>245</td><td></td><td></td></tr>
<tr><td>18.1.3</td><td>• Neutral</td><td>kV</td><td>36</td><td></td><td></td></tr>
<tr><td>18.2</td><td>- Rated Current</td><td colspan="4"></td></tr>
<tr><td>18.2.1</td><td>• HV</td><td>A</td><td>800</td><td></td><td></td></tr>
<tr><td>18.2.2</td><td>• IV</td><td>A</td><td>1250</td><td></td><td></td></tr>
<tr><td>18.2.3</td><td>• Neutral</td><td>A</td><td>800</td><td></td><td></td></tr>
<tr><td>18.3</td><td>- 1.2/50 µs lightning impulse withstand voltage</td><td colspan="4"></td></tr>
</table>
</td></tr>
</table>

SN	Pages/Paragraph	Amendments

18.3.1	• HV	kVp	1425		
18.3.2	• IV	kVp	1050		
18.3.3	• Neutral	kVp	170		
18.4	- 250/2500 µs switching impulse gwithstand voltage				
18.4.1	• HV	kVp	1050		
18.4.2	• IV	kVp	-		
18.4.3	• Neutral	kVp	-		
18.5	- One minute power frequency withstand voltage				
18.5.1	• HV	kV rms	630		
18.5.2	• IV	kV rms	460		
18.5.3	• Neutral	kV rms	75		
18.6	- Minimum. total creepage distances				
18.6.1	• HV	mm	10500		
18.6.2	• IV	mm	6125		
18.6.3	• Neutral	mm	900		
18.7	- Mounting				
18.7.1	• HV		Tank cover		
18.7.2	• IV		Tank cover		
18.7.3	• Neutral		Tank cover		

has been replaced by:

1. AUTOTRANSFORMER SPECIFICATIONS

1.1 SINGLE-PHASE AUTO TRANSFORMER

SN	Pages/Paragraph	Amendments

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
18	Bushings				
18.1	- Rated Voltage				
18.1.1	• HV	kV	420		
18.1.2	• IV	kV	245		
18.1.3	• Neutral	kV	36		
18.2	- Rated Current				
18.2.1	• HV	A	1250		
18.2.2	• IV	A	2000		
18.2.3	• LV	A	1250		
18.2.4	• Neutral	A	2000		
18.3	- 1.2/50 µs lightning impulse withstand voltage				
18.3.1	• HV	kVp	1425		
18.3.2	• IV	kVp	1050		
18.3.3	• LV	kVp	250		
18.3.4	• Neutral	kVp	170		
18.4	- 250/2500 µs switching impulse withstand voltage				
18.4.1	• HV	kVp	1050		
18.4.2	• IV	kVp	850		
18.4.3	• LV	kVp	-		
18.4.4	• Neutral	kVp	-		
18.5	- One minute power frequency withstand voltage				
18.5.1	• HV	kV rms	695		
18.5.2	• IV	kV rms	505		
18.5.3	• LV	kV rms	105		
18.5.4	• Neutral	kV rms	77		

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<tr><td>18.6</td><td>- Minimum. total creepage distances</td><td></td><td></td><td></td><td></td></tr>
<tr><td>18.6.1</td><td>• HV</td><td>mm</td><td>10500</td><td></td><td></td></tr>
<tr><td>18.6.2</td><td>• IV</td><td>mm</td><td>6125</td><td></td><td></td></tr>
<tr><td>18.6.3</td><td>• LV</td><td>Mm</td><td>1300</td><td></td><td></td></tr>
<tr><td>18.6.4</td><td>• Neutral</td><td>mm</td><td>900</td><td></td><td></td></tr>
<tr><td>18.7</td><td>- Mounting</td><td colspan="4"></td></tr>
<tr><td>18.7.1</td><td>• HV</td><td></td><td>Tank cover</td><td></td><td></td></tr>
<tr><td>18.7.2</td><td>• IV</td><td></td><td>Tank cover</td><td></td><td></td></tr>
<tr><td>18.7.3</td><td>• LV</td><td></td><td>Tank cover</td><td></td><td></td></tr>
<tr><td>18.7.4</td><td>• Neutral</td><td></td><td>Tank cover</td><td></td><td></td></tr>
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</td></tr>
<tr><td>16</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 2- Technical Data Schedule, 1. Auto Transformer Specifications, Page 5 (PDF Page 318 of 1019), 18 Bushing</td><td>
1. AUTOTRANSFORMER SPECIFICATIONS
1.1 THREE-PHASE AUTO TRANSFORMER
<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Data</th><th rowspan="2">Comments</th></tr>
<tr><th>Required</th><th>Offered</th></tr>
<tr><td>26.</td><td>Bushings</td><td></td><td></td><td></td><td></td></tr>
<tr><td>27.</td><td>Rated Voltage</td><td></td><td></td><td></td><td></td></tr>
<tr><td>27.1.</td><td>• HV</td><td>kV</td><td>420</td><td></td><td></td></tr>
<tr><td>27.2.</td><td>• IV</td><td>kV</td><td>245</td><td></td><td></td></tr>
<tr><td>27.3.</td><td>• Neutral</td><td>kV</td><td>36</td><td></td><td></td></tr>
<tr><td>28.</td><td>Rated Current</td><td></td><td></td><td></td><td></td></tr>
<tr><td>28.1.</td><td>• HV</td><td>A</td><td>800</td><td></td><td></td></tr>
<tr><td>28.2.</td><td>• IV</td><td>A</td><td>1250</td><td></td><td></td></tr>
<tr><td>28.3.</td><td>• Neutral</td><td>A</td><td>800</td><td></td><td></td></tr>
<tr><td>29.</td><td>1.2/50 µs lightning impulse withstand voltage</td><td></td><td></td><td></td><td></td></tr>
<tr><td>29.1.</td><td>• HV</td><td>kVp</td><td>1425</td><td></td><td></td></tr>
<tr><td>29.2.</td><td>• IV</td><td>kVp</td><td>1050</td><td></td><td></td></tr>
<tr><td>29.3.</td><td>• Neutral</td><td>kVp</td><td>170</td><td></td><td></td></tr>
<tr><td>30.</td><td>250/2500 µs switching impulse withstand voltage</td><td></td><td></td><td></td><td></td></tr>
<tr><td>30.1.</td><td>• HV</td><td>kVp</td><td>1050</td><td></td><td></td></tr>
<tr><td>30.2.</td><td>• IV</td><td>kVp</td><td>-</td><td></td><td></td></tr>
<tr><td>30.3.</td><td>- Neutral</td><td>kVp</td><td>-</td><td></td><td></td></tr>
<tr><td>31.</td><td>One minute power frequency withstand voltage</td><td></td><td></td><td></td><td></td></tr>
<tr><td>31.1.</td><td>• HV</td><td>kV rms</td><td>630</td><td></td><td></td></tr>
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SN	Pages/Paragraph	Amendments

31.2.	• IV	kV rms	460		
31.3.	• Neutral	kV rms	75		
32.	Minimum. total creepage distances				
32.1.	• HV	mm	10500		
32.2.	• IV	mm	6125		
32.3.	• Neutral	mm	900		
33.	Mounting				
33.1.	• HV		Tank cover		
33.2.	• IV		Tank cover		
33.3.	• Neutral		Tank cover		

has been replaced by:

1. AUTOTRANSFORMER SPECIFICATIONS

1.1 THREE-PHASE AUTO TRANSFORMER

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
26.	Bushings				
27.	Rated Voltage				
27.1.	• HV	kV	420		
27.2.	• IV	kV	245		
27.3.	• LV	kV	52		
27.4.	• Neutral	kV	36		
28.	Rated Current				
28.1.	• HV	A	1250		
28.2.	• IV	A	1250		
28.3.	• LV	A	1250		
28.4.	• Neutral	A	2000		
29.	1.2/50 µs lightning impulse withstand voltage				
29.1.	• HV	kVp	1425		
29.2.	• IV	kVp	1050		
29.3.	• LV	kVp	250		
29.4.	• Neutral	kVp	170		
30.	250/2500 µs switching impulse withstand voltage				
30.1.	• HV	kVp	1050		
30.2.	• IV	kVp	-		
30.3.	• Neutral	kVp	-		

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<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
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<tr><td>31.</td><td>One minute power frequency withstand voltage</td><td></td><td></td><td></td><td></td></tr>
<tr><td>31.1.</td><td>• HV</td><td>kV rms</td><td>695</td><td></td><td></td></tr>
<tr><td>31.2.</td><td>• IV</td><td>kV rms</td><td>505</td><td></td><td></td></tr>
<tr><td>31.3.</td><td>• LV</td><td>kV rms</td><td>105</td><td></td><td></td></tr>
<tr><td>31.4.</td><td>• Neutral</td><td>kV rms</td><td>77</td><td></td><td></td></tr>
<tr><td>32.</td><td>Minimum. total creepage distances</td><td></td><td></td><td></td><td></td></tr>
<tr><td>32.1.</td><td>• HV</td><td>mm</td><td>10500</td><td></td><td></td></tr>
<tr><td>32.2.</td><td>• IV</td><td>mm</td><td>6125</td><td></td><td></td></tr>
<tr><td>32.3.</td><td>• LV</td><td>Mm</td><td>1300</td><td></td><td></td></tr>
<tr><td>32.4.</td><td>• Neutral</td><td>mm</td><td>900</td><td></td><td></td></tr>
<tr><td>33.</td><td>Mounting</td><td></td><td></td><td></td><td></td></tr>
<tr><td>33.1.</td><td>• HV</td><td></td><td>Tank cover</td><td></td><td></td></tr>
<tr><td>33.2.</td><td>• IV</td><td></td><td>Tank cover</td><td></td><td></td></tr>
<tr><td>33.3.</td><td>• LV</td><td></td><td>Tank cover</td><td></td><td></td></tr>
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<tr><td>17</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 3-Technical Data Schedule, 1. Auto Transformer Specifications, Page 5 (PDF Page 486 of 1019), 18 Bushing</td><td>
1. AUTOTRANSFORMER SPECIFICATIONS
1.1 SINGLE-PHASE AUTO TRANSFORMER
<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Data</th><th rowspan="2">Comments</th></tr>
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<tr><td>18</td><td colspan="5">Bushings</td></tr>
<tr><td>18.1</td><td>- Rated Voltage</td><td colspan="4"></td></tr>
<tr><td>18.1.1</td><td>• HV</td><td>kV</td><td>420</td><td></td><td></td></tr>
<tr><td>18.1.2</td><td>• IV</td><td>kV</td><td>245</td><td></td><td></td></tr>
<tr><td>18.1.3</td><td>• Neutral</td><td>kV</td><td>36</td><td></td><td></td></tr>
<tr><td>18.2</td><td>- Rated Current</td><td colspan="4"></td></tr>
<tr><td>18.2.1</td><td>• HV</td><td>A</td><td>800</td><td></td><td></td></tr>
<tr><td>18.2.2</td><td>• IV</td><td>A</td><td>1250</td><td></td><td></td></tr>
<tr><td>18.2.3</td><td>• Neutral</td><td>A</td><td>800</td><td></td><td></td></tr>
<tr><td>18.3</td><td>- 1.2/50 µs lightning impulse withstand voltage</td><td colspan="4"></td></tr>
<tr><td>18.3.1</td><td>• HV</td><td>kVp</td><td>1425</td><td></td><td></td></tr>
<tr><td>18.3.2</td><td>• IV</td><td>kVp</td><td>1050</td><td></td><td></td></tr>
<tr><td>18.3.3</td><td>• Neutral</td><td>kVp</td><td>170</td><td></td><td></td></tr>
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SN	Pages/Paragraph	Amendments

18.4	- 250/2500 µs switching impulse withstand voltage				
18.4.1	• HV	kVp	1050		
18.4.2	• IV	kVp	-		
18.4.3	• Neutral	kVp	-		
18.5	- One minute power frequency withstand voltage				
18.5.1	• HV	kV rms	630		
18.5.2	• IV	kV rms	460		
18.5.3	• Neutral	kV rms	75		
18.6	- Minimum. total creepage distances				
18.6.1	• HV	mm	10500		
18.6.2	• IV	mm	6125		
18.6.3	• Neutral	mm	900		
18.7	- Mounting				
18.7.1	• HV		Tank cover		
18.7.2	• IV		Tank cover		
18.7.3	• Neutral		Tank cover		

has been replaced by:

1. AUTOTRANSFORMER SPECIFICATIONS

1.1 SINGLE-PHASE AUTO TRANSFORMER

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
18	Bushings				
18.1	- Rated Voltage				
18.1.1	• HV	kV	420		
18.1.2	• IV	kV	245		
18.1.3	• Neutral	kV	36		
18.2	- Rated Current				

SN	Pages/Paragraph	Amendments					
		18.2.1	• HV	A	1250		
		18.2.2	• IV	A	2000		
		18.2.3	• LV	A	1250		
		18.2.4	• Neutral	A	2000		
		18.3	- 1.2/50 µs lightning impulse withstand voltage				
		18.3.1	• HV	kVp	1425		
		18.3.2	• IV	kVp	1050		
		18.3.3	• LV	kVp	250		
		18.3.4	• Neutral	kVp	170		
		18.4	- 250/2500 µs switching impulse withstand voltage				
		18.4.1	• HV	kVp	1050		
		18.4.2	• IV	kVp	850		
		18.4.3	• LV	kVp	-		
		18.4.4	• Neutral	kVp	-		
		18.5	- One minute power frequency withstand voltage				
		18.5.1	• HV	kV rms	695		
		18.5.2	• IV	kV rms	505		
		18.5.3	• LV	kV rms	105		
		18.5.4	• Neutral	kV rms	77		
		18.6	- Minimum. total creepage distances				
		18.6.1	• HV	mm	10500		
		18.6.2	• IV	mm	6125		
		18.6.3	• LV	Mm	1300		
		18.6.4	• Neutral	mm	900		
		18.7	- Mounting				
		18.7.1	• HV		Tank cover		
		18.7.2	• IV		Tank cover		

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<tr><td>-</td><td>- Diameter</td><td>Mm</td><td>16</td><td></td><td></td></tr>
<tr><td>-</td><td>- Material</td><td></td><td>Copper</td><td></td><td></td></tr>
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<tr><th>S. No</th><th>Parameter</th><th>Unit</th><th colspan="2">Data</th><th>Comments</th></tr>
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<tr><td>-</td><td>- Material</td><td></td><td>Copper Clad Steel</td><td></td><td></td></tr>
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<tr><td>21</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 1-Technical Data Schedule, 16. Ratmate 420kV and 245kV GIS Technical Specifications, 16.1 420kV GIS Technical</td><td>16. RATMATE 420KV AND 245KV GIS TECHNICAL SPECIFICATIONS
16.1 420kV GIS TECHNICAL SPECIFICATIONS
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<tr><th rowspan="2">S. No.</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Data</th><th rowspan="2">Comments</th></tr>
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<tr><td>2.</td><td colspan="5">Gas Insulated Circuit Breaker Requirements</td></tr>
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SN	Pages/Paragraph	Amendments					
	Specifications, Page 46 (PDF Page 192 of 1019), 2. Gas Insulated Circuit Breaker Requirements	2.1.	Interrupter Configuration	N/A	Single-phase encapsulated		
		2.2.	Nominal System Voltage Rating:	kV	400		
		2.3.	Maximum System Voltage Rating:	kV	420		
		2.4.	Frequency	Hz	50		
		2.5.	Rated lightning impulse withstand voltage (1.2 / 50 µs)	kV	1425		
		2.6.	Rated lightning impulse withstand voltage (1.2 / 50 µs)(+bias)	kV	1425(+457)		
		2.7.	Rated switching impulse withstand voltage	kV	1050		
		2.8.	Rated switching impulse withstand voltage, Open Gap	kV	900(+345)		
		2.9.	Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground	kV	650		
		2.10.	Rated short-duration power-frequency withstand voltage (1 min) Open Gap	kV	815		

SN	Pages/Paragraph	Amendments					
		2.11.	Rated normal current	A	4000		
		2.12.	Rated short-circuit breaking current (< 2 cycles)	kA	50 (symmetrical)		
		2.13.	Asymmetrical interrupting capability at rated maximum voltage	kA,rms	BY DBC		
		2.14.	Rated maximum interrupting time	ms	40 (on a 50 Hz basis)		
		2.15.	Opening time from energizing of the trip coil to contact parting	ms	BY DBC		
		2.16.	Rated permissible tripping time delay	S	1.0		
		2.17.	Rated closing and latching current	kA	125 peak		
		2.18.	Rated reclosing time	S	0.3		
		2.19.	Pre-insertion resistor	Ω	400, min. insertion time 8ms, insertion overlap with main contacts 5ms		PIR use to be confirmed only after necessary engineering study.
		2.20.	First pole to clear factor terminal fault	N/A	1.3 at T100		
		2.21.	First pole to clear factor short line fault	N/A	1.0 at T100		
		2.22.	First pole to clear factor out-of-phase	N/A	2.0 at T100		

SN	Pages/Paragraph	Amendments					
		2.23.	TRV peak value terminal fault	kV	817 at T100		
		2.24.	TRV peak value short line fault	kV	629 at T100		
		2.25.	TRV peak value out-of-phase	kV	1120 at T100		
		2.26.	Rate of rising of recovery voltage (RRRV) terminal fault	kV/ µs	2 at T100		
		2.27.	Rate of rising of recovery voltage (RRRV) short-line fault	kV/ µs	2 at T100		
		2.28.	Rate of rising of recovery voltage (RRRV) out-of-phase	kV/ µs	1.54 at T100		
		2.29.	TRV peak value T60	kV	876		
		2.30.	TRV peak value T30	kV	899		
		2.31.	TRV peak value T10	kV	1030		
		2.32.	Rate of rising of recovery voltage (RRRV) T60	kV/ µs	3		
		2.33.	Rate of rising of recovery voltage (RRRV) T30	kV/ µs	5		
		2.34.	Rate of rising of recovery voltage (RRRV) T10	kV/ µs	7		
		2.35.	Rated peak withstand current	kA	125		
		2.36.	Rated short-time withstand current (up to 1s)	kA	50		

SN	Pages/Paragraph	Amendments

2.37.	Rated capacitive switching currents	N/A	IEEE C37.06 Class C2		
2.38.	Mechanical endurance class	N/A	2000 no-load mechanical operations; 100 rated continuous current switching; 100 inrush current switching		
2.39.	Insulation Type:	N/A	SF_6 gas		
2.40.	Leakage rate per year and gas compartment (type-tested)	%	(As per IEC Standard 62271-203)		
2.41.	The operating mechanism of the circuit breaker	N/A	Stored-energy spring		
2.42.	Rated operating sequence	N/A	O-0.3 s-CO-3 min-CO; and CO-15 s-CO		
2.43.	Ambient temperature range	°C	-30 up to +40		
2.44.	DC Control Voltage:	V	220		
2.45.	DC Closing Voltage Range	V	BY DBC		
2.46.	Maximum Closing Current	A	BY DBC		
2.47.	AC Station Service Voltage	V	400, 3-phase		
2.48.	The number of low energy (less than 6A) Trip Coils per Circuit Breaker:	N/A	2		

has been replaced by:

16. RATMATE 420KV AND 245KV GIS TECHNICAL SPECIFICATIONS

16.1 420kV GIS TECHNICAL SPECIFICATIONS

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
2.	**Gas Insulated Circuit Breaker Requirements**				
2.1.	Interrupter Configuration	N/A	Single-phase encapsulated		
2.2.	Nominal System Voltage Rating:	kV	400		
2.3.	Maximum System Voltage Rating:	kV	420		
2.4.	Frequency	Hz	50		
2.5.	Rated lightning impulse withstand voltage (1.2 / 50 µs)	kV	1425		
2.6.	Rated lightning impulse withstand voltage (1.2 / 50 µs)(+bias)	kV	1425(+240)		
2.7.	Rated switching impulse withstand voltage	kV	1050		
2.8.	Rated switching impulse withstand voltage, Open Gap	kV	900(+345)		
2.9.	Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground	kV	650		
2.10.	Rated short-duration power-	kV	815		

SN	Pages/Paragraph	Amendments					
			frequency withstand voltage (1 min) Open Gap				
		2.11.	Rated normal current	A	4000		
		2.12.	Rated short-circuit breaking current (< 2 cycles)	kA	50 (symmetrical)		
		2.13.	Asymmetrical interrupting capability at rated maximum voltage	kA,rms	BY DBC		
		2.14.	Rated maximum interrupting time	ms	40 (on a 50 Hz basis)		
		2.15.	Opening time from energizing of the trip coil to contact parting	ms	BY DBC		
		2.16.	Rated permissible tripping time delay	S	1.0		
		2.17.	Rated closing and latching current	kA	125 peak		
		2.18.	Rated reclosing time	S	0.3		
		2.19.	Pre-insertion resistor	Ω	400, min. insertion time 8ms, insertion overlap with main contacts 5ms		PIR use to be confirmed only after necessary engineering study.
		2.20.	First pole to clear factor terminal fault	N/A	1.3 at T100		
		2.21.	First pole to clear factor short line fault	N/A	1.0 at T100		

SN	Pages/Paragraph	Amendments					
		2.22.	First pole to clear factor out-of-phase	N/A	2.0 at T100		
		2.23.	TRV peak value terminal fault	kV	624 at T100		
		2.24.	TRV peak value short line fault	kV	480 at T100		
		2.25.	TRV peak value out-of-phase	kV	857 at T100		
		2.26.	Rate of rising of recovery voltage (RRRV) terminal fault	kV/ µs	2 at T100		
		2.27.	Rate of rising of recovery voltage (RRRV) short-line fault	kV/ µs	2 at T100		
		2.28.	Rate of rising of recovery voltage (RRRV) out-of-phase	kV/ µs	1.54 at T100		
		2.29.	TRV peak value T60	kV	669		
		2.30.	TRV peak value T30	kV	687		
		2.31.	TRV peak value T10	kV	787		
		2.32.	Rate of rising of recovery voltage (RRRV) T60	kV/ µs	3		
		2.33.	Rate of rising of recovery voltage (RRRV) T30	kV/ µs	5		
		2.34.	Rate of rising of recovery voltage (RRRV) T10	kV/ µs	7		
		2.35.	Rated peak withstand current	kA	125		

SN	Pages/Paragraph	Amendments					
		2.36.	Rated short-time withstand current (up to 1s)	kA	50		
		2.37.	Rated capacitive switching currents	N/A	IEEE C37.06 Class C2		
		2.38.	Mechanical endurance class	N/A	2000 no-load mechanical operations; 100 rated continuous current switching; 100 inrush current switching		
		2.39.	Insulation Type:	N/A	SF_6 gas		
		2.40.	Leakage rate per year and gas compartment (type-tested)	%	(As per IEC Standard 62271-203)		
		2.41.	The operating mechanism of the circuit breaker	N/A	Stored-energy spring		
		2.42.	Rated operating sequence	N/A	O-0.3 s-CO-3 min-CO; and CO-15 s-CO		
		2.43.	Ambient temperature range	°C	-30 up to +40		
		2.44.	DC Control Voltage:	V	220		
		2.45.	DC Closing Voltage Range	V	BY DBC		
		2.46.	Maximum Closing Current	A	BY DBC		
		2.47.	AC Station Service Voltage	V	400, 3-phase		
		2.48.	The number of low energy (less than 6A) Trip Coils per	N/A	2		

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<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
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9. NEW BUTWAL 420KV GIS TECHNICAL SPECIFICATIONS
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<tr><th>Required</th><th>Offered</th></tr>
<tr><td>2.</td><td colspan="5">Gas Insulated Circuit Breaker Requirements</td></tr>
<tr><td>2.1.</td><td>Interrupter Configuration</td><td>N/A</td><td>Single-phase encapsulated</td><td></td><td></td></tr>
<tr><td>2.2.</td><td>Nominal System Voltage Rating:</td><td>kV</td><td>400</td><td></td><td></td></tr>
<tr><td>2.3.</td><td>Maximum System Voltage Rating:</td><td>kV</td><td>420</td><td></td><td></td></tr>
<tr><td>2.4.</td><td>Frequency</td><td>Hz</td><td>50</td><td></td><td></td></tr>
<tr><td>2.5.</td><td>Rated lightning impulse withstand voltage (1.2 / 50 µs)</td><td>kV</td><td>1425</td><td></td><td></td></tr>
<tr><td>2.6.</td><td>Rated lightning impulse withstand voltage (1.2 / 50 µs)(+bias)</td><td>kV</td><td>1425(+457)</td><td></td><td></td></tr>
<tr><td>2.7.</td><td>Rated switching impulse withstand voltage</td><td>kV</td><td>1050</td><td></td><td></td></tr>
<tr><td>2.8.</td><td>Rated switching impulse withstand voltage, Open Gap</td><td>kV</td><td>900(+345)</td><td></td><td></td></tr>
<tr><td>2.9.</td><td>Rated short-duration power-frequency</td><td>kV</td><td>650</td><td></td><td></td></tr>
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SN	Pages/Paragraph	Amendments						
				withstand voltage (1 min) Phase-to-ground				
			2.10.	Rated short-duration power-frequency withstand voltage (1 min) Open Gap	kV	815		
			2.11.	Rated normal current	A	4000		
			2.12.	Rated short-circuit breaking current (< 2 cycles)	kA	50 (symmetrical)		
			2.13.	Asymmetrical interrupting capability at rated maximum voltage	kA,rms	BY DBC		
			2.14.	Rated maximum interrupting time	ms	40 (on a 50 Hz basis)		
			2.15.	Opening time from energizing of the trip coil to contact parting	ms	BY DBC		
			2.16.	Rated permissible tripping time delay	S	1.0		
			2.17.	Rated closing and latching current	kA	125 peak		
			2.18.	Rated reclosing time	S	0.3		
			2.19.	Pre-insertion resistor	Ω	400, min. insertion time 8ms,		PIR use to be confirmed

SN	Pages/Paragraph	Amendments					
					insertion overlap with main contacts 5ms		only after necessary engineering study.
		2.20.	First pole to clear factor terminal fault	N/A	1.3 at T100		
		2.21.	First pole to clear factor short line fault	N/A	1.0 at T100		
		2.22.	First pole to clear factor out-of-phase	N/A	2.0 at T100		
		2.23.	TRV peak value terminal fault	kV	817 at T100		
		2.24.	TRV peak value short line fault	kV	629 at T100		
		2.25.	TRV peak value out-of-phase	kV	1120 at T100		
		2.26.	Rate of rising of recovery voltage (RRRV) terminal fault	kV/ µs	2 at T100		
		2.27.	Rate of rising of recovery voltage (RRRV) short-line fault	kV/ µs	2 at T100		
		2.28.	Rate of rising of recovery voltage (RRRV) out-of-phase	kV/ µs	1.54 at T100		
		2.29.	TRV peak value T60	kV	876		
		2.30.	TRV peak value T30	kV	899		
		2.31.	TRV peak value T10	kV	1030		
		2.32.	Rate of rising of recovery	kV/ µs	3		

SN	Pages/Paragraph	Amendments					
			voltage (RRRV) T60				
		2.33.	Rate of rising of recovery voltage (RRRV) T30	kV/ µs	5		
		2.34.	Rate of rising of recovery voltage (RRRV) T10	kV/ µs	7		
		2.35.	Rated peak withstand current	kA	125		
		2.36.	Rated short-time withstand current (up to 1s)	kA	50		
		2.37.	Rated capacitive switching currents	N/A	IEEE C37.06 Class C2		
		2.38.	Mechanical endurance class	N/A	2000 no-load mechanical operations; 100 rated continuous current switching; 100 inrush current switching		
		2.39.	Insulation Type:	N/A	SF_6 gas		
		2.40.	Leakage rate per year and gas compartment (type-tested)	%	(As per IEC Standard 62271-203)		
		2.41.	The operating mechanism of the circuit breaker	N/A	Stored-energy spring		
		2.42.	Rated operating sequence	N/A	O-0.3 s-CO-3 min-CO; and CO-15 s-CO		

SN	Pages/Paragraph	Amendments

2.43.	Ambient temperature range	°C	-30 up to +40		
2.44.	DC Control Voltage:	V	220		
2.45.	DC Closing Voltage Range	V	BY DBC		
2.46.	Maximum Closing Current	A	BY DBC		
2.47.	AC Station Service Voltage	V	400, 3-phase		
2.48.	The number of low energy (less than 6A) Trip Coils per Circuit Breaker:	N/A	2		

has been replaced by:

9. NEW BUTWAL 420KV GIS TECHNICAL SPECIFICATIONS

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
2.	**Gas Insulated Circuit Breaker Requirements**				
2.1.	Interrupter Configuration	N/A	Single-phase encapsulated		
2.2.	Nominal System Voltage Rating:	kV	400		
2.3.	Maximum System Voltage Rating:	kV	420		
2.4.	Frequency	Hz	50		
2.5.	Rated lightning impulse withstand voltage (1.2 / 50 μs)	kV	1425		
2.6.	Rated lightning impulse withstand	kV	1425(+240)		

SN	Pages/Paragraph	Amendments					
			voltage (1.2 / 50 μs)(+bias)				
		2.7.	Rated switching impulse withstand voltage	kV	1050		
		2.8.	Rated switching impulse withstand voltage, Open Gap	kV	900(+345)		
		2.9.	Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground	kV	650		
		2.10.	Rated short-duration power-frequency withstand voltage (1 min) Open Gap	kV	815		
		2.11.	Rated normal current	A	4000		
		2.12.	Rated short-circuit breaking current (< 2 cycles)	kA	50 (symmetrical)		
		2.13.	Asymmetrical interrupting capability at rated maximum voltage	kA,rms	BY DBC		
		2.14.	Rated maximum interrupting time	ms	40 (on a 50 Hz basis)		
		2.15.	Opening time from energizing of	ms	BY DBC		

SN	Pages/Paragraph	Amendments						
				the trip coil to contact parting				
			2.16.	Rated permissible tripping time delay	S	1.0		
			2.17.	Rated closing and latching current	kA	125 peak		
			2.18.	Rated reclosing time	S	0.3		
			2.19.	Pre-insertion resistor	Ω	400, min. insertion time 8ms, insertion overlap with main contacts 5ms		PIR use to be confirmed only after necessary engineering study.
			2.20.	First pole to clear factor terminal fault	N/A	1.3 at T100		
			2.21.	First pole to clear factor short line fault	N/A	1.0 at T100		
			2.22.	First pole to clear factor out-of-phase	N/A	2.0 at T100		
			2.23.	TRV peak value terminal fault	kV	624 at T100		
			2.24.	TRV peak value short line fault	kV	480 at T100		
			2.25.	TRV peak value out-of-phase	kV	857 at T100		
			2.26.	Rate of rising of recovery voltage (RRRV) terminal fault	kV/ µs	2 at T100		
			2.27.	Rate of rising of recovery voltage (RRRV) short-line fault	kV/ µs	2 at T100		
			2.28.	Rate of rising of recovery voltage	kV/ µs	1.54 at T100		

SN	Pages/Paragraph	Amendments					
			(RRRV) out-of-phase				
		2.29.	TRV peak value T60	kV	669		
		2.30.	TRV peak value T30	kV	687		
		2.31.	TRV peak value T10	kV	787		
		2.32.	Rate of rising of recovery voltage (RRRV) T60	kV/ µs	3		
		2.33.	Rate of rising of recovery voltage (RRRV) T30	kV/ µs	5		
		2.34.	Rate of rising of recovery voltage (RRRV) T10	kV/ µs	7		
		2.35.	Rated peak withstand current	kA	125		
		2.36.	Rated short-time withstand current (up to 1s)	kA	50		
		2.37.	Rated capacitive switching currents	N/A	IEEE C37.06 Class C2		
		2.38.	Mechanical endurance class	N/A	2000 no-load mechanical operations; 100 rated continuous current switching; 100 inrush current switching		
		2.39.	Insulation Type:	N/A	SF_6 gas		
		2.40.	Leakage rate per year and gas compartment (type-tested)	%	(As per IEC Standard 62271-203)		

SN	Pages/Paragraph	Amendments

2.41.	The operating mechanism of the circuit breaker	N/A	Stored-energy spring		
2.42.	Rated operating sequence	N/A	O-0.3 s-CO-3 min-CO; and CO-15 s-CO		
2.43.	Ambient temperature range	°C	-30 up to +40		
2.44.	DC Control Voltage:	V	220		
2.45.	DC Closing Voltage Range	V	BY DBC		
2.46.	Maximum Closing Current	A	BY DBC		
2.47.	AC Station Service Voltage	V	400, 3-phase		
2.48.	The number of low energy (less than 6A) Trip Coils per Circuit Breaker:	N/A	2		

23 Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 3-Technical Data Schedule, 16. New Damauli 420kV GIS Technical Specifications, 16.1 420kV GIS Technical Specifications, Page 45 (PDF Page 480 of 1019), 2. Gas Insulated Circuit Breaker Requirements

16. NEW DAMAULI 420KV GIS TECHNICAL SPECIFICATIONS

16.1 420kV GIS TECHNICAL SPECIFICATIONS

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
2.	**Gas Insulated Circuit Breaker Requirements**				
2.1.	Interrupter Configuration	N/A	Single-phase encapsulated		
2.2.	Nominal System Voltage Rating:	kV	400		
2.3.	Maximum System Voltage Rating:	kV	420		
2.4.	Frequency	Hz	50		
2.5.	Rated lightning impulse withstand	kV	1425		

SN	Pages/Paragraph	Amendments					
			voltage (1.2 / 50 μs)				
		2.6.	Rated lightning impulse withstand voltage (1.2 / 50 μs)(+bias)	kV	1425(+457)		
		2.7.	Rated switching impulse withstand voltage	kV	1050		
		2.8.	Rated switching impulse withstand voltage, Open Gap	kV	900(+345)		
		2.9.	Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground	kV	650		
		2.10.	Rated short-duration power-frequency withstand voltage (1 min) Open Gap	kV	815		
		2.11.	Rated normal current	A	4000		
		2.12.	Rated short-circuit breaking current (< 2 cycles)	kA	50 (symmetrical)		
		2.13.	Asymmetrical interrupting capability at rated	kA,rms	BY DBC		

SN	Pages/Paragraph	Amendments					
			maximum voltage				
		2.14.	Rated maximum interrupting time	ms	40 (on a 50 Hz basis)		
		2.15.	Opening time from energizing of the trip coil to contact parting	ms	BY DBC		
		2.16.	Rated permissible tripping time delay	S	1.0		
		2.17.	Rated closing and latching current	kA	125 peak		
		2.18.	Rated reclosing time	S	0.3		
		2.19.	Pre-insertion resistor	Ω	400, min. insertion time 8ms, insertion overlap with main contacts 5ms		PIR use to be confirmed only after necessary engineering study.
		2.20.	First pole to clear factor terminal fault	N/A	1.3 at T100		
		2.21.	First pole to clear factor short line fault	N/A	1.0 at T100		
		2.22.	First pole to clear factor out-of-phase	N/A	2.0 at T100		
		2.23.	TRV peak value terminal fault	kV	817 at T100		
		2.24.	TRV peak value short line fault	kV	629 at T100		
		2.25.	TRV peak value out-of-phase	kV	1120 at T100		

SN	Pages/Paragraph	Amendments					
		2.26.	Rate of rising of recovery voltage (RRRV) terminal fault	kV/ µs	2 at T100		
		2.27.	Rate of rising of recovery voltage (RRRV) short-line fault	kV/ µs	2 at T100		
		2.28.	Rate of rising of recovery voltage (RRRV) out-of-phase	kV/ µs	1.54 at T100		
		2.29.	TRV peak value T60	kV	876		
		2.30.	TRV peak value T30	kV	899		
		2.31.	TRV peak value T10	kV	1030		
		2.32.	Rate of rising of recovery voltage (RRRV) T60	kV/ µs	3		
		2.33.	Rate of rising of recovery voltage (RRRV) T30	kV/ µs	5		
		2.34.	Rate of rising of recovery voltage (RRRV) T10	kV/ µs	7		
		2.35.	Rated peak withstand current	kA	125		
		2.36.	Rated short-time withstand current (up to 1s)	kA	50		
		2.37.	Rated capacitive switching currents	N/A	IEEE C37.06 Class C2		

SN	Pages/Paragraph	Amendments

2.38.	Mechanical endurance class	N/A	2000 no-load mechanical operations; 100 rated continuous current switching; 100 inrush current switching		
2.39.	Insulation Type:	N/A	SF_6 gas		
2.40.	Leakage rate per year and gas compartment (type-tested)	%	(As per IEC Standard 62271-203)		
2.41.	The operating mechanism of the circuit breaker	N/A	Stored-energy spring		
2.42.	Rated operating sequence	N/A	O-0.3 s-CO-3 min-CO; and CO-15 s-CO		
2.43.	Ambient temperature range	°C	-30 up to +40		
2.44.	DC Control Voltage:	V	220		
2.45.	DC Closing Voltage Range	V	BY DBC		
2.46.	Maximum Closing Current	A	BY DBC		
2.47.	AC Station Service Voltage	V	400, 3-phase		
2.48.	The number of low energy (less than 6A) Trip Coils per Circuit Breaker:	N/A	2		

has been replaced by:

16. NEW DAMAULI 420KV GIS TECHNICAL SPECIFICATIONS

16.1 420kV GIS TECHNICAL SPECIFICATIONS

S. No.	Parameter	Unit	Data		Comments
			Required	Offered	
2.	**Gas Insulated Circuit Breaker Requirements**				
2.1.	Interrupter Configuration	N/A	Single-phase encapsulated		
2.2.	Nominal System Voltage Rating:	kV	400		
2.3.	Maximum System Voltage Rating:	kV	420		
2.4.	Frequency	Hz	50		
2.5.	Rated lightning impulse withstand voltage (1.2 / 50 µs)	kV	1425		
2.6.	Rated lightning impulse withstand voltage (1.2 / 50 µs)(+bias)	kV	1425(+240)		
2.7.	Rated switching impulse withstand voltage	kV	1050		
2.8.	Rated switching impulse withstand voltage, Open Gap	kV	900(+345)		
2.9.	Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground	kV	650		

SN	Pages/Paragraph	Amendments					
		2.10.	Rated short-duration power-frequency withstand voltage (1 min) Open Gap	kV	815		
		2.11.	Rated normal current	A	4000		
		2.12.	Rated short-circuit breaking current (< 2 cycles)	kA	50 (symmetrical)		
		2.13.	Asymmetrical interrupting capability at rated maximum voltage	kA,rms	BY DBC		
		2.14.	Rated maximum interrupting time	ms	40 (on a 50 Hz basis)		
		2.15.	Opening time from energizing of the trip coil to contact parting	ms	BY DBC		
		2.16.	Rated permissible tripping time delay	S	1.0		
		2.17.	Rated closing and latching current	kA	125 peak		
		2.18.	Rated reclosing time	S	0.3		
		2.19.	Pre-insertion resistor	Ω	400, min. insertion time 8ms, insertion overlap with main contacts 5ms		PIR use to be confirmed only after necessary engineering study.
		2.20.	First pole to clear factor terminal fault	N/A	1.3 at T100		

SN	Pages/Paragraph	Amendments					
		2.21.	First pole to clear factor short line fault	N/A	1.0 at T100		
		2.22.	First pole to clear factor out-of-phase	N/A	2.0 at T100		
		2.23.	TRV peak value terminal fault	kV	624 at T100		
		2.24.	TRV peak value short line fault	kV	480 at T100		
		2.25.	TRV peak value out-of-phase	kV	857 at T100		
		2.26.	Rate of rising of recovery voltage (RRRV) terminal fault	kV/ µs	2 at T100		
		2.27.	Rate of rising of recovery voltage (RRRV) short-line fault	kV/ µs	2 at T100		
		2.28.	Rate of rising of recovery voltage (RRRV) out-of-phase	kV/ µs	1.54 at T100		
		2.29.	TRV peak value T60	kV	669		
		2.30.	TRV peak value T30	kV	687		
		2.31.	TRV peak value T10	kV	787		
		2.32.	Rate of rising of recovery voltage (RRRV) T60	kV/ µs	3		
		2.33.	Rate of rising of recovery voltage (RRRV) T30	kV/ µs	5		
		2.34.	Rate of rising of recovery voltage (RRRV) T10	kV/ µs	7		

SN	Pages/Paragraph	Amendments					
		2.35.	Rated peak withstand current	kA	125		
		2.36.	Rated short-time withstand current (up to 1s)	kA	50		
		2.37.	Rated capacitive switching currents	N/A	IEEE C37.06 Class C2		
		2.38.	Mechanical endurance class	N/A	2000 no-load mechanical operations; 100 rated continuous current switching; 100 inrush current switching		
		2.39.	Insulation Type:	N/A	SF_6 gas		
		2.40.	Leakage rate per year and gas compartment (type-tested)	%	(As per IEC Standard 62271-203)		
		2.41.	The operating mechanism of the circuit breaker	N/A	Stored-energy spring		
		2.42.	Rated operating sequence	N/A	O-0.3 s-CO-3 min-CO; and CO-15 s-CO		
		2.43.	Ambient temperature range	°C	-30 up to +40		
		2.44.	DC Control Voltage:	V	220		
		2.45.	DC Closing Voltage Range	V	BY DBC		
		2.46.	Maximum Closing Current	A	BY DBC		
		2.47.	AC Station Service Voltage	V	400, 3-phase		

<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td></td><td></td><td>
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<tr><td>2.48.</td><td>The number of low energy (less than 6A) Trip Coils per Circuit Breaker:</td><td>N/A</td><td>2</td><td></td><td></td></tr>
</table>
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<tr><td>24</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 1- Technical Data Schedule, 16. Ratmate 420kV and 245kV GIS Technical Specifications, 16.1 420kV GIS Technical Specifications, Page 49 (PDF Page 195 of 1019), 4. Gas Insulated Switchgear Voltage Transformers</td><td>16. RATMATE 420KV AND 245KV GIS TECHNICAL SPECIFICATIONS
16.1 420kV GIS TECHNICAL SPECIFICATIONS

<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Data</th><th rowspan="2">Comments</th></tr>
<tr><th>Required</th><th>Offered</th></tr>
<tr><td>4.</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8.</td><td>Rated Output</td><td>VA</td><td>1000 (minimum), each winding</td><td></td><td></td></tr>
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has been replaced by:

16. RATMATE 420KV AND 245KV GIS TECHNICAL SPECIFICATIONS
16.1 420kV GIS TECHNICAL SPECIFICATIONS

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<tr><th>Required</th><th>Offered</th></tr>
<tr><td>4.</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8.</td><td>Rated Output</td><td>VA</td><td>1500 (minimum), each winding</td><td></td><td></td></tr>
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</td></tr>
<tr><td>25</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 1- Technical Data Schedule, 16. Ratmate 420kV and 245kV GIS Technical Specifications, 16.2 245kV GIS Technical Specifications, Page 62 (PDF Page 208 of 1019), 4. Gas Insulated Switchgear Voltage Transformers</td><td>16. RATMATE 420KV AND 245KV GIS TECHNICAL SPECIFICATIONS
16.2 245kV GIS TECHNICAL SPECIFICATIONS

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<tr><th>Required</th><th>Offered</th></tr>
<tr><td>4.</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8.</td><td>Rated Output</td><td>VA</td><td>1000 (minimum), each winding</td><td></td><td></td></tr>
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has been replaced by:</td></tr>
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16.2 245kV GIS TECHNICAL SPECIFICATIONS

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<tr><td>4.</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8.</td><td>Rated Output</td><td>VA</td><td>1500 (minimum), each winding</td><td></td><td></td></tr>
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<tr><td>26</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 2- Technical Data Schedule, 9. New Butwal 420kV GIS Technical Specifications, Page 57 (PDF Page 370 of 1019), 4. Gas Insulated Switchgear Voltage Transformers</td><td>9. NEW BUTWAL 420KV GIS TECHNICAL SPECIFICATIONS

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<tr><td>4</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8</td><td>Rated Output</td><td>VA</td><td>1000 (minimum), each winding</td><td></td><td></td></tr>
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has been replaced by:

9. NEW BUTWAL 420KV GIS TECHNICAL SPECIFICATIONS
<table>
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<tr><th>Required</th><th>Offered</th></tr>
<tr><td>4.</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8</td><td>Rated Output</td><td>VA</td><td>1500 (minimum), each winding</td><td></td><td></td></tr>
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<tr><td>27</td><td>Part 1, Section IV, Form Tech-11: Technical Data Schedule, Lot 3- Technical Data Schedule, 16. New Damauli 420kV GIS Technical Specifications, Page 48 (PDF Page 529 of 1019), 4. Gas Insulated Switchgear Voltage Transformers</td><td>16. NEW DAMAULI 420KV GIS TECHNICAL SPECIFICATIONS
16.1 420KV GIS TECHNICAL SPECIFICATIONS

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<tr><th>Required</th><th>Offered</th></tr>
<tr><td>4</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8</td><td>Rated Output</td><td>VA</td><td>1000 (minimum), each winding</td><td></td><td></td></tr>
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has been replaced by:

16. NEW DAMAULI 420KV GIS TECHNICAL SPECIFICATIONS
16.1 420KV GIS TECHNICAL SPECIFICATIONS</td></tr>
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<tr><th rowspan="2">S. No.</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Data</th><th rowspan="2">Comments</th></tr>
<tr><th>Required</th><th>Offered</th></tr>
<tr><td>4.</td><td colspan="5">Gas Insulated Switchgear Voltage Transformers</td></tr>
<tr><td>4.8</td><td>Rated Output</td><td>VA</td><td>1500 (minimum), each winding</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>28.</td><td>Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Section 1:420kV GIS Technical Specification, Page-27 (word page 35 of 841), 11. Gas Insulated Switchgear and Building General Requirements</td><td>
11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS
Gas Insulated Switchgear General Requirements

11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer:

<u>Bushing Insulation Properties</u>
<table>
<tr><th>System Nominal Voltage</th><th>Bushing BIL</th></tr>
<tr><td>69kV</td><td>350kV</td></tr>
<tr><td>115kV</td><td>550kV</td></tr>
<tr><td>138kV</td><td>650kV</td></tr>
<tr><td>161kV</td><td>900kV</td></tr>
<tr><td>230kV</td><td>1050kV</td></tr>
<tr><td>345kV</td><td>1300kV</td></tr>
<tr><td>400kV</td><td>1550kV</td></tr>
<tr><td>500kV</td><td>1800kV</td></tr>
<tr><td>765kV</td><td>2050kV</td></tr>
<tr><td></td><td></td></tr>
</table>
has been replaced by:

11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS
Gas Insulated Switchgear General Requirements
11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer:
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<tr><td>230kV</td><td>1050kV</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>345kV</td><td>1300kV</td></tr>
<tr><td>400kV</td><td>1425kV</td></tr>
<tr><td>500kV</td><td>1800kV</td></tr>
<tr><td>765kV</td><td>2050kV</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>29.</td><td>Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 1 a. Section 2: 220kV GIS Technical Specification, 11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS, Page-26 (word page 144 of 841), 11. Gas Insulated Switchgear and Building General Requirements</td><td>
11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS
Gas Insulated Switchgear General Requirements

11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer:

<u>Bushing Insulation Properties</u>

<table>
<tr><th>System Nominal Voltage</th><th>Bushing BIL</th></tr>
<tr><td>69kV</td><td>350kV</td></tr>
<tr><td>115kV</td><td>550kV</td></tr>
<tr><td>138kV</td><td>650kV</td></tr>
<tr><td>161kV</td><td>900kV</td></tr>
<tr><td>230kV</td><td>1050kV</td></tr>
<tr><td>345kV</td><td>1300kV</td></tr>
<tr><td>400kV</td><td>1550kV</td></tr>
<tr><td>500kV</td><td>1800kV</td></tr>
<tr><td>765kV</td><td>2050kV</td></tr>
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</table>
has been replaced by:

11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS
Gas Insulated Switchgear General Requirements
11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer:
<u>Bushing Insulation Properties</u>

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<tr><td>115kV</td><td>550kV</td></tr>
<tr><td>138kV</td><td>650kV</td></tr>
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<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>161kV</td><td>900kV</td></tr>
<tr><td>230kV</td><td>1050kV</td></tr>
<tr><td>345kV</td><td>1300kV</td></tr>
<tr><td>400kV</td><td>1425kV</td></tr>
<tr><td>500kV</td><td>1800kV</td></tr>
<tr><td>765kV</td><td>2050kV</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>30.</td><td>Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Page-26 (word page 33 of 732), 11. Gas Insulated Switchgear and Building General Requirements</td><td>
11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS

Gas Insulated Switchgear General Requirements

11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer:

<u>Bushing Insulation Properties</u>

<table>
<tr><td>System Nominal Voltage</td><td>Bushing BIL</td></tr>
<tr><td>69kV</td><td>350kV</td></tr>
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<tr><td>500kV</td><td>1800kV</td></tr>
<tr><td>765kV</td><td>2050kV</td></tr>
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</table>

has been replaced by:

11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS

Gas Insulated Switchgear General Requirements
11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer:
<u>Bushing Insulation Properties</u>

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<tr><td>138kV</td><td>650kV</td></tr>
</table>
</td></tr>
</table>

SN	Pages/Paragraph	Amendments
		161kV | 900kV 230kV | 1050kV 345kV | 1300kV 400kV | 1425kV 500kV | 1800kV 765kV | 2050kV
31.	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Page-26 (word page 33 of 741), 11. Gas Insulated Switchgear and Building General Requirements	**11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS** **Gas Insulated Switchgear General Requirements** 11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer: **Bushing Insulation Properties** System Nominal Voltage | Bushing BIL 69kV | 350kV 115kV | 550kV 138kV | 650kV 161kV | 900kV 230kV | 1050kV 345kV | 1300kV 400kV | 1550kV 500kV | 1800kV 765kV | 2050kV **has been replaced by:** **11. GAS INSULATED SWITCHGEAR AND BUILDING GENERAL REQUIREMENTS** **Gas Insulated Switchgear General Requirements** 11.4 The GIS gas-to-air bushings BIL shall be as follows in accordance with industry standards listed in Section 5.0 unless otherwise requested by the Employer: **Bushing Insulation Properties** System Nominal Voltage | Bushing BIL 69kV | 350kV 115kV | 550kV 138kV | 650kV 161kV | 900kV 230kV | 1050kV

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<tr><td>345kV</td><td>1300kV</td></tr>
<tr><td>400kV</td><td>1425kV</td></tr>
<tr><td>500kV</td><td>1800kV</td></tr>
<tr><td>765kV</td><td>2050kV</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>32.</td><td>Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Page-74 (word page 81 of 732), 12.28 Electric Overhead Travelling Crane</td><td>12.28. ELECTRIC OVERHEAD TRAVELLING CRANE

12.28.1 One EOT Crane each for 400kV GIS hall and 220kV GIS hall of suitable capacity shall be provided for erection & maintenance of the largest GIS component/assembly. The crane shall consist of all special requirements for erection & maintenance of GIS equipment.

has been replaced by:
12.28. ELECTRIC OVERHEAD TRAVELLING CRANE

12.28.1 One EOT Crane each for 400kV GIS hall of suitable capacity shall be provided for erection & maintenance of the largest GIS component/assembly. The crane shall consist of all special requirements for erection & maintenance of GIS equipment.</td></tr>
<tr><td>33.</td><td>Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Page-75 (word page 82 of 732), 12.28 Electric Overhead Travelling Crane</td><td>12.28. ELECTRIC OVERHEAD TRAVELLING CRANE

12.28.11 Contractor shall submit the capacity calculation of crane for GIS hall considering a factor of safety of 5.
a. The crane for 400kV GIS hall shall have capacity of minimum 10T safe working load and minimum height of crane shall have to be 9.0 meters or as per actual requirement whichever is higher.
b. The crane for 220kV GIS shall have capacity of minimum 6T safe working load and minimum height of crane shall have to be 8.0 meters or as per actual requirement whichever is higher.

has been replaced by:
12.28. ELECTRIC OVERHEAD TRAVELLING CRANE

12.28.11 Contractor shall submit the capacity calculation of crane for GIS hall considering a factor of safety of 5.
a. The crane for 400kV GIS hall shall have capacity of minimum 10T safe working load and minimum height of crane shall have to be 9.0 meters or as per actual requirement whichever is higher.</td></tr>
<tr><td>34</td><td>Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Page-77 (word page 84 of 741),</td><td>12.28. ELECTRIC OVERHEAD TRAVELLING CRANE

12.28.1 One EOT Crane each for 400kV GIS hall and 220kV GIS hall of suitable capacity shall be provided for erection & maintenance of the largest GIS component/assembly. The crane shall consist of all special requirements for erection & maintenance of GIS equipment.

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</table>

SN	Pages/Paragraph	Amendments
	12.28 Electric Overhead Travelling Crane	**12.28. ELECTRIC OVERHEAD TRAVELLING CRANE** 12.28.1 One EOT Crane each for 400kV GIS hall of suitable capacity shall be provided for erection & maintenance of the largest GIS component/assembly. The crane shall consist of all special requirements for erection & maintenance of GIS equipment.
35	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Page-78 (word page 85 of 741), 12.28 Electric Overhead Travelling Crane	**12.28. ELECTRIC OVERHEAD TRAVELLING CRANE** 12.28.11 Contractor shall submit the capacity calculation of crane for GIS hall considering a factor of safety of 5. a. The crane for 400kV GIS hall shall have capacity of minimum 10T safe working load and minimum height of crane shall have to be 9.0 meters or as per actual requirement whichever is higher. b. The crane for 220kV GIS shall have capacity of minimum 6T safe working load and minimum height of crane shall have to be 8.0 meters or as per actual requirement whichever is higher. **has been replaced by:** **12.28. ELECTRIC OVERHEAD TRAVELLING CRANE** 12.28.11 Contractor shall submit the capacity calculation of crane for GIS hall considering a factor of safety of 5. a. The crane for 400kV GIS hall shall have capacity of minimum 10T safe working load and minimum height of crane shall have to be 9.0 meters or as per actual requirement whichever is higher.
36	Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 1. General, Page-2 (word page 278 of 841), 1.1 General Requirements	**1. GENERAL** **1.1. GENERAL REQUIREMENTS** g. Autotransformers shall also be fitted with a sufficient number of GIS enabled impact recorders during transportation to measure the movement due to impact in all three directions. **has been replaced by:** **1. GENERAL** **1.1. GENERAL REQUIREMENTS** g. Autotransformers shall also be fitted with a sufficient number of GPS enabled impact recorders during transportation to measure the movement due to impact in all three directions.
37	Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer	**1. GENERAL** **1.1. GENERAL REQUIREMENTS** g. Autotransformers shall also be fitted with a sufficient number of GIS enabled impact recorders during transportation to measure the movement due to impact in all three directions.

SN	Pages/Paragraph	Amendments
	Specification, 1. General, Page-2 (word page 165 of 732), 1.1 General Requirements	**has been replaced by:** **1. GENERAL** **1.1. GENERAL REQUIREMENTS** g. Autotransformers shall also be fitted with a sufficient number of GPS enabled impact recorders during transportation to measure the movement due to impact in all three directions.
38	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 1. General, Page-2 (word page 168 of 741), 1.1 General Requirements	**1. GENERAL** **1.1. GENERAL REQUIREMENTS** h. Autotransformers shall also be fitted with a sufficient number of GIS enabled impact recorders during transportation to measure the movement due to impact in all three directions. **has been replaced by:** **1. GENERAL** **1.1. GENERAL REQUIREMENTS** h. Autotransformers shall also be fitted with a sufficient number of GPS enabled impact recorders during transportation to measure the movement due to impact in all three directions.
39	Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 3. Construction Details, Page-23 (word page 299 of 841), 3.5.Terminal Arrangement	**3. CONSTRUCTION DETAILS** **3.5. TERMINAL ARRANGEMENT** a. Bushings i. The electrical and mechanical characteristics of bushings shall be in accordance with IEC 60137 and DIN 42530. ii. Contractor shall provide details for connecting windings to bushings for Engineer review. iii. All bushings shall be removable without removing the tank cover or any attached internal corona shields. All bushings shall be designed such that there will be no undue stress placed on any parts due to temperature changes. iv. Bushings rated for 420 kV, 245 kV, and 52 kV shall be of the oil filled condenser type. Mounting dimensions of 420kV, 245 kV and 52 kV bushings shall be per IEC. v. Oil filled condenser type bushings shall be provided with at least the following fittings: a. Oil level gauge b. Oil filling plug and drain valve if not hermetically sealed c. Tap for capacitance and tan delta test vi. Where current transformers are specified, the bushings shall be removable without disturbing the current transformers. vii. Bushings of identical ratings shall be interchangeable.

SN	Pages/Paragraph	Amendments
		viii. Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. ix. Clamps and fittings shall be of hot dip galvanized steel. x. Bushing turrets shall be provided with vent pipes to route any gas collection through the Buchholz relay. xi. No arcing horns shall be provided on the bushings. xii. Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of tertiary winding bushings to avoid accidental external short circuit. xiii. Surge s with brackets shall be mounted in the tertiary compartment of the transformers and connected to the tertiary bushings. **has been replaced by:** **3. CONSTRUCTION DETAILS** **3.5. TERMINAL ARRANGEMENT** a. Bushings i. The electrical and mechanical characteristics of bushings shall be in accordance with IEC 60137 and DIN 42530. ii. Contractor shall provide details for connecting windings to bushings for Engineer review. iii. All bushings shall be removable without removing the tank cover or any attached internal corona shields. All bushings shall be designed such that there will be no undue stress placed on any parts due to temperature changes. iv. Bushings rated for 420 kV, 245 kV, and 52 kV shall be of the oil filled condenser type. Mounting dimensions of 420kV, 245 kV and 52 kV bushings shall be per IEC. v. Oil filled condenser type bushings shall be provided with at least the following fittings: a. Oil level gauge b. Oil filling plug and drain valve if not hermetically sealed c. Tap for capacitance and tan delta test vi. Where current transformers are specified, the bushings shall be removable without disturbing the current transformers. vii. Bushings of identical ratings shall be interchangeable. viii. Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. ix. Clamps and fittings shall be of hot dip galvanized steel. x. Bushing turrets shall be provided with vent pipes to route any gas collection through the Buchholz relay.

SN	Pages/Paragraph	Amendments
		xi. No arcing horns shall be provided on the bushings. xii. Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of tertiary winding bushings to avoid accidental external short circuit.
40	Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 3. Construction Details, Page-23 (word page 186 of 732), 3.5.Terminal Arrangement	**3. CONSTRUCTION DETAILS** **3.5. TERMINAL ARRANGEMENT** a. Bushings i. The electrical and mechanical characteristics of bushings shall be in accordance with IEC 60137 and DIN 42530. ii. Contractor shall provide details for connecting windings to bushings for Engineer review. iii. All bushings shall be removable without removing the tank cover or any attached internal corona shields. All bushings shall be designed such that there will be no undue stress placed on any parts due to temperature changes. iv. Bushings rated for 420 kV, 245 kV, and 52 kV shall be of the oil filled condenser type. Mounting dimensions of 420kV, 245 kV and 52 kV bushings shall be per IEC. v. Oil filled condenser type bushings shall be provided with at least the following fittings: a. Oil level gauge b. Oil filling plug and drain valve if not hermetically sealed c. Tap for capacitance and tan delta test vi. Where current transformers are specified, the bushings shall be removable without disturbing the current transformers. vii. Bushings of identical ratings shall be interchangeable. viii. Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. ix. Clamps and fittings shall be of hot dip galvanized steel. x. Bushing turrets shall be provided with vent pipes to route any gas collection through the Buchholz relay. xi. No arcing horns shall be provided on the bushings. xii. Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of tertiary winding bushings to avoid accidental external short circuit. xiii. Surge s with brackets shall be mounted in the tertiary compartment of the transformers and connected to the tertiary bushings. **has been replaced by:** **3. CONSTRUCTION DETAILS**

SN	Pages/Paragraph	Amendments
		3.5. TERMINAL ARRANGEMENT a. Bushings i. The electrical and mechanical characteristics of bushings shall be in accordance with IEC 60137 and DIN 42530. ii. Contractor shall provide details for connecting windings to bushings for Engineer review. iii. All bushings shall be removable without removing the tank cover or any attached internal corona shields. All bushings shall be designed such that there will be no undue stress placed on any parts due to temperature changes. iv. Bushings rated for 420 kV, 245 kV, and 52 kV shall be of the oil filled condenser type. Mounting dimensions of 420kV, 245 kV and 52 kV bushings shall be per IEC. v. Oil filled condenser type bushings shall be provided with at least the following fittings: a. Oil level gauge b. Oil filling plug and drain valve if not hermetically sealed c. Tap for capacitance and tan delta test vi. Where current transformers are specified, the bushings shall be removable without disturbing the current transformers. vii. Bushings of identical ratings shall be interchangeable. viii. Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. ix. Clamps and fittings shall be of hot dip galvanized steel. x. Bushing turrets shall be provided with vent pipes to route any gas collection through the Buchholz relay. xi. No arcing horns shall be provided on the bushings. **xii.** Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of tertiary winding bushings to avoid accidental external short circuit.
41	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 3. Construction Details, Page-22 (word page 188 of 741), 3.5.Terminal Arrangement	**3. CONSTRUCTION DETAILS** **3.5. TERMINAL ARRANGEMENT** a. Bushings i. The electrical and mechanical characteristics of bushings shall be in accordance with IEC 60137 and DIN 42530. ii. Contractor shall provide details for connecting windings to bushings for Engineer review. iii. All bushings shall be removable without removing the tank cover or any attached internal corona shields. All bushings shall be designed such that there will be no undue stress placed on any parts due to temperature changes. iv. Bushings rated for 420 kV, 245 kV, and 52 kV shall be of the oil

SN	Pages/Paragraph	Amendments
		filled condenser type. Mounting dimensions of 420kV, 245 kV and 52 kV bushings shall be per IEC. v. Oil filled condenser type bushings shall be provided with at least the following fittings: a. Oil level gauge b. Oil filling plug and drain valve if not hermetically sealed c. Tap for capacitance and tan delta test vi. Where current transformers are specified, the bushings shall be removable without disturbing the current transformers. vii. Bushings of identical ratings shall be interchangeable. viii. Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. ix. Clamps and fittings shall be of hot dip galvanized steel. x. Bushing turrets shall be provided with vent pipes to route any gas collection through the Buchholz relay. xi. No arcing horns shall be provided on the bushings. xii. Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of tertiary winding bushings to avoid accidental external short circuit. xiii. Surge s with brackets shall be mounted in the tertiary compartment of the transformers and connected to the tertiary bushings. **has been replaced by:** **3. CONSTRUCTION DETAILS** **3.5. TERMINAL ARRANGEMENT** a. Bushings i. The electrical and mechanical characteristics of bushings shall be in accordance with IEC 60137 and DIN 42530. ii. Contractor shall provide details for connecting windings to bushings for Engineer review. iii. All bushings shall be removable without removing the tank cover or any attached internal corona shields. All bushings shall be designed such that there will be no undue stress placed on any parts due to temperature changes. iv. Bushings rated for 420 kV, 245 kV, and 52 kV shall be of the oil filled condenser type. Mounting dimensions of 420kV, 245 kV and 52 kV bushings shall be per IEC. v. Oil filled condenser type bushings shall be provided with at least the following fittings: a. Oil level gauge b. Oil filling plug and drain valve if not hermetically sealed

SN	Pages/Paragraph	Amendments
		c. Tap for capacitance and tan delta test vi. Where current transformers are specified, the bushings shall be removable without disturbing the current transformers. vii. Bushings of identical ratings shall be interchangeable. viii. Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. ix. Clamps and fittings shall be of hot dip galvanized steel. x. Bushing turrets shall be provided with vent pipes to route any gas collection through the Buchholz relay. xi. No arcing horns shall be provided on the bushings. **xii.** Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of tertiary winding bushings to avoid accidental external short circuit.
42	Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 5. Inspection and Testing, Page-45 (word page 321 of 841), 5.1 Inspection	**5. INSPECTION AND TESTING** **5.1 TERMINAL ARRANGEMENT** g. Assembled Autotransformer i. Check completed autotransformer against approved outline drawings, provision for all fittings, finish level etc. ii. Test to check effective shielding of the tank iii. Check for adequate core to tank insulation iv. Jacking test with oil on all the assembled autotransformers, measuring deflection of the base. v. Skid test on filled transformer testing movement and rotation by pulling on provided lugs. vi. Dye penetration test shall be carried out after the jacking test vii. Outsourced Items a. The make of all major outsourced items shall be subject to Engineer's approval. b. The Contractor shall also prepare a comprehensive inspection and testing program for all out sourced/subcontracted items and shall submit the same to the Engineer for approval. Such program shall include the following components: • Buchholz relay • Axles and wheels • Winding temperature indicators for local and remote mounting • Oil temperature indicators • Bushings • Bushing current autotransformers • Cooler control cabinet • Cooling equipment

SN	Pages/Paragraph	Amendments
		• Oil Pumps • Fans/Air Blowers • Tap Change gear • Terminal connectors **has been replaced by:** **5. INSPECTION AND TESTING** **5.1 TERMINAL ARRANGEMENT** g. Assembled Autotransformer i. Check completed autotransformer against approved outline drawings, provision for all fittings, finish level etc. ii. Test to check effective shielding of the tank iii. Check for adequate core to tank insulation iv. Jacking test with oil on all the assembled autotransformers, measuring deflection of the base. v. Dye penetration test shall be carried out after the jacking test vi. Outsourced Items a. The make of all major outsourced items shall be subject to Engineer's approval. b. The Contractor shall also prepare a comprehensive inspection and testing program for all out sourced/subcontracted items and shall submit the same to the Engineer for approval. Such program shall include the following components: • Buchholz relay • Axles and wheels • Winding temperature indicators for local and remote mounting • Oil temperature indicators • Bushings • Bushing current autotransformers • Cooler control cabinet • Cooling equipment • Oil Pumps • Fans/Air Blowers • Tap Change gear • Terminal connectors
43	Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS,	**5. INSPECTION AND TESTING** **5.1 TERMINAL ARRANGEMENT** g. Assembled Autotransformer i. Check completed autotransformer against approved outline

SN	Pages/Paragraph	Amendments
	B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 5. Inspection and Testing, Page-45 (word page 208 of 732), 5.1 Inspection	drawings, provision for all fittings, finish level etc. ii. Test to check effective shielding of the tank iii. Check for adequate core to tank insulation iv. Jacking test with oil on all the assembled autotransformers, measuring deflection of the base. v. Skid test on filled transformer testing movement and rotation by pulling on provided lugs. vi. Dye penetration test shall be carried out after the jacking test vii. Outsourced Items a. The make of all major outsourced items shall be subject to Engineer's approval. b. The Contractor shall also prepare a comprehensive inspection and testing program for all out sourced/subcontracted items and shall submit the same to the Engineer for approval. Such program shall include the following components: • Buchholz relay • Axles and wheels • Winding temperature indicators for local and remote mounting • Oil temperature indicators • Bushings • Bushing current autotransformers • Cooler control cabinet • Cooling equipment • Oil Pumps • Fans/Air Blowers • Tap Change gear • Terminal connectors **has been replaced by:** **5. INSPECTION AND TESTING** **5.1 TERMINAL ARRANGEMENT** g. Assembled Autotransformer i. Check completed autotransformer against approved outline drawings, provision for all fittings, finish level etc. ii. Test to check effective shielding of the tank iii. Check for adequate core to tank insulation iv. Jacking test with oil on all the assembled autotransformers, measuring deflection of the base. v. Dye penetration test shall be carried out after the jacking test vi. Outsourced Items

SN	Pages/Paragraph	Amendments
		a. The make of all major outsourced items shall be subject to Engineer's approval. b. The Contractor shall also prepare a comprehensive inspection and testing program for all out sourced/subcontracted items and shall submit the same to the Engineer for approval. Such program shall include the following components: • Buchholz relay • Axles and wheels • Winding temperature indicators for local and remote mounting • Oil temperature indicators • Bushings • Bushing current autotransformers • Cooler control cabinet • Cooling equipment • Oil Pumps • Fans/Air Blowers • Tap Change gear • Terminal connectors
44	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 3: Auto Transformer Specification, 5. Inspection and Testing, Page-44 (word page 210 of 841), 5.1 Inspection	**5. INSPECTION AND TESTING** **5.1 TERMINAL ARRANGEMENT** g. Assembled Autotransformer i. Check completed autotransformer against approved outline drawings, provision for all fittings, finish level etc. ii. Test to check effective shielding of the tank iii. Check for adequate core to tank insulation iv. Jacking test with oil on all the assembled autotransformers, measuring deflection of the base. v. Skid test on filled transformer testing movement and rotation by pulling on provided lugs. vi. Dye penetration test shall be carried out after the jacking test vii. Outsourced Items a. The make of all major outsourced items shall be subject to Engineer's approval. b. The Contractor shall also prepare a comprehensive inspection and testing program for all out sourced/subcontracted items and shall submit the same to the Engineer for approval. Such program shall include the following components: • Buchholz relay • Axles and wheels • Winding temperature indicators for local and

SN	Pages/Paragraph	Amendments
		remote mounting • Oil temperature indicators • Bushings • Bushing current autotransformers • Cooler control cabinet • Cooling equipment • Oil Pumps • Fans/Air Blowers • Tap Change gear • Terminal connectors **has been replaced by:** **5. INSPECTION AND TESTING** **5.1 TERMINAL ARRANGEMENT** g. Assembled Autotransformer i. Check completed autotransformer against approved outline drawings, provision for all fittings, finish level etc. ii. Test to check effective shielding of the tank iii. Check for adequate core to tank insulation iv. Jacking test with oil on all the assembled autotransformers, measuring deflection of the base. v. Dye penetration test shall be carried out after the jacking test vi. Outsourced Items a. The make of all major outsourced items shall be subject to Engineer's approval. b. The Contractor shall also prepare a comprehensive inspection and testing program for all out sourced/subcontracted items and shall submit the same to the Engineer for approval. Such program shall include the following components: • Buchholz relay • Axles and wheels • Winding temperature indicators for local and remote mounting • Oil temperature indicators • Bushings • Bushing current autotransformers • Cooler control cabinet • Cooling equipment • Oil Pumps • Fans/Air Blowers

SN	Pages/Paragraph	Amendments
		• Tap Change gear • Terminal connectors
45	Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 5: Fire Protection System Specification, Page-12 (word page 377 of 841), 2.4 Water Supply	**2.4 WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be informed to the Engineer /Employer. Employer will facilitate in identifying the source (if deemed necessary). The water shall be adequate both in terms of quantity and head. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of Engineer. f. Bore wells and pumps for water supply are not in the scope of the contractor. Contractor shall provide a source of water supply arrangement to the Fire Water tank from the Employer provided source. g. Water supply distribution shall include service to all buildings on site including Residential and Non-Residential buildings h. The external water supply from Bore-well shall be measured diameter-wise in running meters. It shall include all the items such as excavation, piping, pipe fittings, painting, brickwork, sand filling, concrete, valves, chambers cutting chases in walls, openings in RCC and repairs, etc. required to complete the job. i. Capacity of the well and design of the pumping system shall meet the requirements of NFPA 850: i. At a minimum, the water supply system shall be capable of replenishing the maximum 2-hour supply for the fire protection requirement in an 8 hour period. ii. Refilling operation to be accomplished on an automatic basis. **has been replaced by:** **2.4 WATER SUPPLY** a. Water shall be arranged by the Contractor and the source shall be informed to the Engineer /Employer. Employer will facilitate in identifying the source (if deemed necessary). The water shall be adequate both in terms of quantity and head.

SN	Pages/Paragraph	Amendments
		b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements, including pumps, shall be arranged by the Contractor with no extra cost to the Employer. g. Water supply distribution shall include service to all buildings on site including Residential and Non-Residential buildings. h. The external water supply from Bore-well shall be measured diameter-wise in running meters. It shall include all the items such as excavation, piping, pipe fittings, painting, brickwork, sand filling, concrete, valves, chambers cutting chases in walls, openings in RCC and repairs, etc. required to complete the job. i. Capacity of the well and design of the pumping system shall meet the requirements of NFPA 850: i. At a minimum, the water supply system shall be capable of replenishing the maximum 2-hour supply for the fire protection requirement in an 8 hour period. ii. Refilling operation to be accomplished on an automatic basis.
46	Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 5: Fire Protection System Specification, Page-12 (word page 265 of 732), 2.4 Water Supply	**2.4 WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be informed to the Engineer /Employer. Employer will facilitate in identifying the source (if deemed necessary). The water shall be adequate both in terms of quantity and head. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete

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SN	Pages/Paragraph	Amendments
		filling, concrete, valves, chambers cutting chases in walls, openings in RCC and repairs, etc. required to complete the job. i. Capacity of the well and design of the pumping system shall meet the requirements of NFPA 850: i. At a minimum, the water supply system shall be capable of replenishing the maximum 2-hour supply for the fire protection requirement in an 8 hour period. **ii.** Refilling operation to be accomplished on an automatic basis.
47	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 5: Fire Protection System Specification, Page-12 (word page 266 of 741), 2.4 Water Supply	**2.4 WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be informed to the Engineer /Employer. Employer will facilitate in identifying the source (if deemed necessary). The water shall be adequate both in terms of quantity and head. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of Engineer. f. Bore wells and pumps for water supply are not in the scope of the contractor. Contractor shall provide a source of water supply arrangement to the Fire Water tank from the Employer provided source. g. Water supply distribution shall include service to all buildings on site including Residential and Non-Residential buildings h. The external water supply from Bore-well shall be measured diameter-wise in running meters. It shall include all the items such as excavation, piping, pipe fittings, painting, brickwork, sand filling, concrete, valves, chambers cutting chases in walls, openings in RCC and repairs, etc. required to complete the job. i. Capacity of the well and design of the pumping system shall meet the requirements of NFPA 850: i. At a minimum, the water supply system shall be capable of replenishing the maximum 2-hour supply for the fire protection requirement in an 8 hour period. ii. Refilling operation to be accomplished on an automatic basis. **has been replaced by:**

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48	Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 9: Civil Works Specification, Page-25 (word page 492 of 841), 12. Water Supply	**12. WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be agreed with the Employer, which will facilitate in identifying the source (if deemed necessary) and negotiating and settling any necessary easements in line with the Resettlement Action Plan. . The water shall be adequate both in terms of quantity and head, without causing a significant reduction in the availability of supplu for current community usage. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above.

SN	Pages/Paragraph	Amendments
		c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of the Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements including pumps shall be arranged by the Contractor with no any extra cost to the Employer. **has been replaced by:** **12. WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be agreed with the Employer, which will facilitate in identifying the source (if deemed necessary) and negotiating and settling any necessary easements in line with the Resettlement Action Plan. . The water shall be adequate both in terms of quantity and head, without causing a significant reduction in the availability of supply for current community usage. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of the Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements including pumps shall be arranged by the Contractor with no any extra cost to the Employer. g. Installation of permanent water supply from bore well/single point of water supply system with a underground storage tank of capacity 18m^3, one (1) pump with discharge capacity of 0.6liter/s, one (1) filter unit, one (1) pressurize unit, one (1) lot of pipes, valves etc. to be supplied to the Fire Fighting pump house, Fire water tank,

SN	Pages/Paragraph	Amendments
		control room building, GIS building, guard house, etc.; Installation of internal water supply system (including water pipes, arrangement for potable water system, pumping stations etc.) and domestic water drainage system (canalization).
49	Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 9: Civil Works Specification, Page-24 (word page 379 of 732), 12. Water Supply	**12. WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be agreed with the Employer, which will facilitate in identifying the source (if deemed necessary) and negotiating and settling any necessary easements in line with the Resettlement Action Plan. . The water shall be adequate both in terms of quantity and head, without causing a significant reduction in the availability of supplu for current community usage. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of the Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements including pumps shall be arranged by the Contractor with no any extra cost to the Employer. **has been replaced by:** **12. WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be agreed with the Employer, which will facilitate in identifying the source (if deemed necessary) and negotiating and settling any necessary easements in line with the Resettlement Action Plan. . The water shall be adequate both in terms of quantity and head, without causing a significant reduction in the availability of supply for current community usage. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above.

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		d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of the Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements including pumps shall be arranged by the Contractor with no any extra cost to the Employer. **g.** Installation of permanent water supply from bore well/single point of water supply system with a underground storage tank of capacity 18m^3, one (1) pump with discharge capacity of 0.6liter/s, one (1) filter unit, one (1) pressurize unit, one (1) lot of pipes, valves etc. to be supplied to the Fire Fighting pump house, Fire water tank, control room building, GIS building, guard house, etc.; Installation of internal water supply system (including water pipes, arrangement for potable water system, pumping stations etc.) and domestic water drainage system (canalization).
50	Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 10: Civil Works Specification, Page-24 (word page 405 of 741), 12. Water Supply	**12. WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be agreed with the Employer, which will facilitate in identifying the source (if deemed necessary) and negotiating and settling any necessary easements in line with the Resettlement Action Plan. . The water shall be adequate both in terms of quantity and head, without causing a significant reduction in the availability of supply for current community usage. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of the Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements including pumps shall be arranged by the Contractor with no any extra cost to the Employer.

SN	Pages/Paragraph	Amendments
		has been replaced by: **12. WATER SUPPLY** a. Water shall be arranged by Contractor and the source shall be agreed with the Employer, which will facilitate in identifying the source (if deemed necessary) and negotiating and settling any necessary easements in line with the Resettlement Action Plan. . The water shall be adequate both in terms of quantity and head, without causing a significant reduction in the availability of supply for current community usage. b. The contractor shall carry out all the plumbing/erection works required for supply of water in control room cum administrative building beyond the single point as above. c. The contractor shall carry out all the plumbing/erection works required for supply of water to the Fire Fighting pump house beyond the single point as above. d. The details of tanks, pipes, fittings, fixtures, etc. for water supply are given elsewhere in the specification under respective sections. e. A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be approved by the Engineer before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works. All drawings shall be prepared by the contractor for approval of the Engineer. f. The Contractor may also assess the possibility of use of bore well. The necessary arrangements including pumps shall be arranged by the Contractor with no any extra cost to the Employer. **g.** Installation of permanent water supply from bore well/single point of water supply system with a underground storage tank of capacity 18m^3, one (1) pump with discharge capacity of 0.6liter/s, one (1) filter unit, one (1) pressurize unit, one (1) lot of pipes, valves etc. to be supplied to the Fire Fighting pump house, Fire water tank, control room building, GIS building, guard house, etc.; Installation of internal water supply system (including water pipes, arrangement for potable water system, pumping stations etc.) and domestic water drainage system (canalization).
51	Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 9: Civil Works Specification, Section 2: Buildings Specification, Page-3 (word page 395 of	Add 2.4 SWITCH YARD PANEL ROOM at the end of 2.3 FIRE FIGHTING PUMP HOUSE BUILDING **2.4 SWITCH YARD PANEL ROOM** RCC switchyard panel room with the size as mentioned in the bid price schedule shall be constructed. RCC sloped roof shall be provided. The sloped roof shall be covered with suitable tiles to enhance aesthetic look. The floor details (sand, PCC, cement mortar) shall match that of other buildings. The floor finish shall be provided with vitrified tiles. Plinth protection as per other buildings shall be provided. The finished details like

<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td></td><td>732), 2.3 Fire Fighting Pump House Building</td><td>painting, plaster shall match with other buildings. Doors shall be UPVC glazed.
All walls, floor and roof shall be provided with suitable chicken wire mesh which shall be connected with earthing system shall be defined in other section of this specifications. Air conditioning and internal electrification of panel room shall be done as mentioned in the respective technical specification and BPS in Electrical portion. The size and layout of internal cable trenches of panel room shall be decided by the contractor as per the requirements. All cable trenches inside the panel room shall be covered with minimum 6 mm thick steel chequered plate with suitable stiffeners. The design shall conform to relevant British standard codes (B S Codes)/ IS Code /equivalent International Standards.</td></tr>
<tr><td>52</td><td>Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 17: Construction Specification, 6. Lighting System, Page-26 (word page 801 of 841), 6.2 Description of items for Substation Lighting</td><td>e. Lighting fixture shall be in general conformance with the table below. The catalog numbers are indicative only to illustrate the desired fixtures. Contractor shall provide a complete BOQ for the lighting system for the Engineer's Review.
Table 6: Lighting Fixtures
<table>
<tr><th>Type of Lighting Fixture</th><th>Description</th><th>Philips Catalog No</th></tr>
<tr><td>F1</td><td>2x28W T5 type fluorescent lamps in industrial reflector type fixtures, complete with accessories and suitable for pendant /surface mounting.</td><td>TMS 122/228 HF</td></tr>
<tr><td>FF</td><td>2x28 T5 energy efficient fluorescent lamps with low glare, mirror optics suitable for recess mounting type lighting fixtures.</td><td>TBS 088/228 C5 HF</td></tr>
<tr><td>FL</td><td>2x28W T5 energy efficient fluorescent lamps with low glare mirror optics suitable for pendent/surface mounting with all accessories</td><td>TCS 398/228 D6 HF</td></tr>
<tr><td>TL</td><td>Sleek and functional electronic decobatten suitable for use with 1x'TLD'36W fluorescent lamp with dual tone end caps. Pre-phosphated & powder coated CRCA steel channel complete with all electrical accessories like electronic ballast, lamp holders all pre wired up to a terminal block</td><td>TMS500/136 HF</td></tr>
<tr><td>IB</td><td>60/100w GLS lamp in bulkhead fixtures with cast aluminum alloy body, suitable for column, wall and ceiling mounting finished stove enameled silver grey outside</td><td>NXC101</td></tr>
<tr><td>BL</td><td>Aesthetic wall/ceiling mounted luminaire suitable for 1x PL-C 13W OR 11W CFL.</td><td>FMC21/113</td></tr>
</table></td></tr>
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<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>Low loss O.C. copper ballast. Built in high gloss anodized reflector. Twin finish UV stabilized SAN diffuser for protection & elimination of lamp glare.</td><td></td></tr>
<tr><td>SL</td><td>Aesthetic ceiling mounted luminaire for Ecotone crystal/Décor CFL of 2x9W or 1x18W. ABS housing pre-wired with porcelain lamp holder. Pre-phospated plated CRCA gear tray.</td><td>FL343/118</td></tr>
<tr><td>BH</td><td>Bulkhead luminaire suitable for use with PL-S 9W CFL. Single piece pressure die-cast aluminum & cover retaining frame. Opal acrylic cover along with a gasket made of E.P.R</td><td>FXC 101/109</td></tr>
<tr><td>BLD</td><td>2X9 or 1x18 watt CFL bollard light for landscape lighting having FRP/LLDPE housing</td><td>FGC202 /118</td></tr>
<tr><td>DLR</td><td>2x18 watt CFL downlight with HF ballast suitable for recess mounting</td><td>FBH145/218L HF</td></tr>
<tr><td>DSM</td><td>1X13 W surface mounted CFL</td><td>FCS100/113</td></tr>
<tr><td>IF</td><td>Incandescent GLS lamp down light</td><td>DN622</td></tr>
</table>
has been replaced by:

e. Lighting fixture shall be in general conformance with the table below. The type of Lighting Fixture to be used in different areas shall be generally as per the table below. The contractor shall provide a complete BOQ for the lighting system for the Engineer's Review.

Table 6-1: Fixture Type to be used for various applications
Table 6-2: Details of Lighting Fixture

Details of Table 6-1 & Table 6-2 are included as Attachment #7 to this addendum
</td></tr>
<tr><td>53</td><td>Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 17: Construction Specification, 6. Lighting System, Page-29 (word page 677 of 732), 6.2 Description of Items For Substation Lighting</td><td>
e. Lighting fixture shall be in general conformance with the table below. The catalog numbers are indicative only to illustrate the desired fixtures. Contractor shall provide a complete BOQ for the lighting system for the Engineer's Review.
Table 6: Lighting Fixtures
<table>
<tr><th>Type of Lighting Fixture</th><th>Description</th></tr>
<tr><td>F1</td><td>2x28W T5 type fluorescent lamps in industrial reflector type fixtures, complete with accessories and suitable for pendant /surface mounting.</td></tr>
</table>
</td></tr>
</table>

SN	Pages/Paragraph	Amendments

FF	2x28 T5 energy efficient fluorescent lamps with low glare, mirror optics suitable for recess mounting type lighting fixtures.
FL	2x28W T5 energy efficient fluorescent lamps with low glare mirror optics suitable for pendent/surface mounting with all accessories
TL	Sleek and functional electronic decobatten suitable for use with 1x'TLD'36W fluorescent lamp with dual tone end caps. Pre-phosphated & powder coated CRCA steel channel complete with all electrical accessories like electronic ballast, lamp holders all pre wired up to a terminal block
IB	60/100w GLS lamp in bulkhead fixtures with cast aluminum alloy body, suitable for column, wall and ceiling mounting finished stove enameled silver grey outside
BL	Aesthetic wall/ceiling mounted luminaire suitable for 1x PL-C 13W OR 11W CFL. Low loss O.C. copper ballast. Built in high gloss anodized reflector. Twin finish UV stabilized SAN diffuser for protection & elimination of lamp glare.
SL	Aesthetic ceiling mounted luminaire for Ecotone crystal/Décor CFL of 2x9W or 1x18W. ABS housing pre-wired with porcelain lamp holder. Pre-phospated plated CRCA gear tray.
BH	Bulkhead luminaire suitable for use with PL-S 9W CFL. Single piece pressure die-cast aluminum & cover retaining frame. Opal acrylic cover along with a gasket made of E.P.R
BLD	2X9 or 1x18 watt CFL bollard light for landscape lighting having FRP/LLDPE housing
DLR	2x18 watt CFL downlight with HF ballast suitable for recess mounting
DSM	1X13 W surface mounted CFL
IF	Incandescent GLS lamp down light

has been replaced by:

e. Lighting fixture shall be in general conformance with the table below. The type of Lighting Fixture to be used in different areas shall be generally as per the table below. The Contractor shall provide a complete BOQ for the lighting system for the Engineer's Review.

Table 6-1: Fixture Type to be used for various applications
Table 6-2: Details of Lighting Fixture

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c. Gas Insulated Circuit Breaker Requirements

<u>General Description</u>
The circuit breaker shall consist of three single-phase poles in a single-phase encapsulated tank arrangement. Switching shall take place by means of a separate spring-charged operating mechanism for single-pole operation and auto-reclosing. The circuit breakers shall be the SF6 gas-insulated type, dead tank design, puffer, self-compression or dynamic self-compression and with the ratings as specified. The circuit breaker shall have ratings as described in IEC 62271, IEEE C37.06 and IEEE C37.122, specific ratings in accordance with this design criteria and other applicable IEEE/IEC standards. The circuit breaker shall be capable of performing the specified duty cycle without derating.
<table>
<tr><th>DESCRIPTION</th><th></th></tr>
<tr><td>Interrupter Configuration</td><td>Single-phase encapsulated</td></tr>
<tr><td>Nominal System Voltage Rating:</td><td>400kV</td></tr>
<tr><td>Maximum System Voltage Rating:</td><td>420kV</td></tr>
<tr><td>Frequency</td><td>50Hz</td></tr>
<tr><td>Rated lightning impulse withstand voltage (1.2 / 50 μs)</td><td>1425kV</td></tr>
<tr><td>Rated lightning impulse withstand voltage (250 / 2,500 μs)(+bias)</td><td>1425(+240)kV</td></tr>
<tr><td>Rated switching impulse withstand voltage</td><td>1050kV</td></tr>
<tr><td>Rated switching impulse withstand voltage, Open Gap</td><td>900(+345)kV</td></tr>
<tr><td>Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground</td><td>650kV</td></tr>
<tr><td>Rated short-duration power-frequency withstand voltage (1 min) Open Gap</td><td>815kV</td></tr>
<tr><td>Rated normal current</td><td>4000A</td></tr>
</table>
</td></tr>
</table>

SN	Pages/Paragraph	Amendments	
		Rated short-circuit breaking current (< 2 cycles)	50kA (symmetrical)
		Rated maximum interrupting time	40ms (on a 50 Hz basis)
		Rated permissible tripping time delay	1.0s
		Rated closing and latching current	125kA peak
		Rated reclosing time	0.3s
		Pre-insertion resistor	400Ω, min. insertion time 8ms, insertion overlap with main contacts 5ms
		First pole to clear factor terminal fault	1.3 at T100 [1]
		First pole to clear factor short line fault	1.0 at T100 [1]
		First pole to clear factor out-of-phase	2.0 at T100 [1]
		TRV peak value terminal fault	817kV at T100 [1]
		TRV peak value short line fault	629kV at T100 [1]
		TRV peak value out-of-phase	1120kV at T100 [1]
		Rate of rise of recovery voltage (RRRV) terminal fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) short line fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) out-of-phase	1.54kV/µs at T100 [1]
		TRV peak value T60	876kV [1]
		TRV peak value T30	899kV [1]
		TRV peak value T10	1030kV [1]
		Rate of rise of recovery voltage (RRRV) T60	3kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T30	5kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T10	7kV/µs [1]
		Rated peak withstand current	125kA [1]
		Rated short-time withstand current (up to 1s)	50kA [1]
		Rated capacitive switching currents	IEEE C37.06 Class C2
		Mechanical endurance class	2000 no-load mechanical operations 100 rated continuous current switching 100 inrush current switching [2]
		Insulation Type:	SF_6 gas
		Leakage rate per year and gas compartment (type-tested)	<0.5%

SN	Pages/Paragraph	Amendments

Operating mechanism of circuit breaker	Stored-energy spring
Rated operating sequence	O-0.3 s-CO-3 min-CO CO-15 s-CO
Ambient temperature range	-30 ºC up to +40 ºC
DC Control Voltage:	220VDC
AC Station Service Voltage:	400V AC, 3-phase
Number of low energy (less than 6A)Trip Coils per Circuit Breaker:	2

has been replaced by:

c. Gas Insulated Circuit Breaker Requirements

General Description

The circuit breaker shall consist of three single-phase poles in a single-phase encapsulated tank arrangement. Switching shall take place by means of a separate spring-charged operating mechanism for single-pole operation and auto-reclosing. The circuit breakers shall be the SF6 gas-insulated type, dead tank design, puffer, self-compression or dynamic self-compression and with the ratings as specified. The circuit breaker shall have ratings as described in IEC 62271, IEEE C37.06 and IEEE C37.122, specific ratings in accordance with this design criteria and other applicable IEEE/IEC standards. The circuit breaker shall be capable of performing the specified duty cycle without derating.

DESCRIPTION	
Interrupter Configuration	Single-phase encapsulated
Nominal System Voltage Rating:	400kV
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Rated short-duration power-frequency withstand voltage (1 min) Open Gap	815kV
Rated normal current	4000A
Rated short-circuit breaking current (< 2 cycles)	50kA (symmetrical)

SN	Pages/Paragraph	Amendments	
		Rated maximum interrupting time	40ms (on a 50 Hz basis)
		Rated permissible tripping time delay	1.0s
		Rated closing and latching current	125kA peak
		Rated reclosing time	0.3s
		Pre-insertion resistor	400Ω, min. insertion time 8ms, insertion overlap with main contacts 5ms
		First pole to clear factor terminal fault	1.3 at T100 [1]
		First pole to clear factor short line fault	1.0 at T100 [1]
		First pole to clear factor out-of-phase	2.0 at T100 [1]
		TRV peak value terminal fault	624kV at T100 [1]
		TRV peak value short line fault	480kV at T100 [1]
		TRV peak value out-of-phase	857kV at T100 [1]
		Rate of rise of recovery voltage (RRRV) terminal fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) short line fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) out-of-phase	1.54kV/µs at T100 [1]
		TRV peak value T60	669kV [1]
		TRV peak value T30	687kV [1]
		TRV peak value T10	787kV [1]
		Rate of rise of recovery voltage (RRRV) T60	3kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T30	5kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T10	7kV/µs [1]
		Rated peak withstand current	125kA [1]
		Rated short-time withstand current (up to 1s)	50kA [1]
		Rated capacitive switching currents	IEEE C37.06 Class C2
		Mechanical endurance class	2000 no-load mechanical operations 100 rated continuous current switching 100 inrush current switching [2]
		Insulation Type:	SF_6 gas
		Leakage rate per year and gas compartment (type-tested)	<0.5%
		Operating mechanism of circuit breaker	Stored-energy spring

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<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
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<tr><td>Rated operating sequence</td><td>O-0.3 s-CO-3 min-CO
CO-15 s-CO</td></tr>
<tr><td>Ambient temperature range</td><td>-30 ºC up to +40 ºC</td></tr>
<tr><td>DC Control Voltage:</td><td>220VDC</td></tr>
<tr><td>AC Station Service Voltage:</td><td>400V AC, 3-phase</td></tr>
<tr><td>Number of low energy (less than 6A)Trip Coils per Circuit Breaker:</td><td>2</td></tr>
</table>
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<tr><td>56</td><td>Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Section 1: 420kV GIS Technical Specification, APPENDIX A - Gas Insulated Switchgear (GIS), Summary of Major Components and Detailed Specifications, Gas Insulated Switchgear Detailed Specification for New Butwal Substation, Description of Components, 2. High Voltage Design Parameters, Word Page 99 of 732, c. Gas Insulated Circuit Breaker Requirements</td><td>c. Gas Insulated Circuit Breaker Requirements

<u>General Description</u>
The circuit breaker shall consist of three single-phase poles in a single-phase encapsulated tank arrangement. Switching shall take place by means of a separate spring-charged operating mechanism for single-pole operation and auto-reclosing. The circuit breakers shall be the SF6 gas-insulated type, dead tank design, puffer, self-compression or dynamic self-compression and with the ratings as specified. The circuit breaker shall have ratings as described in IEC 62271, IEEE C37.06 and IEEE C37.122, specific ratings in accordance with this design criteria and other applicable IEEE/IEC standards. The circuit breaker shall be capable of performing the specified duty cycle without derating.
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</table>
</td></tr>
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SN	Pages/Paragraph	Amendments	
		Rated normal current	4000A
		Rated short-circuit breaking current (< 2 cycles)	50kA (symmetrical)
		Rated maximum interrupting time	40ms (on a 50 Hz basis)
		Rated permissible tripping time delay	1.0s
		Rated closing and latching current	125kA peak
		Rated reclosing time	0.3s
		Pre-insertion resistor	400Ω, min. insertion time 8ms, insertion overlap with main contacts 5ms
		First pole to clear factor terminal fault	1.3 at T100 [1]
		First pole to clear factor short line fault	1.0 at T100 [1]
		First pole to clear factor out-of-phase	2.0 at T100 [1]
		TRV peak value terminal fault	817kV at T100 [1]
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		Rate of rise of recovery voltage (RRRV) terminal fault	2kV/µs at T100 [1]
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		Rated peak withstand current	125kA [1]
		Rated short-time withstand current (up to 1s)	50kA [1]
		Rated capacitive switching currents	IEEE C37.06 Class C2
		Mechanical endurance class	2000 no-load mechanical operations 100 rated continuous current switching 100 inrush current switching [2]
		Insulation Type:	SF_6 gas

SN	Pages/Paragraph	Amendments

Leakage rate per year and gas compartment (type-tested)	<0.5%
Operating mechanism of circuit breaker	Stored-energy spring
Rated operating sequence	O-0.3 s-CO-3 min-CO CO-15 s-CO
Ambient temperature range	-30 ºC up to +40 ºC
DC Control Voltage:	220VDC
AC Station Service Voltage:	400V AC, 3-phase
Number of low energy (less than 6A)Trip Coils per Circuit Breaker:	2

has been replaced by:

c. Gas Insulated Circuit Breaker Requirements

General Description

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Rated short-duration power-frequency withstand voltage (1 min) Open Gap	815kV
Rated normal current	4000A

SN	Pages/Paragraph	Amendments	
		Rated short-circuit breaking current (< 2 cycles)	50kA (symmetrical)
		Rated maximum interrupting time	40ms (on a 50 Hz basis)
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		Pre-insertion resistor	400Ω, min. insertion time 8ms, insertion overlap with main contacts 5ms
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		Rated peak withstand current	125kA [1]
		Rated short-time withstand current (up to 1s)	50kA [1]
		Rated capacitive switching currents	IEEE C37.06 Class C2
		Mechanical endurance class	2000 no-load mechanical operations 100 rated continuous current switching 100 inrush current switching [2]
		Insulation Type:	SF_6 gas
		Leakage rate per year and gas compartment (type-tested)	<0.5%

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<tr><td>Rated normal current</td><td>4000A</td></tr>
<tr><td>Rated short-circuit breaking current (< 2 cycles)</td><td>50kA (symmetrical)</td></tr>
<tr><td>Rated maximum interrupting time</td><td>40ms (on a 50 Hz basis)</td></tr>
<tr><td>Rated permissible tripping time delay</td><td>1.0s</td></tr>
<tr><td>Rated closing and latching current</td><td>125kA peak</td></tr>
</table>
</td></tr>
</table>

SN	Pages/Paragraph	Amendments	
		Rated reclosing time	0.3s
		Pre-insertion resistor	400Ω, min. insertion time 8ms, insertion overlap with main contacts 5ms
		First pole to clear factor terminal fault	1.3 at T100 [1]
		First pole to clear factor short line fault	1.0 at T100 [1]
		First pole to clear factor out-of-phase	2.0 at T100 [1]
		TRV peak value terminal fault	817kV at T100 [1]
		TRV peak value short line fault	629kV at T100 [1]
		TRV peak value out-of-phase	1120kV at T100 [1]
		Rate of rise of recovery voltage (RRRV) terminal fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) short line fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) out-of-phase	1.54kV/µs at T100 [1]
		TRV peak value T60	876kV [1]
		TRV peak value T30	899kV [1]
		TRV peak value T10	1030kV [1]
		Rate of rise of recovery voltage (RRRV) T60	3kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T30	5kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T10	7kV/µs [1]
		Rated peak withstand current	125kA [1]
		Rated short-time withstand current (up to 1s)	50kA [1]
		Rated capacitive switching currents	IEEE C37.06 Class C2
		Mechanical endurance class	2000 no-load mechanical operations 100 rated continuous current switching 100 inrush current switching [2]
		Insulation Type:	SF_6 gas
		Leakage rate per year and gas compartment (type-tested)	<0.5%
		Operating mechanism of circuit breaker	Stored-energy spring
		Rated operating sequence	O-0.3 s-CO-3 min-CO CO-15 s-CO
		Ambient temperature range	-30 ºC up to +40 ºC
		DC Control Voltage:	220VDC

SN	Pages/Paragraph	Amendments

AC Station Service Voltage:	400V AC, 3-phase
Number of low energy (less than 6A)Trip Coils per Circuit Breaker:	2

has been replaced by:

c. Gas Insulated Circuit Breaker Requirements

General Description

The circuit breaker shall consist of three single-phase poles in a single-phase encapsulated tank arrangement. Switching shall take place by means of a separate spring-charged operating mechanism for single-pole operation and auto-reclosing. The circuit breakers shall be the SF6 gas-insulated type, dead tank design, puffer, self-compression or dynamic self-compression and with the ratings as specified. The circuit breaker shall have ratings as described in IEC 62271, IEEE C37.06 and IEEE C37.122, specific ratings in accordance with this design criteria and other applicable IEEE/IEC standards. The circuit breaker shall be capable of performing the specified duty cycle without derating.

DESCRIPTION	
Interrupter Configuration	Single-phase encapsulated
Nominal System Voltage Rating:	400kV
Maximum System Voltage Rating:	420kV
Frequency	50Hz
Rated lightning impulse withstand voltage (1.2 / 50 μs)	1425kV
Rated lightning impulse withstand voltage (250 / 2,500 μs)(+bias)	1425(+240)kV
Rated switching impulse withstand voltage	1050kV
Rated switching impulse withstand voltage, Open Gap	900(+345)kV
Rated short-duration power-frequency withstand voltage (1 min) Phase-to-ground	650kV
Rated short-duration power-frequency withstand voltage (1 min) Open Gap	815kV
Rated normal current	4000A
Rated short-circuit breaking current (< 2 cycles)	50kA (symmetrical)
Rated maximum interrupting time	40ms (on a 50 Hz basis)
Rated permissible tripping time delay	1.0s
Rated closing and latching current	125kA peak
Rated reclosing time	0.3s
Pre-insertion resistor	400Ω, min. insertion time 8ms, insertion overlap with main contacts 5ms

SN	Pages/Paragraph	Amendments	
		First pole to clear factor terminal fault	1.3 at T100 [1]
		First pole to clear factor short line fault	1.0 at T100 [1]
		First pole to clear factor out-of-phase	2.0 at T100 [1]
		TRV peak value terminal fault	624kV at T100 [1]
		TRV peak value short line fault	480kV at T100 [1]
		TRV peak value out-of-phase	857kV at T100 [1]
		Rate of rise of recovery voltage (RRRV) terminal fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) short line fault	2kV/µs at T100 [1]
		Rate of rise of recovery voltage (RRRV) out-of-phase	1.54kV/µs at T100 [1]
		TRV peak value T60	669kV [1]
		TRV peak value T30	687kV [1]
		TRV peak value T10	787kV [1]
		Rate of rise of recovery voltage (RRRV) T60	3kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T30	5kV/µs [1]
		Rate of rise of recovery voltage (RRRV) T10	7kV/µs [1]
		Rated peak withstand current	125kA [1]
		Rated short-time withstand current (up to 1s)	50kA [1]
		Rated capacitive switching currents	IEEE C37.06 Class C2
		Mechanical endurance class	2000 no-load mechanical operations 100 rated continuous current switching 100 inrush current switching [2]
		Insulation Type:	SF_6 gas
		Leakage rate per year and gas compartment (type-tested)	<0.5%
		Operating mechanism of circuit breaker	Stored-energy spring
		Rated operating sequence	O-0.3 s-CO-3 min-CO CO-15 s-CO
		Ambient temperature range	-30 ºC up to +40 ºC
		DC Control Voltage:	220VDC
		AC Station Service Voltage:	400V AC, 3-phase
		Number of low energy (less than 6A)Trip Coils per Circuit Breaker:	2

<table>
<tr><th>SN</th><th>Pages/Paragraph</th><th>Amendments</th></tr>
<tr><td>58</td><td>Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Section 1: 420kV GIS Technical Specification, APPENDIX A - Gas Insulated Switchgear (GIS), Summary of Major Components and Detailed Specifications, Gas Insulated Switchgear Detailed Specification for Ratmate Substation, Description of Components, 2. High Voltage Design Parameters, Word Page 107 of 841, e. Gas Insulated Switchgear Current Transformers & f. Gas Insulated Switchgear Voltage Transformers</td><td>
d. Gas Insulated Switchgear Current Transformers

<u>General Description</u>
The current transformers shall be the inductive single-conductor type (the primary conductor is the primary winding with one turn). The secondary windings shall be fixed on toroidal cores. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. Multiple ratios shall be possible using taps of the secondary winding. The connection of the various taps shall be made in the terminal box. The current transformers shall be arranged in a common gas zone.
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<tr><td>Rated secondary current</td><td>1A</td></tr>
<tr><td>Thermal rating factor per IEEE C37.13</td><td>150%</td></tr>
<tr><td>Relay accuracy class</td><td>5P20, 200VA</td></tr>
<tr><td>Mechanical design</td><td>Indoor class, temp range -30 to +50°C</td></tr>
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e. Gas Insulated Switchgear Voltage Transformers
<u>General Description</u>
The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.
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<tr><th>DESCRIPTION</th><th></th></tr>
<tr><td>Application</td><td>Relaying and interlocking, loads and lines</td></tr>
<tr><td>Nominal Rated primary voltage, line-to-line</td><td>400kV</td></tr>
<tr><td>Nominal Rated primary voltage, line-to-ground</td><td>230.9kV</td></tr>
<tr><td>Maximum primary voltage line-to-ground</td><td>242.48kV</td></tr>
<tr><td>Ratios</td><td>2100:1(two secondary windings)</td></tr>
<tr><td>Rated secondary voltages</td><td>110V</td></tr>
<tr><td>Rated output</td><td>1000 volt-amperes (VA) (minimum), each winding</td></tr>
<tr><td>Accuracy class</td><td>0.3WXYZ</td></tr>
</table>

has been replaced by:

d. Gas Insulated Switchgear Current Transformers
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General Description
The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.
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<tr><td>Nominal Rated primary voltage, line-to-ground</td><td>127kV</td></tr>
<tr><td>Maximum primary voltage line-to-ground</td><td>141.4kV</td></tr>
<tr><td>Ratios</td><td>1155:1(two secondary windings)</td></tr>
<tr><td>Rated secondary voltages</td><td>110V</td></tr>
<tr><td>Rated output</td><td>1500 volt-amperes (VA) (minimum), each winding</td></tr>
<tr><td>Accuracy class</td><td>0.3WXYZ</td></tr>
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</td></tr>
<tr><td>59</td><td>Part 2, Section V, B12_TS, 220913_Lot1_RAT_TS,</td><td>d. Gas Insulated Switchgear Current Transformers

General Description</td></tr>
</table>

<table>
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e. Gas Insulated Switchgear Voltage Transformers
General Description
The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.
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<tr><td>Accuracy class</td><td>0.3WXYZ</td></tr>
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has been replaced by:
d. Gas Insulated Switchgear Current Transformers
General Description
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General Description
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<tr><td>Maximum primary voltage line-to-ground</td><td>141.4kV</td></tr>
<tr><td>Ratios</td><td>1155:1(two secondary windings)</td></tr>
<tr><td>Rated secondary voltages</td><td>110V</td></tr>
<tr><td>Rated output</td><td>1500 volt-amperes (VA) (minimum), each winding</td></tr>
<tr><td>Accuracy class</td><td>0.3WXYZ</td></tr>
</table>
</td></tr>
<tr><td>60</td><td>Part 2, Section V, B12_TS, 220913_Lot2_NBW_TS, B1.2 Technical Specifications, Chapter</td><td>
d. Gas Insulated Switchgear Current Transformers

General Description
The current transformers shall be the inductive single-conductor type (the primary conductor is the primary winding with one turn). The secondary
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</table>

<table>
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<tr><td></td><td>1: GIS Technical Specification, Section 1: 420kV GIS Technical Specification, APPENDIX A - Gas Insulated Switchgear (GIS), Summary of Major Components and Detailed Specifications, Gas Insulated Switchgear Detailed Specification for New Butwal Substation, Description of Components, 2. High Voltage Design Parameters, Word Page 102 of 732, e. Gas Insulated Switchgear Current Transformers & f. Gas Insulated Switchgear Voltage Transformers</td><td>windings shall be fixed on toroidal cores. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. Multiple ratios shall be possible using taps of the secondary winding. The connection of the various taps shall be made in the terminal box. The current transformers shall be arranged in a common gas zone.
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<tr><td>Thermal rating factor per IEEE C37.13</td><td>150%</td></tr>
<tr><td>Relay accuracy class</td><td>5P20, 200VA</td></tr>
<tr><td>Mechanical design</td><td>Indoor class, temp range -30 to +50°C</td></tr>
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e. Gas Insulated Switchgear Voltage Transformers
<u>General Description</u>
The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.
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<tr><td>Accuracy class</td><td>0.3WXYZ</td></tr>
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d. Gas Insulated Switchgear Current Transformers
<u>General Description</u>
The current transformers shall be the inductive single-conductor type (the primary conductor is the primary winding with one turn). The secondary windings shall be fixed on toroidal cores. A terminal box for connection</td></tr>
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The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.
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<tr><td>Ratios</td><td>1155:1(two secondary windings)</td></tr>
<tr><td>Rated secondary voltages</td><td>110V</td></tr>
<tr><td>Rated output</td><td>1500 volt-amperes (VA) (minimum), each winding</td></tr>
<tr><td>Accuracy class</td><td>0.3WXYZ</td></tr>
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</td></tr>
<tr><td>61</td><td>Part 2, Section V, B12_TS, 220913_Lot3_NDM_TS, B1.2 Technical Specifications, Chapter 1: GIS Technical Specification, Section 1: 420kV GIS Technical</td><td>
d. Gas Insulated Switchgear Current Transformers

General Description
The current transformers shall be the inductive single-conductor type (the primary conductor is the primary winding with one turn). The secondary windings shall be fixed on toroidal cores. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. Multiple ratios shall be possible using taps of the secondary
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<tr><td>Mechanical design</td><td>Indoor class, temp range -30 to +50°C</td></tr>
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e. Gas Insulated Switchgear Voltage Transformers
General Description
The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.
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SN	Pages/Paragraph	Amendments

winding. The connection of the various taps shall be made in the terminal box. The current transformers shall be arranged in a common gas zone.

DESCRIPTION	
Rated primary current	4000A
Rated secondary current	1A
Thermal rating factor per IEEE C37.13	150%
Relay accuracy class	5P20
Mechanical design	Indoor class, temp range -30 to +50°C

e. Gas Insulated Switchgear Voltage Transformers

General Description

The voltage transformers shall be the inductive type consisting of a single-phase core-and-coil assembly in a single-phase enclosure. The construction of the voltage transformer shall consist of an iron core with the secondary windings and the primary winding on top and all windings designed as layer windings with plastic foil insulation. A terminal box for connection of the secondary windings shall be provided on the current transformer housing. The voltage transformers shall form a separate gas zone.

DESCRIPTION	
Application	Relaying and interlocking, loads and lines
Nominal Rated primary voltage, line-to-line	220kV
Nominal Rated primary voltage, line-to-ground	127kV
Maximum primary voltage line-to-ground	141.4kV
Ratios	1155:1(two secondary windings)
Rated secondary voltages	110V
Rated output	1500 volt-amperes (VA) (minimum), each winding
Accuracy class	0.3WXYZ

ATTACHMENT #1

Section III. Qualification and Evaluation Criteria

This Section contains all the criteria that the Employer shall use to review the Technical and Financial Offers and select the winning Bid. No other factors, methods or criteria shall be used. The Bidder shall provide all the information requested in the forms included in Section IV. Bid Submission Forms. This review shall be based on the information provided by the Bidder in the forms plus the Bidder's record of past performance, other references and any other sources at the Employer's discretion to confirm and verify the Bidder's qualifications and representations in its Bid. The Qualifications and Experience of Parents/Sister/Subsidiary Companies shall not be considered for the evaluation of the technical offers.

A. Technical Offer

A1. Technical Offer - Administrative Completeness Review

This review is conducted to determine that the Technical Offer is complete, all required documents are included, and all forms are included and are completed. The Bidder may be requested to submit additional information or documentation within a reasonable period of time and/or to correct nonmaterial nonconformities in the Bid related to the Technical Offer documentation requirements. Determinations made during this review include:

- Determine if the Letter of Technical Offer is included and signed as per the requirements of ITB Clause 21 and ITB Clause 22;
- Determine eligibility of Bidder, in accordance with ITB Clause 5 and eligibility of materials, equipment and services, in accordance with ITB Clause 6;
- Determine if the Bid and Bid Security are valid as per the Bidding Document provisions;
- Determine if GOE certification is enclosed and completed;
- Determine if all other forms and documents required under BDS ITB Sub-Clause 12.2 are included and completed;
- Determine if the submitted bid complies with Instruction to Bidders and meets all administrative requirements; and
- Determine if the Technical Offer does not include rates, prices or any financial information that should be submitted with the Financial Offer only.

A2. Legal Status

Each entity forming the Bidder shall attach to Form ELI-1 a copy of its letter of incorporation, or other such document, indicating its legal status. In the event the Bidder is an association of entities, the Bidder shall include any other document showing that it intends to associate, or it has associated with, the other entity or entities that are jointly submitting a Bid. Each member of the association that forms the Bidder must provide the information required in Forms ELI-1 and 2.

A3. Financial Criteria

The Bidder shall provide evidence showing that it has the sufficient financial capacity needed for this Contract, as required in Form FIN-1, with additional financial capacity information provided in Forms FIN-2 to FIN-4. Each member of the association that forms the Bidder should provide

the information required in Forms FIN-1 to FIN-4 as required in the Qualification Table of this Section III.

A4. Litigation Criteria

The Bidder shall provide accurate information on any current or past litigation or arbitration resulting from contracts completed, terminated, or under execution by the Bidder over the last ten (10) years, as indicated in Form CON-1. A consistent history of awards against the Bidder or existence of high value dispute, which may threaten the financial standing of the Bidder, may lead to the rejection of the Bid. Each member of the association that forms the Bidder must provide the information required in Form CON-1.

A5. Determination of Responsiveness

During the evaluation of Bids, the following definitions apply:

(a) "Deviation" is a departure from the requirements specified in the Bidding Document;

(b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and

(c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

The Employer's determination of a Bid's substantial responsiveness is to be based on the contents of the Bid itself. For purposes of this determination, a substantially responsive Bid is one that materially conforms to the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that:

(a) if accepted, would:

(i) affect in any substantial way the scope, quality, or delivery of Goods and performance of the Related Services specified in the Bidding Document; or

(ii) limit in any substantial way, inconsistent with the Bidding Document, the Employer's rights or the Bidder's obligations under the proposed Contract; or

(b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.

For the purposes of QPBS procurements, any deviations from mandatory criteria/requirements shall be considered material deviation. All other deviations shall be scored below the minimum technical threshold and in a manner consistent with the evaluation framework established below.

Provided that a Bid is substantially responsive, the Employer may waive any nonmaterial nonconformity in the Bid.

Provide that a Bid is substantially responsive, the Employer may request that the Bidder submits the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements.

B. Qualifications Review

This process will be conducted to determine if the Bidder satisfies the qualification requirements stated in this Section III as Qualifications - Documents Establishing the Qualifications of the Bidder. The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder as requested in Section IV. Bid Submission Forms, plus the Bidder's record of past performance and a review of references and any other source at the Employer's discretion. All qualification requirements shall be considered on a pass/fail basis. An affirmative determination of qualifications shall be a prerequisite for award of the Contract to a Bidder.

Multiple lots (contracts). If a Bidder submits successful Bids for multiple lots (contracts), the qualification review will also include an assessment of the Bidder's capacity to meet the aggregate qualification requirements.

C. References and Past Performance Review

The Employer reserves the right to contact the references in Forms REF-1 and REF-2 as well as other sources to check references and past performance as per ITB 33.

D. Technical Evaluation Criteria for each Lot

	Criteria, sub-criteria, and point system for the evaluation of Technical Offers.		
ITB 29.1	**Criteria, sub-criteria**		**Maximum Points**
	1. Organizational Capability and Experience of the Contractor within last 10 Years		
	The evidence of organizational capability and relevant experience in the execution of projects of a similar nature, will be scored based on the submitted Forms as follows: EXP-1: General Design Experience EXP-2: General Construction Experience EXP-3: Similar Design Experience EXP-4: Similar Construction Experience EXP-5: Environmental and Social Management Experience EXP-6: Health and Safety Management Experience The MCA Entity reserves the right to contact the references in Form REF-2 References as well as other sources to check references and past performance		
	1.1 Regional experience in Construction of Electrical Substations in **South Asia** in minimum two projects		2.0
	1.2 General experience in the **Electrical** works in minimum two projects		2.0

	1.3 Similar Design Experience in 380kV or above Gas Insulated Switchgear (GIS) Substation Design in minimum three projects		3.0
	1.4 Similar Construction Experience in 380kV or above GIS Substation Construction in minimum four projects		4.0
	1.5 Similar experience in Manufacturing of 380kV or above GIS Substation Equipment (experience of bidder or its manufacturer – Please provide experience of manufacturing) in minimum five projects		5.0
	1.6 Environmental and Social Management Experience in Substations Design and Construction in minimum two projects		2.0
	1.7 Health and Safety Management Experience in Substations Design and Construction in minimum two projects		2.0
	Total Points for this criterion 1		**20.0**
	2. Approach, Methodology and Work Plan		
	The quality of the Bidder's proposed approach, methodology and work plan for this project will be scored based on the following Forms submitted as part of the Bid: TECH-1: Design Proposal TECH-2: Method Statement TECH-3: Environmental, Social, Gender, Health & Safety Methodology TECH-4: Work Program TECH-5: Project Management Organization TECH-6: Construction Equipment TECH-7: CVs of Key Personnel TECH-8: Manufacturer's authorization TECH-9: List of Proposed Subcontractors TECH-10: List of Proposed Manufacturer and/or Suppliers TECH-11: Technical Data Schedule and how best their Approach, Methodology and Work Plan addresses Employer's Requirements.		

	2.1 Proposed Overall Approach and Methodology Technical Approach which responds to the proposed scope of work and specifications, and details the bidder's proposed approach / methodology and work plan, to include but not limited to: a. **Substation Design Proposal**: The bidder must provide Design Proposal as per the requirements stated under TECH-1 Design Proposal and Employer's Requirement. b. **Substation Method Statement**: The bidder must provide Method Statement for execution of the Works as per the requirements stated under TECH-2 Method Statements c. **Substation Environmental, Social, Gender, Health & Safety Methodology and Staffing**: The bidder must provide Environmental, Social, Gender, Health & Safety Methodology as per the requirements stated under TECH-3: Environmental, Social, Gender, Health & Safety Methodology d. **Substation Construction Equipment**: The bidder must provide Construction Equipment as per the requirements stated under Section III and in the format attached under TECH-6: Construction Equipment e. **Substation Technical Data Schedule**: The bidder must provide completed Technical Data Schedule for the lots they are applying, clearly identifying the lot reference as per the requirements and format provided under Employer's Requirement (Technical Data Schedule should not include material deviations, please refer note #6)		8 8 5 2 2
	2.2 Proposed design work plan as per TECH-4 and Employer's Requirement		5

	2.3 Proposed build work plan as per TECH-4 and TECH-6 Note for both Work Plan under 2.2 and 2.3: The Bidder should propose the main activities for the assignment, their content and duration, phasing and interdependencies, milestones (including interim approvals by the Employer) and delivery dates including detailed critical path diagrams. It should also contain the amount of schedule 'float' that exists in the project plan (i.e. amount of time a given task may be delayed without impacting the final project in-service date). The bids should include a description of potential challenges and recommended mitigation measures based on past experience in similar projects. The consistency of the technical approach and methodology with the proposed work plan is a good indication that the Bidder has understood the Employer's requirements for the assignment and is able to translate them into a feasible working plan with clear deliverables.		6
	2.4 Proposed Project Organization and Staffing as per TECH-5 and extent to which the Technical Offer provides a clear, logical and appropriate staffing pattern with responsibilities among different staff positions adequately defined.		4
	Total Points for this criterion 2		**40**
	Key Professional Personnel Qualifications: For all key personnel the bidder needs to provide regional experience, which will also be evaluated.	No.	
	Resident Project Director:	**1**	**4.50**
	Bachelor Degree in electrical engineering/Science or similar field.		0.90
	Minimum 15 years of project management experience in Substations Construction		3.15

	Regional experience in South Asia region		0.45
	Resident Construction Manager-Electrical	**1**	**4.00**
	Bachelor Degree in electrical engineering		0.80
	Minimum 15 years of Construction Management experience in Substations		1.40
	Minimum experience in two 380kV or above rating GIS substation		1.40
	Regional experience in South Asia region		0.40
	Resident Construction Manager-Civil	**1**	**4.00**
	Bachelor Degree in civil/Structural Engineering		0.80
	Minimum15 years of Construction Management experience in Substations		1.40
	Minimum experience in two 380kV or above rating GIS substation.		1.40

	Regional experience in South Asia region		0.40
	Design Engineer-Electrical	**1**	**3.50**
	Minimum Bachelor Degree in electrical engineering.		0.70
	Minimum 10 years' experience in the field of design of Transmission Substations of 380kV or higher rating with at least design of one GIS substation of 380kV or above rating and		1.4
	At least design experience of one GIS substation of 380kV or above rating		1.4
	Design Engineer-Protection	**1**	**3.00**
	Minimum Bachelor Degree in electrical engineering.		0.60
	Minimum 10 years' experience in the field of design of protection, SCADA and automation system of Transmission Substation of 380kV or higher rating		1.2
	At least design experience of one GIS substation of 380kV or above rating		1.2
	Design Engineer-Civil	**1**	**3.00**

	Bachelor Degree in civil/structural Engineering.		0.60
	Minimum 10 years' experience in the field of design of Civil works for Transmission Substation of 380kV or higher rating		1.050
	At least design experience of one GIS substation Building of 380kV or above rating		1.050
	Regional experience in South Asia region		0.30
	Resident LDC (Load Dispatch Centre) Integration and SCADA specialist:	**1**	**3.00**
	Minimum bachelor's degree in electrical/Electronics/Communication/Computer Engineering/science.		0.60
	Minimum10 years' experience in the field of LDC Integration and installation and commissioning of SCADA		2.10
	Regional experience in South Asia region		0.30
	Resident Commissioning Engineer:	**1**	**3.00**
	Minimum Bachelor Degree in electrical engineering		0.60

	Minimum 10 years' experience in the field of testing and commissioning of Transmission Substation of 380kV or higher rating		1.050
	At least testing and commissioning experience of one GIS substation of 380kV or above rating		1.050
	Regional experience in South Asia region		0.30
	Resident Engineer-Planning:	**1**	**3.00**
	Diploma in Engineering.		0.60
	The candidate must have proficiency in MS Project/Primavera software. He/she should be conversant with project management tools.		1.050
	Minimum 5 years of experience in the planning activities of 380kV and above rating Transmission Substation		1.050
	Regional experience in South Asia region		0.30
	Health and Safety Manager:	**1**	**2.25**
	At least Bachelor Degree in engineering / environmental science (or equivalent)		0.34

	Certificate / training in health and safety		0.11
	Minimum 5 years of working experience in Health and Safety		1.35
	Knowledge in Nepali, Hindi and English		0.23
	Regional experience in South Asia region		0.22
	Social Safeguards Manager:	**1**	**2.25**
	At least Bachelor Degree in social science / human geography (or equivalent)		0.45
	Minimum 5 years of working experience in Social Safeguards		1.35
	Knowledge in Nepali, Hindi and English		0.23
	Regional experience in South Asia region		0.22
	Gender and Social Inclusion Manager:	**1**	**2.25**

	At least Bachelor's degree in social science / human geography (or equivalent)		0.45
	Minimum 5 years of working experience in Gender and Social Inclusion		1.35
	Knowledge in Nepali, Hindi and English.		0.23
	Regional experience in South Asia region		0.22
	Environmental Manager:	**1**	**2.25**
	At least Bachelor Degree in physical geography / natural science / environmental science		0.45
	Minimum 5 years of working experience in Environmental Management		1.35
	Knowledge in Nepali, Hindi and English.		0.23
	Regional experience in South Asia region		0.22
	Total Points for this criterion 3		**40**
	Total Points (criterion 1 + 2 +3)		**100**

	The minimum technical score St required to pass is		70

Note:

1. For each lot, the Bidder needs to include separate information for Criteria 2 and Criteria 3. To qualify for each lot, the Bidder's proposal for each lot needs to score a minimum technical score of 70.
2. The list of Key Professional Personnel mentioned above is the minimum required for a Lot for evaluation purposes, the Contractor will have to provide the required number of personnel for carrying out the works as per the requirements of each lot.
3. During contract implementation the Contractor shall provide the required personnel with adequate experience and resources to perform the Work.
4. If none of the scores awarded by the Technical Evaluation Panel (TEP) reach or exceed the minimum technical score (St), the MCA Entity reserves the right to invite the Bidder(s) receiving the highest technical score (St) to negotiate both its Technical and Financial Proposals. If the negotiations fail to result in an acceptable contract within a reasonable time, the MCA Entity reserves the right to terminate the negotiations, at its sole discretion, and to invite the Bidder receiving the next highest technical score (St) to negotiate both its Technical and Financial Proposals.
5. In order to reach a determination, the Employer will examine and compare the technical aspects of the Bids based on the information supplied by the Bidders, taking into account the overall completeness and compliance with the Technical Specifications and Drawings of Part 2, Employer's Requirements.
6. The Employer shall examine the Submitted Technical Data Sheet with technical aspects in accordance with Section V: Employer's Requirements, in particular, to confirm that all requirements of B1.2: Technical Specifications have been met without any material deviation, reservation, or omission which may affect in any substantial way the scope, quality, or performance of the plant and services specified.
7. Historical information may be requested (as per ITB 28) by the Technical Evaluation Panel (TEP) during the evaluation process and may be accepted for administrative evaluation, qualification evaluation. The historical information requested and submitted by the bidder may be evaluated but the maximum score to be attained in this regard is "Meeting the requirements".

A6. Technical Evaluation Framework

The Technical Evaluation Framework for Scoring is as follows:

0 = Not meeting the requirements

1 = Material deviation from the requirements

2 = Significant deviation from the requirements

3 = Marginal deviation from the requirements

4 = Meeting the requirements

4.3 = Marginally exceeding the requirements

4.7 = Significantly exceeding the requirements

5 = Outstandingly exceeding the requirements

For Example: The requirement for **Resident Construction Manager-Electrical** is a bachelor's degree in electrical engineering and the points allocated is 4.0. In case the proposed candidate has bachelor's degree in electrical engineering, the candidate meets the requirement and shall be provided a score of 4.0 x 4/5 = 3.2 that is 80% of the points allocated. If the proposed candidate's qualification is marginally exceeding the requirements, then the candidate shall be provided a score of 4.0 x 4.3/5 =3.44 that is 86% of the points allocated, and so on.

B. Financial Offer

B1. Financial Offer - Administrative Completeness Review

This review is conducted to determine that the Financial Offer is complete, all required documents are included and all forms are included and are completed. The Bidder may be requested to submit additional information or documentation within a reasonable period of time and/or to correct nonmaterial nonconformities in the Bid related to the Financial Offer documentation requirements. Determinations made during this review include:

- Determine if the Letter of Financial Offer is included and signed as per the requirements of ITB Clause 21 and ITB Clause 22; and
- Determine if all forms and documents required under BDS ITB Sub-Clause 12.3 are included and completed.
- Determine if the schedule of prices for all scopeas described in the Employer's Requirements Section B11, are duly included.
- Determine if there are no commercial or technical conditions/deviations (apart from what it is stated under Technical Offer/Bid) included.

B2. Review of the Prices in the Financial Offer

This review is conducted to determine the Evaluated Financial Offer Price of each Bid. The "Evaluated Bid Price" shall be the Bid price adjusted as follows:

- The Evaluated Bid Price excludes Provisional Sums, but includes daywork items, where priced competitively;
- The Evaluated Bid Price does not include the estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract;

- The Evaluated Bid Price does not include the estimated effect of the price adjustment to rates due to extensions of the Bid validity period in accordance with ITB Sub-Clause 19.3**;**
- The Evaluated Bid Price includes adjustment for correction of arithmetical errors, omissions, clarifications, etc., in accordance with ITB Sub-Clause 30.2; and
- The Evaluated Bid Price includes price adjustment due to Capitalization of Transformer losses stated under Employer's requirement, section 2.3 of chapter 3: Autotransformer Specification.

After the above adjustments and corrections are made, the Employer will convert the Evaluated Bid Price to a single currency in accordance with ITB Sub-Clause 30.2 (**Not Applicable** as submission is only in USD).

Recommended Spare Parts

The price of recommended spare parts quoted in Price Schedule No. 6 shall not be considered for evaluation. This is because such spare parts would normally be used after long time duration beyond the MCC Compact end date and could not be financed from the Compact funds. Still the recommended spare parts may be financed directly by the government.

B3. Determination of Combined Technical and Financial Scores

The lowest evaluated Financial Offer (Fm) is given the maximum financial score (Sf) of 100.

The formula for determining the financial scores (Sf) of all other Offers is calculated as following:

Sf = 100 x Fm/ F, in which "Sf" is the financial score, "Fm" is the lowest price, and "F" the price of the Offer under consideration.

The weights given to the Technical (T) and Financial (P) Offers are:

T = 60, and

P = 40

Bids will be ranked according to their combined technical (St) and financial (Sf) scores according to the formula: **S = St x T% + Sf x P%**

Multiple Lots/ Contracts

Bidders may offer discounts if awarded more than one lot. Discounts can be expressed either in monetary terms in the currency of the Bid, or as a percentage of the Bid Price. In either case, the Employer will apply the indicated discounts to the Bid Price. The discount must be stated only in the Letter of Financial Offer. Discount stated anywhere else shall not be considered.

A bidder may submit bids for one, two or three lots**.** The Employer may award **a maximum of three Lots/Contract(s) to the** Bidder(s) that offer(s) the best value lot combination of Bids and meets the qualification criteria (4. Qualification Criteria, below) and the price is found to be reasonable. Bidders submitting proposals for more than one lot must meet all qualifications for each lot and propose separate personnel, equipment, etc., which would allow for performance of all lots for which bids have been submitted.

To determine the lot combinations that provides the best value, the Employer will:

a. evaluate only Bids that satisfies all technical and financial evaluation requirements;

b. take into account:

(i) the Bid that provides the highest Combined Technical and Financial score;

(ii) the discounts and the methodology for their application as offered by a Bidder in its Bid; and

(iii) consider the Contract award sequence that provides the most optimum economic combination taking into account any limitations due to constraints in qualification or execution capacity determined in accordance with the qualification criteria, as described in under Section III, 4. Qualification Criteria, below and ensuring that contracts be awarded in all lot/s (if practical).

(iv) In case, there will be a tie between two or more bidders, the award of the Contract to the bidder will be decided based on award of which lot/s will best suits the execution of work, considering price reasonableness and other project requirements.

B4. Price Reasonableness Determination

Price Review also includes a determination of price reasonableness in accordance with the provisions of MCC PPG and ITB Clause 31.

The Employer will award the contracts to the Bidders offering the highest total of combined technical and financial scores for each lot, subject to positive determination of the (a) Bidders' qualification to complete the respective number of lots; (b) responsiveness to the requirements of the bidding document as per provision of the Bid Document and (c) reasonableness of the evaluated Bid Prices.

Qualifications - <u>Documents Establishing the Qualifications of the Bidder</u>

If applicable, the Bidder shall provide the information requested in the corresponding information sheets included in Section IV. Bid Submission Forms, to establish that the Bidder meets the requirements established below.

ELIGIBILITY						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each Member**	**Lead Member**	
1. Nationality	Nationality in accordance with ITB 5.3.	Must meet requirement	N/A	Must meet requirement	N/A	Form ELI–1, with attachments
2. Conflict of Interest	No conflicts of interests as described in ITB 5.8 and 5.9.	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Technical Offer
3. Ineligibility	Not having been declared ineligible based on any of the criteria set forth in ITB 5.	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Technical Offer
4. Government-Owned Enterprise	Compliance with conditions of ITB 5.6	Must meet requirement	N/A	Must meet requirement	N/A	Form ELI–3
5. Joint Venture or Association						
(a) all members of the joint venture or association must satisfy the legal, financial, litigation and other requirements set out in this Bidding Document	Compliance with conditions of ITB 5.7	N/A	N/A for Legal and Litigation (Financial Requirements need to be satisfied)	Must meet requirement. (Except Financial Requirement)	N/A	Attachment of Letter of Technical Offer

ELIGIBILITY						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each Member**	**Lead Member**	
(b) all members of the joint venture or association will be jointly and severally liable for the execution of the Contract;	Compliance with conditions of ITB 5.7	N/A	N/A	Must meet requirement	N/A	Attachment of Letter of Technical Offer

ELIGIBILITY						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each Member**	**Lead Member**	
(c) the joint venture or association will nominate a representative who will have the authority to conduct all business for and on behalf of any and all the members of the joint venture or the association during the bidding process and, in the event the joint venture or association is awarded the Contract, during Contract performance.	Compliance with conditions of ITB 5.7	N/A	Must meet requirement	N/A	Must meet requirement	Attachment of Letter of Technical Offer

ELIGIBILITY						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each Member**	**Lead Member**	
6. Government Employees	Compliance with conditions of ITB 5.11	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Technical Offer

HISTORICAL CONTRACT NON-PERFORMANCE						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each member**	**Lead Member**	
7. History of non-performing contracts	Non-performance of a contract (including contracts terminated for cause) did not occur within the last ten (10) years prior to the deadline for Bid submission, determined using all information on fully settled proceedings, litigation, arbitrations, actions, claims, investigations or disputes. A fully settled proceeding, litigation, arbitration, action, claim, investigation or dispute is one that has been resolved in accordance with the dispute	Must meet requirement by itself, including as member of past or existing Joint Venture or other association (not mandatory if in the past was as a member of a Joint Venture or other association with	N/A	Must meet requirement by itself or as member of past or existing Joint Venture, or other association (not mandatory if in the past was as a member of a Joint Venture or other	N/A	Form CON –1

HISTORICAL CONTRACT NON-PERFORMANCE						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each member**	**Lead Member**	
	resolution mechanism under the respective contract, and where all appeal instances available to the Bidder have been exhausted.	less than 20% role in the contract).		association with less than 20% role in the contract).		

HISTORICAL CONTRACT NON-PERFORMANCE						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each member**	**Lead Member**	
8. Failure to Sign a Contract	Failure to sign a contract after receiving a notice of award has not occurred in the past five years. Any deviation should be explained in the enclosed Contract Non-Performance form.	Must meet requirement	N/A	Must meet requirement	N/A	Form CON-1

HISTORICAL CONTRACT NON-PERFORMANCE						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each member**	**Lead Member**	
9. Pending Litigation	All pending proceedings, litigation, arbitrations, actions, claims, investigations or disputes, in net (difference between claim by Bidder and Claim against bidder), against bidder, shall not represent more than ten percent (10%) of the Bidder's net worth.	Must meet requirement by itself, including as member of past or existing Joint Venture or other association (not mandatory if in the past was as a member of a Joint Venture or other association with less than 20% role in the contract).	N/A	Must meet requirement by itself or as member of past or existing Joint Venture, or other association (not mandatory if in the past was as a member of a Joint Venture or other association with less than 20% role in the contract).	N/A	Form CON-1

FINANCIAL SITUATION[1]						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each member**	**Lead Member**	
10. Historical Financial Performance[2]	Submission of certified financial statements, including balance sheets, income statements and cash flow statements, or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for the last three (3) years to demonstrate the current soundness of the Bidder's financial position and its prospective long-term profitability and to demonstrate: **1.** Average ~~coefficient~~ of Current ratio (Current Assets / Current Liabilities) ≥ **1.0** **2.** Average of Debt ratio (Total Debt / Total Assets) ≤ **0.85**	Must meet requirement	N/A	Must meet requirement **(Except that if one JV member is solely a designer, that member need not meet the "Historical Financial Performance)**	N/A	Form FIN-1 with attachments

[1] The financial information provided by a Bidder shall be reviewed in its entirety to allow a truly informed judgment about the capacity of the Bidder to undertake the contract, and will not be limited strictly to substantiate the financial ratios indicated here.

[2] Unless exempted by MCC, this requirement is met by the submission of **one of the following:** 1) audited financial statements for the last three (3) years, supported by audit letters, 2) certified financial statements for the last three (3) years, supported by tax returns or 3) a copy of the Contractor's Dun & Bradstreet Business Information Report ("BIR"). The Dun & Bradstreet report must either be notarized or accompanied by the following statement by the Bidder: "I certify that the attached BIR has been issued by Dun & Bradstreet within thirty (30) days of the date of this certification, that report has not been altered in any way since its issuance, and that it is true and correct to the best of my knowledge." The statement must be signed by an authorized representative of the Bidder. If the Bid is submitted by a joint venture, all parties in the joint venture are required to submit their financial statements or Dun & Bradstreet BIR. The reports should be submitted in order of the partner's significance in the partnership, greatest to least. Failure to submit one of the three documents as evidence of financial capacity may result in the rejection of the Bid.

11. Annual Average Turnover	**1.** Minimum average annual construction turnover of **Lot 1: US$85 Million** **Lot 2: US$52 Million** **Lot 3: US$54 Million** ,calculated as total amount as per certified financial statements ~~payments received~~ for contracts in progress or completed, within the last three (3) years. Values to determine annual construction turnover are to be demonstrated in the audited financial statements (income statements) of the last three (3) years. To be eligible for award of more than one lot, the bidder needs to satisfy the total requirements for the lots in consideration. **2.** Minimum average annual design	Must meet requirement	Must meet requirement	Must meet twenty-five percent (25%) of the requirement **(Except that if one JV member is solely a designer, that member need not meet the "Average Annual Construction turnover" sub-factor).**	Must meet fifty-five percent (55%) of the requirement **(Except that if one JV member is solely a designer, that member need not meet the "Average Annual Construction turnover" sub-factor).**	Form FIN-2

	turnover of **Lot 1: US$ 150,000** **Lot 2: US$ 100,000** **Lot 3: US$ 100,000,** calculated as total amount as per certified financial statements ~~payments received~~ for contracts in progress or completed, within the last three (3) years. Values to determine annual design turnover are to be demonstrated in the audited financial statements (income statements) of the last three (3) years. A certificate issued by the Bidder's Chartered Accountant certifying that the design turnover was of value in US$ (value of the design turnover in an year) will also be acceptable. To be eligible for award of more than one lot, the bidder needs to satisfy the	Must meet requirement	Must meet requirement	N/A	N/A	

FINANCIAL SITUATION[1]						
Sub-Factor	**Requirement**	**Bidder**				**Documentation Required**
		Single Entity	**Joint Venture or Association**			
			All members combined	**Each member**	**Lead Member**	
	total requirements for the lots in consideration.					

12. Financial Resources	The Bidder must demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet: (i) the following cash-flow requirement: **Lot 1: US$ 4.3 Million** **Lot 2: US$ 2.6 Million** **Lot 3: US$ 2.7 Million**, ~~and~~ ~~(ii) the overall cash flow requirements for this Contract and its current commitments.~~ **To be eligible for award of more than one lot, the bidder needs to satisfy the total cumulative requirements for the lots in consideration.**	Must meet requirement	Must meet requirement	Must meet twenty-five percent (25%) of the requirement **(Except that if one JV member is solely a designer, that member need not meet the "Financial Resource" sub-factor).**	Must meet fifty-five percent (55%) of the requirement **(Except that if one JV member is solely a designer, that member need not meet the "Financial Resource" sub-factor).**	Forms FIN-3 & Form FIN-4

EXPERIENCE						
Sub-Factor	**Criteria**					**Documentation Required**
	Requirement	**Bidder**				
		Single Entity	**Joint Venture**			
			All members combined	**Each member**	**Lead Member**	
13. General Design Experience	Experience under contracts in the role of designer for at least the last ten (10) years prior to the Bid submission deadline, and with activity in at least nine (9) months in each year.	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP-1
14. General Construction Experience	Experience under contracts in the role of contractor, subcontractor, or management contractor for at least the last ten (10) years prior to the Bid submission deadline, and with activity in at least nine (9) months in each year.	Must meet requirement	Must meet Requirement	Must meet requirement (except that if one JV member is solely a designer, that member need not meet the "General Construction Experience" sub-factor).	Must meet Requirement	Form EXP-2
15. Similar Design Experience	(a) Participation as designer in at least two (2) substation contracts within the last five (5)	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP-3

	years that have been successfully and substantially completed and that are similar to the proposed works. (b) Successfully completed as designer, as single entity or as joint venture partner, at least two (2) turnkey or design-build contract for GIS substations within last five years at voltages 380kV or above, that requirement (c) Successfully completed as single entity or as joint venture partner at least one (1) turnkey contract as a designer in a South Asian country. Evidence shall be given by end users or taking over certificates or similar certificates.					

EXPERIENCE						
Sub-Factor	**Criteria**					**Documentation Required**
	Requirement	**Bidder**				
		Single Entity	**Joint Venture**			
			All members combined	**Each member**	**Lead Member**	
16. Similar Construction Experience	Successfully completed turnkey or design-build substation projects within the last ten 10 years for each lot, (a) of below mentioned value: **for Lot 1: US$34 Million (2 Contracts each of US$ 34 Million or above)** **for Lot 2: US$ 20 Million (2 Contracts each of US$ 20 Million or above)** **for Lot 3: US$ 21 Million (2 Contracts each of US$ 21 Million or above)** (b) Participation as single entity or as joint venture partner in at least two (2) turnkey	Must meet requirement	Must meet Requirement	N/A	Must meet fifty percent (50%) of the requirement (that is at least one work of required value of a Lot to qualify for that Lot.	Form EXP-4

	contract/design and build constructing GIS substations of voltages 380kV or above and 50 kA short circuit level or higher and the same should be in successful operation for each lot. To be eligible for award of more than one lot, the bidder needs to satisfy the total requirements for the lots in consideration. (c) Participation as single entity or as joint venture partner in at least two (2) turnkey contracts, at least one being in a South Asian country for each lot. (d) Supply, delivery, installation, testing and commissioning of at least cumulative 1000MVA three phase (or equivalent capacity in bank of three single phase units) auto/power transformer of 380 kV or higher EHV side					

EXPERIENCE						
Sub-Factor	**Criteria**					**Documentation Required**
	Requirement	**Bidder**				
		Single Entity	**Joint Venture**			
			All members combined	**Each member**	**Lead Member**	
	and the same should be in successful operation for each lot. **Evidence shall be given by end users or taking over certificates.** All contracts must have been successfully and substantially completed.					
17. Environmental and Social Management Experience	Has developed and implemented at least two Environmental and Social Management Plans (ESMP) that include gender and social inclusion considerations for similar types of projects in the last five years prior to the Bid submission deadline.	Must meet requirement	Must meet requirement	N/A	N/A	EXP-5

EXPERIENCE						
Sub-Factor	**Criteria**					**Documentation Required**
	Requirement	**Bidder**				
		Single Entity	**Joint Venture**			
			All members combined	**Each member**	**Lead Member**	
18. Health and Safety Management Experience	Has developed at least two Health and Safety Management Plans for similar types of projects in the last five (5) years prior to the Bid submission deadline.	Must meet requirement	Must meet requirement	N/A	N/A	EXP-6

Note:

1. For Environmental and Social Management Experience and Health and Safety Management Experience, with experience in two projects/contracts, bidders will be able to satisfy requirement for Lot 1, Lot 2 and Lot 3.

2. Historical information may be requested (as per ITB 28) by the TEP during evaluation and may be accepted for administrative evaluation, qualification evaluation.

3. Overall years of experience of the firm will be considered in calendar years and more years of overall experience (since registration of firm) compared to what is stated above will receive more marks as per A6. Technical Evaluation Framework.

4. The General Design and Construction Experience stated in this Qualification Table is related to any construction.

Equipment

The Bidder must demonstrate that it has, at the minimum, access to (own or rent) the key equipment listed hereafter or propose alternative equipment that satisfy the requirements of the contract:

No.	Equipment Type and Characteristics	Number/sets required for each Lot
E1	Suitable crane/jack and slide technique or mechanism to handle unloading of 315MVA capacity Transformer	1
E2	4-wheel drive utility vehicle	3
E3	Lorry /Truck over 10 tonnes	1
E4	Tipper/Dump truck	1
E5	Truck mounted crane	1
E6	Generator sets	1
E7	Welding equipment	1
E8	Oil Filter Machine ≥ 6000 LPH	1
E9	Tan Delta Tester	1
E10	Frequency response analysis tester (FRA)	1
E11	SF6 filling equipment for GIS	1
E12	Gas leakage detector	1
E13	Transformer Turn Ratio detector (TTR)	1
E14	Micro Ohm Meter	1
E15	Excavator	1
E16	Soil Compacting machine	2
E17	Air compressor	1
E18	Concrete mixer	1
E19	Concrete testing lab	1
E20	Dewatering pumps	2

Note: This is the minimum that a bidder must propose for each lot to qualify. The list provided is just for evaluation purposes. During construction, the Contractor shall be responsible for bringing all required equipment to carry out the Works.

The Bidder shall provide further details of proposed items of equipment using Form TECH-6 in Section IV. Bid Submission Forms.

Bidders shall provide information in the methodology and work-program section of the Bid forms on how this equipment shall be utilized.

Key Personnel

The Bidder must demonstrate that it has, at the minimum (for each Lot), the key personnel as follows:

Nr.	Key Personnel	Number	Minimum Qualification and Experience
1	Resident Project Director	1	As stated under Section III, D. Technical Evaluation Criteria for each Lot, sub-criteria, 3. Key Professional Personnel Qualifications
2	Resident Construction Manager-Electrical	1	
3	Resident Construction Manager-Civil	1	
4	Design Engineer-Electrical	1	
5	Design Engineer-Protection	1	
6	Design Engineer-Civil	1	
7	Resident LDC (Load Dispatch Centre) Integration and SCADA specialist	1	

~~8~~	~~Resident Commissioning Engineer~~	~~1~~	
~~9~~	~~Resident Engineer - Planning~~	~~1~~	
~~10~~	~~Health and Safety Manager~~ [3]	~~1~~	
~~11~~	~~Social Safeguards Manager~~ [4]	~~1~~	
~~12~~	~~Gender and Social Inclusion Manager~~[5]	~~1~~	
~~13~~	~~Environmental Manager~~[6]	~~1~~	

~~For the Key Personnel, Bidders should include a copy of the Curriculum Vitae of each key personnel, signed by the employee concerned, filling for these purposes Form TECH-7.~~

~~The MCA Entity retains the right to request and check references for each key personnel listed.~~

References and Past Performance Review

In accordance with ITB 33, the Bidder's performance on earlier contracts has been considered in determining if the Bidder is qualified for award of the Contract. The Employer reserves the right to check the performance references provided by the Bidder or to use any other source at the Employer's discretion. If the Bidder (including any of its associates or joint venture/association members) is or has been a party to an MCC-funded contract (either with MCC directly or with any Millennium Challenge Account Entity, anywhere in the world), whether as a lead contractor, affiliate, associate, subsidiary, subcontractor, or in any other role, the Bidder must identify the

3 For the Health and Safety Manager position, familiarity with local language and culture is strongly desired.
4 For the Social Safeguards Manager position, familiarity with local language and culture is strongly desired.
5 For the Gender and Social Inclusion Manager position, familiarity with local language and culture is strongly desired.
6 For the Environmental Manager position, familiarity with local language and culture is strongly desired.

contract in its lists of references submitted with its Bid using Bidding Form REF1: References of MCC Funded Contracts. Failure to include any such contracts may be used to form a negative determination by the Employer on the Bidder's record of performance in prior contracts. However, the failure to list any contracts because the Bidder (including any of its associates or joint venture/association members) has not been a party to any such contract will not be grounds for a negative determination by the Employer on the Bidder's record of performance in prior contracts. That is, prior performance in connection with an MCC-funded contract is not required. The Employer will check the references, including the Bidder's past performance reports filed in MCC's Contractor Past Performance Reporting System.

The Employer reserves the right to contact the references in REF-1 and REF-2 R as well as other sources to check references and past performance.

Manufacturers

Manufacturers for the following major items of supply or installation services must meet the following minimum criteria, herein listed for that item:

Item No.	Description the Item	Minimum criteria to be met
1	Gas Insulated Switchgear	I. At least five years in manufacturing of Gas Insulated Switchgear. II. Must be the manufacturer of Gas Insulated Switchgear who have been, for not less than five (5) years, a manufacturer of 380kV or above GIS and must have designed, manufactured, tested (as per or relevant international standard), supplied, at least three (3) GIS Substations having cumulative ten (10) number of Circuit breaker bays of 380kV or above and short circuit level 50 kA or above, and which should be in successful operation. III. Manufacturer shall also have supplied at least three (3) Gas Insulated Switchgear (GIS) Substation of 220kV or above voltage class during last five (5) years outside the Manufacturer's home country and which should be in successful operation. IV. The above-criteria (I, II, and III) would also be applicable to Gas Insulated Bus ducts (GIB). V. Manufacturer shall provide evidence that it is ISO 9001 certified.
2	Outdoor Capacitor Voltage Transformer for 400kV	Must have designed, manufactured, tested and supplied at least three times the units required for this tender within the last 5 years prior to the date of bid opening. Manufacturer shall provide evidence that it is ISO 9001 certified.

3	Outdoor Surge Arrester for 400 kV	Must have designed, manufactured, tested and supplied at least a hundred units within last 5 years prior to bid opening. Manufacturer shall provide evidence that it is ISO 9001 certified.
4	Substation Automation System (SAS), Relays, Energy Meter (Control and Relay Panel)	I. At least Ten (10) years in manufacturing of SAS and relays II. Must have designed, manufactured and supplied at least thrice the quantity of SAS and relays necessitated in this tender within last five (5) years prior to bid opening date. III. Manufacturer shall provide evidence that it is ISO 9001 certified
5	Auto Transformer	Must have designed, manufactured, tested and supplied at least 10 (Ten) units of power/auto transformers of 380kV class or above, 300 MVA or above, within last five (5) years prior to the date of bid opening. (Three single phase units, if applicable, will be considered as one unit.) Manufacturer shall provide evidence that it is ISO 9001 certified
6	OLTC (On load tap changer)	OLTC shall be offered from among the following manufacturers: MR Germany, ABB Sweden[7]. Manufacturer shall provide evidence that it is ISO 9001 certified.
7	Communication Equipment, Protection and Control, SCADA	Must have designed, manufactured, tested and supplied at least 10 (Ten) complete units of Communication Equipment, Protection and Control, SCADA units for major HV transmission substations. All such equipment must be designed, manufactured and tested in accordance with IEEE/IEC recommendations within last ten (10) years prior to the date of bid opening. Manufacturer shall provide evidence that it is ISO 9001 certified
8	220 V & 48 V Battery and Battery Charger	Must have designed, manufactured, tested and supplied at least 10 (Ten) sets designed for transmission system substations installed in climatic conditions similar to Nepal within last five (5) years prior to the date of bid opening. Manufacturer shall provide evidence that it is ISO 9001

[7] As per NEA requirements.

		certified.
9	XLPE Power Cable	The manufacturer must have manufactured, tested and supplied at least 100kms of XLPE power cable of 33kV or higher Voltage Class within last ten (10) years prior to the date of bid opening. Manufacturer shall provide evidence that it is ISO 9001 certified.

Note: The Bidder must propose only one manufacturer for 1. Gas Insulated Switchgear and 5. Auto Transformer among the above listed major equipment (under 1 to 9) in their technical offer. Approved equipment cannot be changed without MCA-Nepal approval.

In the case of a Bidder (single entity or Joint Venture) who offers to supply and install major items of supply under the contract that the Bidder did not manufacture or otherwise produce, the Bidder shall provide the manufacturer's authorization (in the form of a letter of authorization), showing that the Bidder has been duly authorized by the manufacturer of the related plant and equipment or component to supply and install the plant and equipment in the Employer's country. In case of non-major items, it could be either manufacturer or supplier whose letter of authorization is to be provided. The supplier/ manufacturer shall comply with the requirements of ITB 5 and 6 and meet the criteria described above for that item. Furthermore, the manufacturer shall provide evidence that it is ISO 9001 certified (submission of valid certificate) and in the business for the required period of time (submission of company brochure or company registration).

ATTACHMENT #2

Form TECH-7: CVs of Key Personnel[8]

Name of Bidder	

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
	Trainings Taken (include detail of training, duration, date and location of training):	
Prese	Name of employer	
	Address of employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present employer

Summarize professional experience as per the requirements of Section III, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

[8] The Bidder who proposes for more than one lot must take this into account by responding to Form TECH-7 by including the information required for each of the lots for which it is submitting a Bid.

From (Month/ Year)	To (Month/ Year)	Company / Project / Position / All Relevant technical and management experience
Month/Year	*Month/Year*	*Company:*
		Project:
		Position:
		All Relevant technical and management experience:
Month/Year	*Month/Year*	*Company:*
		Project:
		Position: All Relevant technical and management experience:

Countries of Work Experience	[List the countries where staff has worked in the last ten years]
Languages	[For each language indicate proficiency: good, fair, or poor in speaking, reading, and writing] Language Speaking Reading Writing

References:

[List at least three individual references with substantial knowledge of the person's work. Include each reference's name, title, phone and e-mail contact information.] [The MCA-Nepal/Employer reserves the right to contact other sources as well as to check references, in particular for performance on any relevant MCC-funded projects.]

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

I, the undersigned, hereby declare that I agree to participate with the **[Bidder]** in the above-mentioned procurement process. I further declare that I am able and willing to work:

1. for the period(s) foreseen in the Bidding Document for the position for which my CV has been included in the Technical Offer of the Bidder and

2. within the Contract period of the specific contract.

Signature of Key Personnel

If this form has NOT been signed by the Key Professional Personnel, then in signing below the authorized representative of the Bidder is making the following declaration.

"In due consideration of my signing herewith below, if the Key Personnel has NOT signed this CV then I declare that the facts contained therein are, to the best of my knowledge and belief, a true and fair statement AND THAT I confirm that I have approached the said Key Personnel and obtained his/her assurance that he/she will maintain his/her availability for this assignment if the Contract is agreed within the Bid validity period provided for in the Bidding Document."

Signature of Authorized Representative of the Bidder

Note:

1. The bidder should include all required information under Section III for a Personnel under their CV.
2. The three referees stated in the CV by the proposed personnel shall not be representative(s) of the Bidder or Sub-Consultant submitting the proposal and proposing the person.
3. The CV should not be more than 10 pages in length.
4. For Intermittent input, the CV must state the duration (from – to and duration in days).

ATTACHMENT #3

Form FIN-1: Financial Situation

Each Bidder or member of a Joint Venture/Association making up a Bidder must fill in this form.

Financial Data for Previous Three (3) Years [US$ Equivalent]		
Year 1:	**Year 2:**	**Year 3:**

Information from Balance Sheet

Total Assets			
Total Liabilities			
Net Worth			
Current Assets			
Current Liabilities			

Information from Income Statement

Total Revenues			
Profits Before Taxes			
Profits After Taxes			

❑ Attached are copies of financial statements (balance sheet, income statement, and cash flow statement, including all related notes) for the last three (3) years, as indicated above, complying with the following conditions.

- All such documents reflect the financial situation of the Bidder or member of a joint venture or other association, and not sister or parent companies.
- Historic financial statements must be audited by a certified accountant.
- Historic financial statements must be complete, including all notes to the financial statements.
- Historic financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

Financial Ratios

	Year 1:	**Year 2:**	**Year 3:**	**Average coefficient of Current Ratio and Average coefficient of Debt Ratio**
Current Ratio				
Debt Ratio				

* Bidders to fill these tables. The Employer will verify during the review process.

Form FIN-2: Average Annual Turnover (Design and Construction)

Each Bidder or member of a Joint Venture/Association making up a Bidder must fill in these forms.

Annual Turnover Data for the Last Three (3) Years (Construction only)			
Year	**Amount Currency**	**Exchange Rate**	**US$ Equivalent**
Average Annual Construction Turnover			

The information supplied should be the annual construction turnover of the Bidder or each member of a Joint Venture/Association making up a Bidder in terms of the amounts as per the certified financial statements ~~billed~~ of the Bidder ~~clients~~ for each year for work in progress or completed, converted to USD at the exchange rate at the end of the period reported.

Annual Turnover Data for the Last Three (3) Years (Design only)			
Year	**Amount Currency**	**Exchange Rate**	**US$ Equivalent**
Average Annual Design Turnover			

The information supplied should be the annual design turnover of the Bidder or each member of a Joint Venture/Association making up a Bidder in terms of the amounts as per audited certified financial statements ~~billed~~ of the Bidder ~~clients~~ for each year for work in progress or completed, converted to USD at the rate of exchange at the end of the period reported.

Attachment #4

Price Schedules

Lots	***Price Schedule***
Lot 1	230820_Lot1_RAT_PS.pdf
Lot 2	230820_Lot2_NBW_PS.pdf
Lot 3	230820_Lot3_NDM_PS.pdf

Lot 1 - Price Schedules

Millennium Challenge Account Nepal
Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of
Lot 1: 400kV Ratmate Substation and works at Lapsiphedi and New Hetauda Substations
Price Schedule

Breakdown of Rates and Price Schedule No. 1. Design Services					
Item No	**Description**	**Qty**	**Unit**	**Unit Rate US$**	**Total Price US$**
		1		***2***	***(1)x(2)***
1.1	**Design Works (Electrical)**				
Complete Electromechancial and Electrical Design of New Substation as Specified in Scope and Employers Requirements					
1.1.1	Substation Design: (SLD, Layout, Section elevation, P&C, SCADA,400/220kV Switchgear, Auto Transformers along with connections, Auxiliary System, Control, LV & Fibre Optic Cables along with connections for the same, etc.)	1	Lot		
1.1.2	Thermal Calculations for normal and emergency continuous current ratings of the switchgear and each main current path component.	1	Lot		
1.1.3	Insulation Coordination Study	1	Lot		
1.1.4	Lightning Surge Overvoltage Study	1	Lot		
1.1.5	Transient Recovery Voltage (TRV) Study for GIS	1	Lot		
1.1.6	Grounding analysis for entire substation (Includes ERT)	1	Lot		
1.1.7	All the requested settings for Protection Coordination, Relay Test Plan, Configuration and Programming on Intelligent Electronic Device (IEDs) such as Relays, RTUs, Automation system, etc. to ensure normal function of integrated system at substation and with other facilities in the entire power system as referred to Lot 1 works	1	Lot		
1.1.8	GIS system earthing and bonding study	1	Lot		
1.1.9	Outdoor Switchyard Lighting Study	1	Lot		
1.1.10	Power Cable Ampacity Study	1	Lot		
1.1.11	Rigid Bus Study	1	Lot		
1.1.12	Power Cable Pulling Tension Calculation	1	Lot		
1.1.13	Any other design work not specifically mentioned above but deemed necessary or as required by Engineer/Employer for satisfactory completion of design work.	1	Lot		
				Sub Total 1.1	
1.2	**Design Works (Civil)**				
Complete Civil Design of New Substation as Specified in Scope and Employers Requirements including but not limited to:					
1.2.1	Geotechnical investigation data and drawings including on-site support during excavation and compaction.	1	Lot		
1.2.2	Hydrological study to carryout a flood risk assessment	1	Lot		
1.2.3	Surveying and benchmarking design and drawings including on-site support during site preparation.	1	Lot		
1.2.4	Substation Design in Civil, Structural, Mechanical and Architectural, such as foundation works, hot dip galvanised steel supporting structures for all outdoor electrical equipment, other civil works like boundary wall etc., substation buildings, roads, cable trenches, water drainage system, oil containment chamber and sump pit, fire walls etc. of new substation complete in all respect.	1	Lot		
1.2.5	Design of rail tracks for movement of power transformers on the reinforced concrete foundations.	1	Lot		
1.2.6	Any Architectural-Related Calculations and Analysis	1	Lot		
1.2.7	Any Mechanical-Related Calculations and Analysis	1	Lot		
1.2.8	Any other design work not specifically mentioned above but deemed necessary or as required by Engineer/Employer for satisfactory completion of design work.	1	Lot		
				Sub Total 1.2	
				Total (Carried forward to Grand SC-5)	
			Name of Bidder:		
			Signature of Bidder:		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.1	**AIS HV and MV Equipment**					
2.1.1	167 MVA, (400/√3/220/√3/33) kV, Single Phase Auto-Transformer with OLTC, RTCC Facility, Surge protection arrangement (AIS) for HV, IV and LV side and with Bushing CT complete with all accessories as specified		7	Nos		
2.1.2	Capacitor Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering		18	Nos		
2.1.3	Current Transformer (CT), 400kV, Single Phase, Live Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA		18	Nos		
2.1.4	Current Transformer (CT), 72.5kV, Single Phase 2 Windings		6	Nos		
2.1.5	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV		18	Nos		
2.1.7	Station Service Transformer, 630 kVA, 33/0.4kV		2	Nos		
2.1.8	30kV,10kA Lightning arrester for 33kV line bays		6	Nos		
2.1.9	30kV,10kA Lightning arrester for 33/0.4kV station service transformers		6	Nos		
2.1.10	72.5kV Double Break Isolator, Single Phase		1	Lot		
2.1.11	72.5kV Circuit Breaker, Three Phase, 50Hz.		2	Nos		
2.1.12	72.5kV Current Transformer		6	Nos.		
2.1.13	400kV Bus Support Post Insulator		1	Lot		
2.1.14	220kV Bus Support Post Insulator		1	Lot		
2.1.15	72.5kV Bus Support Post Insulator		1	Lot		
2.1.16	Suspension/Tension Insulator Strings, Including Hardware		1	Lot		
2.1.17	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.1	
2.2	**Hot-Dip Galvanized Steel**					
2.2.1	Gantry Column for 400 kV Incoming Line		7	Nos		
2.2.2	Hydrological study to carryout a flood risk assessment		6	Nos		
2.2.3	Support Structure for 400 kV Current Transformer		18	Nos		
2.2.4	Support Structure for 400 kV Capacitive Voltage Transformer		18	Nos		
2.2.5	Support Structure for 400 kV Surge Arrester		18	Nos		
2.2.6	Support Structure for 400 kV Bus Support		1	Lot		
2.2.7	Support Structure for 220 kV Bus Support		1	Lot		
2.2.8	Support Structure for 72.5 kV Current Transformer		6	Nos		
2.2.9	Support Structure for 72.5 kV Bus Support or Pot Head		1	Lot		
2.2.10	Support Structure for 72.5 kV Single Switch Stand		1	Lot		
2.2.11	Support Structure for 30kV Lightning Arrestor		12	Nos		
2.2.12	Structures for Lightning Mast and other Lighting structures		1	Lot		
2.2.13	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.2	

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.3	**Bus Bar and Overhead Connections**					
2.3.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness		1	Lot		
2.3.2	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)		1	Lot		
2.3.3	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel		1	Lot		
2.3.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.3	
2.4	**LV Control and Power Cable**					
2.4.1	LV Control Cables		1	Lot		
2.4.2	LV Power Cables		1	Lot		
2.4.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)		1	Lot		
2.4.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)		1	Lot		
2.4.5	33 kV Cable Pothead		1	Lot		
2.4.6	Power Cable for Filter Plant (Transformer) 3.5CX240 sq.mm. (Armoured, PVC Insulated) with suitable termination arrangement all complete		1	Lot		
2.4.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.		1	Lot		
2.4.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.4	
2.5	**AC AND DC STATION SUPPLY**					
2.5.1	**400 V AC Main Switch Board**					
2.5.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		3	Nos		
2.5.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers		1	Nos		
2.5.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer		1	Nos		
2.5.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer		1	Nos		
2.5.2	**400 V AC Main Lighting Board**					
2.5.2.1	100kVA Lighting Transformer		2	Nos		
2.5.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker		1	Nos		
2.5.3	**400 V AC Emergency Lighting Distribution Board**					
2.5.3.1	100kVA Lighting Transformer		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.5.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A Breaker		1	Nos		
2.5.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers		1	Nos		
2.5.4	**400 V AC Distribution Board**					
2.5.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		1	Nos		
2.5.4.2	400/110V, 50VA, Potential Transformer		3	Nos		
2.5.4.3	400/1A Current Transformer, Class 5P20		1	Nos		
2.5.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers		1	Nos		
2.5.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker		1	Nos		
2.5.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers		1	Nos		
2.5.5	**400 V AC AMF Panel**					
2.5.5.1	400/1A Current Transformer, Class 1		3	Nos		
2.5.5.2	400/1A Current Transformer, Class 5P20		1	Nos		
2.5.6	**DC Chargers and Batteries**					
2.5.6.1	220V Battery Charger (Float/Boost)		6	Nos		
2.5.6.2	48V Battery charger (Float/Boast)		6	Nos		
2.5.6.3	250A Throw over Switch, Interlock		12	Nos		
2.5.6.4	Battery, 220Vdc, 108 Minimum Cells		4	Nos		
2.5.6.5	Battery, 48Vdc, 24 Minimum Cells		4	Nos		
2.5.7	**DC Distribution Boards**					
2.5.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions		6	Nos		
2.5.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions		4	Nos		
2.5.7.3	DC Fuse Box, 220Vdc		1	Lot		
2.5.7.4	DC Fuse Box, 48Vdc		1	Lot		
2.5.8	**Other Equipment**					
2.5.8.1	Diesel Generator Set, 250kVA (Including Fuel Tank) and all accessories		1	Nos		
2.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.5	
2.6	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**					
2.6.1	**Line/Feeder Bay-400 kV**					
2.6.1.1.	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole		10	Nos		
2.6.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set (1 set = 3 single phase)		20	Nos		
2.6.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		20	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.6.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		20	Nos		
2.6.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		10	Nos		
2.6.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set (1 set = 3 single phase)		10	Nos		
2.6.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		10	Nos		
2.6.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		10	Nos		
2.6.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		10	Nos		
2.6.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		10	Nos		
2.6.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.1.14	Gas Insulated bus (GIB) with required GIS Termination along with supports for GIB run for whole Line/Feeder Bay (Three phase set)		10	Bays		
2.6.2	**Transformer Bay-400 kV**					
2.6.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		4	Nos		
2.6.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set ((1 set = 3 single phase)		8	Nos		
2.6.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
2.6.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set(1 set = 3 single phase)		8	Nos		
2.6.2.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		3	Nos		
2.6.2.6	Voltage Transformers, 400kV, dual secondary, earthing link, single-phase, three-phase set(1 set = 3 single phase)		3	Nos		
2.6.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		6	Nos		
2.6.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		6	Nos		
2.6.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		4	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.6.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		4	Nos		
2.6.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.2.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.2.14	Isolating & Earthing Switches, 400kV, 4000A, 50kA Single phase, and Auxiliary Gas Insulated Bus (GIB) for Spare Transformer Operation,GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete. 33kV isolators, 33kV cables , jumpers as required all complete		3	Set		
2.6.2.15	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination Bushing along with supports for GIB run for whole Transformer Bay Lot		3	Bays		
2.6.3	**Diameter Middle Breaker Bay-400 kV**					
2.6.3.1	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole		4	Nos		
2.6.3.2	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		2	Nos		
2.6.3.3	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set ((1 set = 3 single phase)		12	Nos		
2.6.3.4	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
2.6.3.5	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set (1 set = 3 single phase)		12	Nos		
2.6.3.6	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		6	Nos		
2.6.3.7	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		6	Nos		
2.6.3.8	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.3.9	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.3.10	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.4	**Gas Insulated BUSBAR**					
2.6.4.1	400kV, Double Bus Bar of 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures per diameter		7	Diameter		
2.6.4.2	Voltage Transformers, 400kV, dual secondary, single-phase, three-phase set ((1 set = 3 single phase)		2	Nos		
2.6.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		2	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

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			1	*2*	*3*	*(1) x (3)*
2.6.4.4	Main Bus Bar Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		2	Nos		
2.6.4.5	Bus Bar Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set ((1 set = 3 single phase)		2	Nos		
2.6.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.6	
2.7	**220kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**					
2.7.1	**Line/Feeder Bay-220 kV**					
2.7.1.1	SF6 Circuit Breaker, 220kV, 4000A, 50kA, Three Pole		8	Nos		
2.7.1.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set ((1 set = 3 single phase)		16	Nos		
2.7.1.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		16	Nos		
2.7.1.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		16	Nos		
2.7.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
2.7.1.6	Voltage Transformers, 220kV, dual secondary, with earthing link, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
2.7.1.7	Line/Feeder Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
2.7.1.8	Line/Feeder Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set		8	Nos		
2.7.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		8	Nos		
2.7.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		8	Nos		
2.7.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.7.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.7.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.7.1.14	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for the whole Line/Feeder		8	Bays		
2.7.2	**Transformer Bay-220 kV**					
2.7.2.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole.		6	Nos		
2.7.2.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set		12	Nos		
2.7.2.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set		12	Nos		
2.7.2.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set		12	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.7.2.5	Transformer High Speed Earthing Switches, with removable earthing link 220kV, 50kA, single-phase, three-phase set		5	Nos		
2.7.2.6	Voltage Transformers, 220kV, dual secondary, with earthing link, single-phase, three-phase set		5	Nos		
2.7.2.7	Transformer Disconnect Switches,220kV, 4000A, 50kA, single-phase, three-phase set		8	Nos		
2.7.2.8	Transformer Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set		8	Nos		
2.7.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		6	Nos		
2.7.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		6	Nos		
2.7.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.7.2.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.7.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.7.2.14	Isolating & Earthing Switches, 220kV, 4000A, 50kA,Single phase, and Gas Insulated Bus (GIB) for Spare Transformer, with auxiliary Bus, GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete.		3	Set		
2.7.2.15	Three Single Phase Gas Insulated Bus (GIB) and required GIS Termination along with supports for GIB run for the whole Transformer Bay		6	Bays		
2.7.3	**Middle Diameter Breaker Bay -220 kV**					
2.7.3.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole.		6	Nos		
2.7.3.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set		12	Nos		
2.7.3.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set		12	Nos		
2.7.3.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set		12	Nos		
2.7.3.5	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		6	Nos		
2.7.3.6	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		6	Nos		
2.7.3.7	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.7.3.8	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.7.3.9	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.7.4	**Gas Insulated Bus Bars**					
2.7.4.1	220kV , Double 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures per diameter		7	Diameter		
2.7.4.2	Voltage Transformers, 220kV, dual secondary, single-phase, three-phase set		2	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

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			1	*2*	*3*	*(1) x (3)*
2.7.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 220kV, 50kA, Single-phase, Three-phase set		2	Nos		
2.7.4.4	Bus Bar Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		2	Nos		
2.7.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.7	
2.8	**Complete with control & protection up to GIB sealing end for all Feeder and**					
2.8.1	**Complete set of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**					
2.8.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		12	Nos		
2.8.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)		12	Nos		
2.8.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)		4	Nos		
2.8.1.4	400kV (Double Bus Bar Protection)		2	Set		
2.8.1.5	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.8.2	**Complete set of Control and Protection panels for 220 kV station as specified in Scope and Employers Requirements including but not limited to:**					
2.8.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the relay panel)		6	Nos		
2.8.2.2	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)		4	Nos		
2.8.2.3	220kV (Double Bus Bar Protection)		2	Set		
2.8.2.4	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.8.3	**Complete set of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**					
2.8.3.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		2	Nos		
2.8.3.2	Transformer Protection Panel		2	Nos		
2.8.3.3	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.8.4	**Substation Automation & Metering System**					
2.8.4.1	SAS Operator Station for control of 400/220/33 kV		1	Set		
2.8.4.2	Substation Automation System (SAS) for 400 kV System per diameter		7	Set		
2.8.4.3	Substation Automation System (SAS) for 220kV System per diameter		7	Set		
2.8.4.4	Substation Automation System (SAS) for 33kV System per feeder		2	Set		
2.8.4.5	Substation Automation System (SAS) for Auxiliary System		1	Set		

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			1	*2*	*3*	*(1) x (3)*
2.8.4.6	Integration of all 400/220kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.		1	Lot		
2.8.4.7	Telecommunication system for Ratmate		1	Lot		
2.8.4.8	Fibre Optic SDH System		1	Lot		
2.8.4.9	Phone System		1	Lot		
2.8.4.10	400 kV Metering		1	Lot		
2.8.4.11	220kV Metering		1	Lot		
2.8.4.14	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
					Sub Total 2.8	
2.9	**Grounding System**					
2.9.1	Stranded Bare Copper 240 Sq. mm*** Grid (Including Fusion and Mechanical Connectors)		1	Lot		
2.9.2	Grounding Rods		1	Lot		
2.9.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)		1	Lot		
2.9.4	Embedded Grounding System - 220kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)		1	Lot		
2.9.5	Embedded Grounding System - Control Room		1	Lot		
2.9.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.9	
2.10	**Lightning Protection System**					
2.10.1	Overhead Galvanized Steel Wire, Including Hardware		1	Lot		
2.10.2	Lightening Mast as required for total protection of equipment		1	Lot		
2.10.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.10	
2.11	**Firefighting System**					
2.11.1	Fire protection/detection for 7 (Seven) auto transformers		1	Lot		
2.11.2	Fire protection/detection for 400kV GIS Building		1	Lot		
2.11.3	Fire protection/detection for 220kV GIS Building		1	Lot		
2.11.4	Fire protection/detection for Control House		1	Lot		
2.11.5	Fire protection/detection system for pump house building		1	Lot		
2.11.6	Fire protection/detection system for generator diesel tank		1	Lot		
2.11.7	Portable fire extinguishers		1	Lot		
2.11.8	Clean-agent fire extinguishers		1	Lot		
2.11.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.11	
2.12	**HVAC And Ventilation Systems**					
2.12.1	400kV GIS Building HVAC and Ventilation Systems		1	Lot		
2.12.2	220kV GIS Building HVAC and Ventilation Systems		1	Lot		
2.12.3	Control House HVAC and Ventilation Systems		1	Lot		

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			1	*2*	*3*	*(1) x (3)*
					Sub Total 2.12	
2.13	**Accessories and Ancillary Material**					
2.13.1	Junction and marshalling boxes, outdoor		1	Lot		
2.13.2	Junction and marshalling boxes, indoor		1	Lot		
2.13.3	Outdoor lighting, including lighting fixtures		1	Lot		
2.13.4	Indoor lighting, including lighting fixtures		1	Lot		
2.13.5	Water Supply System as per TS		1	Lot		
2.13.6	Rainwater harvesting as per TS		1	Lot		
2.13.7	Control Cabinet for outdoor lighting		1	Lot		
2.13.8	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.		1	Lot		
2.13.9	Electric Overhead Travelling Crane for installation and removal of GIS Equipment (For 400 and 220 kV each)		2	Lot		
2.13.10	Visual Monitoring System		1	Lot		
2.13.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.13	
2.14	**Mandatory Maintenance, Repair tools and Testing Instruments**					
2.14.1	**GIS Equipment**					
2.14.1.1	400kV GIS SF6 leakage detector, analyzer and processing unit all complete		1	Lot		
2.14.1.2	220kV GIS SF6 leakage detector, analyzer and processing unit all complete		1	Lot		
2.14.1.3	400kV GIS Wrenches and tools		1	Lot		
2.14.1.4	220kV GIS Wrenches and tools		1	Lot		
2.14.1.5	400kV GIS Pressure gauge		1	Nos		
2.14.1.6	220kV GIS Pressure gauge		1	Nos		
2.14.1.7	400kV GIS Gas sampling and moisture meter		1	Nos		
2.14.1.8	220kV GIS Gas sampling and moisture meter		1	Nos		
2.14.1.9	400kV GIS Micro-Ohmmeter		1	Nos		
2.14.1.10	220kV GIS Micro-Ohmmeter		1	Nos		
2.14.1.11	400kV GIS Circuit-breaker, timing tester		1	Nos		
2.14.1.12	220kV GIS Circuit-breaker, timing tester		1	Nos		
2.14.1.13	400kV GIS Laptop computer with specialized software for GIS setting and monitoring		1	Nos		
2.14.1.14	220kV GIS Laptop computer with specialized software for GIS setting and monitoring		1	Nos		
2.14.1.15	Complete set of SF6 gas service cart mounted on a trailer for mobile application. SF6 gas refilling cart equipped with 1 SF6 gas cylinder and the necessary instruments and adapters for easy and quick gas refilling in case of losses		1	Lot		
2.14.1.16	HV Test Bushing for GIS		1	Lot		
2.14.1.17	Online Partial Discharge Monitoring System		1	Nos		
2.14.2	**Auto Transformer & Station Service Transformer**					
2.14.2.1	Oil-treatment unit 6000lph along with suitable size and quantity of connection arrangement (MCCB (240-300 Amp),terminal lugs etc.) all complete (autotransformer)		1	Nos		
2.14.2.2	Oil dielectric tester		1	Nos		
2.14.2.3	Dielectric tester based on tan δ and dielectric losses , 10 kV		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.14.2.4	Megger, electronic, 5 kV		1	Nos		
2.14.2.5	Wrenches and tools		1	Lot		
2.14.3	**Complete set of Control and Protection for Sub-Station**					
2.14.3.1	Relay Test kit		1	Lot		
2.14.3.2	Test Equipment & tools for SAS SYSTEM for measuring, configuration & diagnostics.		1	Lot		
					Sub Total 2.14	
2.15	**Mandatory Spare Parts**					
2.15.1	**HV Equipment**					
2.15.1.1	Unit of 400kV surge arrester, complete with grading ring, terminals and surge counter		2	Nos		
2.15.1.2	Capacitive voltage transformer, 400kV		1	Nos		
2.15.1.3	Current transformer, 400kV		1	Nos		
2.15.1.4	Current transformer, 72.5kV		1	Nos		
2.15.2	**Auto Transformer**					
2.15.2.1	Complete set of gaskets with grease, for cover, manholes, hand holes, and pipping fittings.		2	Lot		
2.15.2.2	Lot of LV control and protective components, minimum one unit of each type of components used		2	Lot		
2.15.2.3	Pressure relief device, complete with accessories		2	Nos		
2.15.2.4	Bushings, one complete unit of each type used, with accessories		2	Lot		
2.15.2.5	Current transformer, one unit of each type		2	Lot		
2.15.2.6	Oil-circulating pump with motor, complete with accessories		2	Nos		
2.15.2.7	Cooling fan, complete with motor		2	Nos		
2.15.2.8	Buchholz relay, complete (2 each for main tank and OLTC tank)		4	Nos		
2.15.2.9	One instrument of each type used (temperature, oil level, pressure vent, etc.)		2	Lot		
2.15.2.10	One valve of each type used		2	Lot		
2.15.2.11	Insulating oil, 5% of the volume used		1	Lot		
2.15.2.12	Silica gel, quantity for one load		1	Lot		
2.15.2.13	Tap changer diverter switch, spare contacts and transition resistance		2	Lot		
2.15.2.14	Tap changer selector switch spare contacts		2	Lot		
2.15.2.15	Rolls of Kraft insulating paper		2	Lot		
2.15.2.16	LA for HV,IV and LV side each		2	Lot		
2.15.2.17	Additional spare parts as per Chapter 3: Auto Transformer Specification of Part 2: Employer's Requirements, Section V – B1 (Technical Specifications).		1	Lot		
2.15.3	**630kVA Transformer**					
2.15.3.1	All Bushing with metal parts (each voltage rating) for 630 kVA Transformer		1	Lot		
2.15.3.2	Oil Temperature Indicator with sensing device		1	Lot		
2.15.3.3	Tap Changer Contacts		1	Lot		
2.15.3.4	Buchholz Relay		1	Nos		
2.15.3.5	Explosion vent diaphragm		1	Nos		
2.15.3.6	Set of valve (each type)		1	Lot		
2.15.3.7	3-Phase 11 kV Horn Gap Fuse		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.15.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.15	
2.16	**Spare Parts for AC and DC Station Supply**					
2.16.1	**Spare for LV Switchgear**					
2.16.1.1	LV circuit breaker, complete, with CT's and protection devices		1	Lot		
2.16.1.2	Outgoing thermomagnetic breakers - one unit of each type used		1	Lot		
2.16.1.3	Metering - one instrument of each type used		1	Lot		
2.16.1.4	Protection (other than included in LV breaker) One unit of each type used		1	Lot		
2.16.1.5	Automatic Transfer Switch One complete controller including sensors		1	Nos		
2.16.1.6	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Lot		
2.16.2	**Spare for DC Distribution Panels**					
2.16.2.1	Thermomagnetic breakers one unit of each type used		1	Lot		
2.16.2.2	Metering - one metering instrument of each type used		1	Lot		
2.16.2.3	Protection (other than included in LV breaker) One unit of each type used		1	Lot		
2.16.2.4	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Lot		
2.16.3	**Spare for Diesel Generator Set**					
2.16.3.1	Replaceable elements for air filter		1	Nos		
2.16.3.2	Replaceable elements for oil filter		1	Nos		
2.16.3.3	Replaceable elements for fuel filter		1	Nos		
2.16.3.4	Complete set of injectors		1	Nos		
2.16.3.5	Fuel injector pump		1	Nos		
2.16.3.6	Oil pump		1	Nos		
2.16.3.7	Intake valves		1	Nos		
2.16.3.8	Seats for intake valves		1	Nos		
2.16.3.9	Exhaust valves		1	Nos		
2.16.3.10	Set for exhaust valves		1	Nos		
2.16.3.11	Disconnect switch, with grounding blades, 220 kV, 3 Ø		1	Nos		
2.16.3.12	Set of pistons		1	Nos		
2.16.3.13	Set of complete bearings of the engine		1	Nos		
2.16.3.14	Set of all gaskets needed for the engine		1	Nos		
2.16.3.15	Set of thermostats		1	Nos		
2.16.3.16	Set of bearings for the alternator		1	Nos		
2.16.3.17	Set of control cards, at least one unit of each type used		1	Lot		
2.16.3.18	Diodes and thyristors of each type used		3	Nos		
2.16.3.19	Lamp, one unit of each type used		10	Nos		
2.16.3.20	Auxiliary relay, one unit of each type used		1	Lot		
2.16.3.21	Multifunction metering instrument		1	Nos		
2.16.3.22	Voltage and speed regulator component and actuator		1	Nos		
2.16.3.23	Controller components		1	Nos		
2.16.3.24	Instrument, detectors		1	Nos		
2.16.4	**Spare for Batteries**					
2.16.4.1	One unit of battery used in 220 V DC system		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.16.4.2	Loose parts for 220 V DC - connection elements, cables, links, etc.		1	Lot		
2.16.4.3	One unit of battery used in 48 Vdc system		1	Nos		
2.16.4.4	Loose parts for 48 V DC - connection elements, cables, links, etc.		1	Lot		
2.16.5	**Spare for Battery Chargers**					
2.16.5.1	Complete bridge of thyristors assembled on a cooling base		1	Nos		
2.16.5.2	Controller, complete including each type of card used		1	Nos		
2.16.5.3	Loose elements - auxiliary relays, breakers, metering instruments, control switches, fuses, etc.		1	Lot		
2.16.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.16	
2.17	**Mandatory spare parts - Miscellaneous material**					
2.17.1	Junction and marshalling boxed, outdoor, one of each type used		1	Lot		
2.17.2	Junction and marshalling boxed, indoor, one of each type used		1	Lot		
2.17.3	Outdoor lighting fixture, one unit of each type used		1	Lot		
2.17.4	Post-type insulator, one unit of each type used		1	Lot		
2.17.5	Suspension insulator, 5% of the total used		1	Lot		
2.17.6	Bus bar (rigid and strain) hardware, including, connectors, terminals, separator, corona rings, 5% of each type used, minimum one unit		1	Lot		
2.17.7	Grounding conductors, 5% of the installed conductors (stranded copper conductor, rectangular-shape copper bar and grounding rod)		1	Lot		
2.17.8	Fission connection material, including molds, welding powder and installation tools, quantity required to make 5% of the total executed connections		1	Lot		
2.17.9	Mechanical connectors for grounding, 5% of the total executed connections		1	Lot		
2.17.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.17	
2.18	**Mandatory spare parts for 400kV and 220kV GIS**					
2.18.1	**Spare Gas**					
2.18.1.1	SF6 bottles required to fill the two largest volume compartments for 400kV and 220kV		2	Lot		
2.18.2	**Circuit Breakers, 4000 A, 50kA (For 400kV)**					
2.18.2.1	Circuit breaker, complete pole assembly		1	Lot		
2.18.2.2	Complete sets of main contacts		1	Lot		
2.18.2.3	Complete sets of arcing contacts		2	Lot		
2.18.2.4	Operating mechanism, complete		1	Lot		
2.18.2.5	Closing coils		10	Nos		
2.18.2.6	Tripping coils		10	Nos		
2.18.3	**Circuit Breakers, 4000 A, 50kA (For 220kV)**					
2.18.3.1	Circuit breaker, complete pole assembly		1	Lot		
2.18.3.2	Complete sets of main contacts		1	Lot		
2.18.3.3	Complete sets of arcing contacts		2	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.18.3.4	Operating mechanism, complete		1	Lot		
2.18.3.5	Closing coils		10	Nos		
2.18.3.6	Tripping coils		10	Nos		
2.18.4	**Disconnect-Switches, 4000 A (For 400kV)**					
2.18.4.1	Disconnect-Switch, complete pole		1	Nos		
2.18.4.2	Complete set of contacts		2	Nos		
2.18.4.3	Operating mechanism, complete		1	Nos		
2.18.4.4	Operating mechanism motor		2	Nos		
2.18.5	**Disconnect-Switches, 4000 A (For 220kV)**					
2.18.5.1	Disconnect-Switch, complete pole		1	Nos		
2.18.5.2	Complete set of contacts		2	Nos		
2.18.5.3	Operating mechanism, complete		1	Nos		
2.18.5.4	Operating mechanism motor		2	Nos		
2.18.6	**Maintenance Earthing Switches (For 400kV)**					
2.18.6.1	Earthing-Switch, complete pole		1	Lot		
2.18.6.2	Complete set of contacts		2	Nos		
2.18.6.3	Operating mechanism, complete		1	Lot		
2.18.6.4	Operating mechanism motor		2	Nos		
2.18.7	**Maintenance Earthing Switches (For 220kV)**					
2.18.7.1	Earthing-Switch, complete pole		1	Lot		
2.18.7.2	Complete set of contacts		2	Nos		
2.18.7.3	Operating mechanism, complete		1	Lot		
2.18.7.4	Operating mechanism motor		2	Nos		
2.18.8	**High-speed earthing Switches (For 400kV)**					
2.18.8.1	High-speed earthing switch, complete pole		1	Lot		
2.18.8.2	Complete set of contacts		2	Nos		
2.18.8.3	Operating mechanism, complete		1	Lot		
2.18.8.4	Operating mechanism motor		2	Nos		
2.18.9	**High-speed earthing Switches (For 220kV)**					
2.18.9.1	High-speed earthing switch, complete pole		1	Lot		
2.18.9.2	Complete set of contacts		2	Nos		
2.18.9.3	Operating mechanism, complete		1	Lot		
2.18.9.4	Operating mechanism motor		2	Nos		
2.18.10	**Other Equipment**					
2.18.10.1	Voltage transformer, 400 kV, complete with disconnecting and earthing switch		3	Nos		
2.18.10.2	Voltage transformer, 220 kV, complete with disconnecting and earthing switch		3	Nos		
2.18.10.3	Current transformer, metering core, loose part for 400kV		6	Nos		
2.18.10.4	Current transformer, metering core, loose part for 220kV		6	Nos		
2.18.10.5	Current transformer, protection core, loose part for 400kV		6	Nos		
2.18.10.6	Current transformer, protection core, loose part for 220kV		6	Nos		
2.18.11	**400kV GIS and 220kV GIS Bay, Local Control Cabinet**					
2.18.11.1	One Bay Local Control Cabinet complete, wired, with all specified devices		2	Lot		
2.18.12	**Bus bar Elements (For 400kV)**					
2.18.12.1	Bus conductor elements		2	Lot		
2.18.12.2	Bus connection elements		2	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.18.12.3	GIS insulators, one of each type used		2	Lot		
2.18.12.4	Pressure relief elements		2	Lot		
2.18.13	**Bus bar Elements (For 220kV)**					
2.18.13.1	Bus conductor elements		2	Lot		
2.18.13.2	Bus connection elements		2	Lot		
2.18.13.3	GIS insulators, one of each type used		2	Lot		
2.18.13.4	Pressure relief elements		2	Lot		
2.18.14	**SF6-to-Air Bushing Modules**					
2.18.14.1	SF6-to-air bushing module, 400 kV, single phase		1	Lot		
2.18.14.2	SF6-to-air bushing module, 220 kV, single phase		1	Lot		
2.18.15	**Loose Spare Parts**					
2.18.15.1	5% of auxiliary relays, control devices, fuses, terminal blocks, etc. minimum one unit of each type used		2	Lot		
2.18.16	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.18	
2.19	**Spare of LV control and power cables**					
2.19.1	LV control cable, 5% of the installed cables		1	Lot		
2.19.2	LV power cable, 5% of the installed cables		1	Lot		
2.19.3	Cable installation accessories - 5% of the installed material		1	Lot		
2.19.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.19	
2.20	**Spare parts of Mechanical Equipment**					
2.20.1	**Fire protection**					
2.20.1.1	Fire protection/detection for auto transformer - one unit of each type used		1	Lot		
2.20.1.2	Clean-agent fire extinguisher		1	Lot		
2.20.1.3	Control building general fire protection/detection system, one unit of each component used		1	Lot		
2.20.1.4	GIS building general fire protection/detection system, one unit of each component used		1	Lot		
2.20.2	**Control building HVAC system**					
2.20.2.1	Throwaway air filters per air conditioning unit		1	Lot		
2.20.2.2	Pulley belts per air conditioning unit motor		1	Lot		
2.20.2.3	Thermostat per air conditioning unit		1	Lot		
2.20.3	**GIS building ventilation system**					
2.20.3.1	Throwaway air filters per ventilation system		1	Lot		
2.20.3.2	Pulley belts per ventilation unit motor		1	Lot		
2.20.3.3	Thermostat per ventilation unit		1	Lot		
2.20.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.20	
2.21	**Works at New-Hetauda**					

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.21.1	Approach cable and hardware for termination of OPGW including joint box of Ratmate – Hetauda D/C Lines at New Hetauda Substation End including necessary AC,DC and Interfacing cable for tele protection application. Addition to the above Telecommunication works should include connection, extension and configuration of the local and network remote fiber optic equipment and all works required for the connection, extension and configuration of the phone system as well as for tele protection		1	Lot		
					Sub Total 2.21	
2.22	**Works at Lapsiphedi**					
2.22.1	Supply and installation of necessary approach cable and hardware for termination of OPGW of Ratmate – Lapsiphedi D/C Lines at Lapsiphedi Substation End, it's interfacing with existing DPC for tele protection application and necessary SDH, MUX/DMUX telecommunication terminal equipment required for the communication of the 400 kV Lines and its integrations with SAS at both end substations and SCADA system of the LDC. Addition to above Telecommunication works should include connection, extension and configuration of the local and network remote fiber optic equipment and all works required for the connection, configuration and extension of the phone system as well as for tele protection		1	Lot		
					Sub Total 2.22	
					Total (Carried forward to Grand SC-5)	
					Name of Bidder:	
					Signature of Bidder:	
Note:						
***:*This value is indicative, the Contractor will validate as per item 1.1.6 of Design Works (Electrical)*						

Country of Origin Declaration Form

Item No.	Description	Code

***Note** : Bidders shall enter the full name of the country of origin of all imported plant and equipment. Enter the code as per the Country of Origin Declaration Form.*

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.1	**AIS HV and MV Equipment**					
3.1.1	167 MVA, (400/√3/220/√3/33) kV, Single Phase Auto-Transformer with OLTC, RTCC Facility, Surge protection arrangement (AIS) for HV, IV and LV side and with Bushing CT complete with all accessories as specified		7	Nos		
3.1.2	Capacitor Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering		18	Nos		
3.1.3	Current Transformer (CT), 400kV, Single Phase, Live Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA		18	Nos		
3.1.4	Current Transformer (CT), 72.5kV, Single Phase 2 Windings		6	Nos		
3.1.5	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV		18	Nos		
3.1.6	Station Service Transformer, 630 kVA, 33/0.4kV		2	Nos		
3.1.7	30kV,10kA Lightning arrester for 33kV line bays		6	Nos		
3.1.8	30kV,10kA Lightning arrester for 33/0.4kV station service transformers		6	Nos		
3.1.9	72.5kV Double Break Isolator, Single Phase		1	Lot		
3.1.10	72.5kV Circuit Breaker, Three Phase, 50Hz.		2	Nos		
3.1.11	72.5kV Current Transformer		6	Nos.		
3.1.12	400kV Bus Support Post Insulator		1	Lot		
3.1.13	220kV Bus Support Post Insulator		1	Lot		
3.1.14	72.5kV Bus Support Post Insulator		1	Lot		
3.1.15	Suspension/Tension Insulator Strings, Including Hardware		1	Lot		
3.1.16	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.1	
3.2	**Hot-Dip Galvanized Steel**					
3.2.1	Gantry Column for 400 kV Incoming Line		7	Nos		
3.2.2	Hydrological study to carryout a flood risk assessment		6	Nos		
3.2.3	Support Structure for 400 kV Current Transformer		18	Nos		
3.2.4	Support Structure for 400 kV Capacitive Voltage Transformer		18	Nos		
3.2.5	Support Structure for 400 kV Surge Arrester		18	Nos		
3.2.6	Support Structure for 400 kV Bus Support		1	Lot		
3.2.8	Support Structure for 220 kV Bus Support		1	Lot		
3.2.9	Support Structure for 72.5 kV Current Transformer		6	Nos		
3.2.10	Support Structure for 72.5 kV Bus Support or Pot Head		1	Lot		
3.2.11	Support Structure for 72.5 kV Single Switch Stand		1	Lot		
3.2.12	Support Structure for 30kV Lightning Arrestor		12	Nos		
3.2.13	Structures for Lightning Mast and other Lighting structures		1	Lot		
3.2.14	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
					Sub Total 3.2	
3.3	**Bus Bar and Overhead Connections**					
3.3.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness		1	Lot		
3.3.2	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)		1	Lot		
3.3.3	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel		1	Lot		
3.3.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.3	
3.4	**LV Control and Power Cable**					
3.4.1	LV Control Cables		1	Lot		
3.4.2	LV Power Cables		1	Lot		
3.4.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)		1	Lot		
3.4.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)		1	Lot		
3.4.5	33kV Cable Pothead		1	Lot		
3.4.6	Power Cable for Filter Plant (Transformer) 3.5CX240 sq.mm. (Armoured, PVC Insulated) with suitable termination arrangement all complete		1	Lot		
3.4.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.		1	Lot		
3.4.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.4	
3.5	**AC AND DC STATION SUPPLY**					
3.5.1	**400 V AC Main Switch Board**					
3.5.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		3	Nos		
3.5.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers		1	Nos		
3.5.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer		1	Nos		
3.5.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer		1	Nos		
3.5.2	**400 V AC Main Lighting Board**					
3.5.2.1	100kVA Lighting Transformer		2	Nos		
3.5.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker		1	Nos		
3.5.3	**400 V AC Emergency Lighting Distribution Board**					
3.5.3.1	100kVA Lighting Transformer		1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.5.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A Breaker		1	Nos		
3.5.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers		1	Nos		
3.5.4	**400 V AC Distribution Board**					
3.5.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		1	Nos		
3.5.4.2	400/110V, 50VA, Potential Transformer		3	Nos		
3.5.4.3	400/1A Current Transformer, Class 5P20		1	Nos		
3.5.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers		1	Nos		
3.5.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker		1	Nos		
3.5.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers		1	Nos		
3.5.5	**400 V AC AMF Panel**					
3.5.5.1	400/1A Current Transformer, Class 1		3	Nos		
3.5.5.2	400/1A Current Transformer, Class 5P20		1	Nos		
3.5.6	**DC Chargers and Batteries**					
3.5.6.1	220V Battery Charger (Float/Boost)		6	Nos		
3.5.6.2	48V Battery charger (Float/Boast)		6	Nos		
3.5.6.3	250A Throw over Switch, Interlock		12	Nos		
3.5.6.4	Battery, 220Vdc, 108 Minimum Cells		4	Nos		
3.5.6.5	Battery, 48Vdc, 24 Minimum Cells		4	Nos		
3.5.7	**DC Distribution Boards**					
3.5.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions		6	Nos		
3.5.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions		4	Nos		
3.5.7.3	DC Fuse Box, 220Vdc		1	Lot		
3.5.7.4	DC Fuse Box, 48Vdc		1	Lot		
3.5.8	**Other Equipment**					
3.5.8.1	Diesel Generator Set, 250kVA (Including Fuel Tank) and all accessories		1	Nos		
3.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.5	
3.6	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**					
3.6.1	**Line/Feeder Bay-400 kV**					
3.6.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole		10	Nos		
3.6.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set (1 set = 3 single phase)		20	Nos		
3.6.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		20	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.6.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		20	Nos		
3.6.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		10	Nos		
3.6.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set (1 set = 3 single phase)		10	Nos		
3.6.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		10	Nos		
3.6.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		10	Nos		
3.6.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		10	Nos		
3.6.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		10	Nos		
3.6.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
3.6.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
3.6.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
3.6.1.14	Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for whole Line/Feeder Bay (Three Phase Set)		10	Bays		
3.6.2	**Transformer Bay-400 kV**					
3.6.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		4	Nos		
3.6.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set (1 set = 3 single phase)		8	Nos		
3.6.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.6.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set (1 set = 3 single phase)		8	Nos		
3.6.2.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		3	Nos		
3.6.2.6	Voltage Transformers, 400kV, dual secondary, earthing link, single-phase, three-phase set (1 set = 3 single phase)		3	Nos		
3.6.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		6	Nos		
3.6.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		6	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.6.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		4	Nos		
3.6.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		4	Nos		
3.6.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
3.6.2.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
3.6.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
3.6.2.14	Isolating & Earthing Switches, 400kV, 4000A, 50kA Single phase, and Auxiliary Gas Insulated Bus (GIB) for Spare Transformer Operation, GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete. 33kV isolators, 33kV cables , jumpers as required all complete		3	Set		
3.6.2.15	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for whole Transformer Bay Lot		3	Bays		
3.6.3	**Diameter Middle Breaker Bay-400 kV**					
3.6.3.1	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole		4	Nos		
3.6.3.2	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		2	Nos		
3.6.3.3	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set ((1 set = 3 single phase)		12	Nos		
3.6.3.4	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
3.6.3.5	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set (1 set = 3 single phase)		12	Nos		
3.6.3.6	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		6	Nos		
3.6.3.7	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		6	Nos		
3.6.3.8	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
3.6.3.9	All metallic structures and supports required for GIS complete with accessories		1	Lot		
3.6.3.10	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
3.6.4	**Gas Insulated BUSBAR**					
3.6.4.1	400kV , Double Bus Bar of 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures per diameter		7	Diameter		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.6.4.2	Voltage Transformers, 400kV, dual secondary, single-phase, three-phase set ((1 set = 3 single phase)		2	Nos		
3.6.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		2	Nos		
3.6.4.4	Main Bus Bar Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		2	Nos		
3.6.4.5	Bus Bar Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set ((1 set = 3 single phase)		2	Nos		
3.6.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.6	
3.7	**220kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**					
3.7.1	**Line/Feeder Bay-220 kV**					
3.7.1.1	SF6 Circuit Breaker, 220kV, 4000A, 50kA, Three Pole		8	Nos		
3.7.1.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set ((1 set = 3 single phase)		16	Nos		
3.7.1.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		16	Nos		
3.7.1.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		16	Nos		
3.7.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.7.1.6	Voltage Transformers, 220kV, dual secondary, with earthing link, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.7.1.7	Line/Feeder Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.7.1.8	Line/Feeder Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.7.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		8	Nos		
3.7.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		8	Nos		
3.7.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
3.7.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
3.7.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
3.7.1.14	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for the whole Line/Feeder		8	Bays		
3.7.2	**Transformer Bay-220 kV**					

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.7.2.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole.		6	Nos		
3.7.2.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
3.7.2.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
3.7.2.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
3.7.2.5	Transformer High Speed Earthing Switches, with removable earthing link 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		5	Nos		
3.7.2.6	Voltage Transformers, 220kV, dual secondary, with earthing link, single-phase, three-phase set (1 set = 3 single phase)		5	Nos		
3.7.2.7	Transformer Disconnect Switches,220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.7.2.8	Transformer Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		8	Nos		
3.7.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		6	Nos		
3.7.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		6	Nos		
3.7.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
3.7.2.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
3.7.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
3.7.2.14	Isolating & Earthing Switches, 220kV, 4000A, 50kA,Single phase, and Gas Insulated Bus (GIB) for Spare Transformer, with auxiliary Bus, GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete.		3	Set		
3.7.2.15	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for the whole Transformer Bay		6	Bays		
3.7.3	**Diameter Middle Breaker Bay -220 kV**					
3.7.3.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole.		6	Nos		
3.7.3.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
3.7.3.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		
3.7.3.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)		12	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.7.3.5	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		6	Nos		
3.7.3.6	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		6	Nos		
3.7.3.7	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
3.7.3.8	All metallic structures and supports required for GIS complete with accessories		1	Lot		
3.7.3.9	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
3.7.4	**Gas Insulated Bus bars**					
3.7.4.1	220kV , Double 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures per diameter		7	Diameter		
3.7.4.2	Voltage Transformers, 220kV, dual secondary, single-phase, three-phase set (1 set = 3 single phase)		2	Nos		
3.7.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 220kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		2	Nos		
3.7.4.4	Main Bus Bar High Speed Earthing Switches, with removable earthing link 220kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)		#REF!	#REF!		
3.7.4.5	Bus Bar Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)		2	Nos		
3.7.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.7	
3.8	**Complete with control & protection up to GIB sealing end for all Feeder and**					
3.8.1	**Complete set of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**					
3.8.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		12	Nos		
3.8.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)		12	Nos		
3.8.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)		4	Nos		
3.8.1.4	400kV (Double Bus Bar Protection)		2	Set		
3.8.1.5	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
3.8.2	**Complete set of Control and Protection panels for 220 kV station as specified in Scope and Employers Requirements including but not limited to:**					
3.8.2.1	Circuit Breaker Relay Panel		6	Nos		
3.8.2.2	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)		4	Nos		
3.8.2.3	220kV (Double Bus Bar Protection)		2	Set		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.8.2.4	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
3.8.3	**Complete set of Control and Protection panels for 33 kV station as specified in**					
3.8.3.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		2	Nos		
3.8.3.2	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)		2	Nos		
3.8.3.3	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
3.8.4	**Substation Automation & Metering System**					
3.8.4.1	SAS Operator Station for control of 400/220/33 kV		1	Set		
3.8.4.2	Substation Automation System (SAS) for 400 kV System		7	Set		
3.8.4.3	Substation Automation System (SAS) for 220kV System		7	Set		
3.8.4.4	Substation Automation System (SAS) for 33kV System		2	Set		
3.8.4.5	Substation Automation System (SAS) for Auxiliary System		1	Set		
3.8.4.6	Integration of all 400/220kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.		1	Lot		
3.8.4.7	Telecommunication system for Ratmate		1	Lot		
3.8.4.8	Fibre Optic SDH System		1	Lot		
3.8.4.9	Phone System		1	Lot		
3.8.4.10	400 kV Metering		1	Lot		
3.8.4.11	220kV Metering		1	Lot		
3.8.4.14	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
					Sub Total 3.8	
3.9	**Grounding System**					
3.9.1	Stranded Bare Copper 240 Sq. mm*** Grid (Including Fusion and Mechanical Connectors)		1	Lot		
3.9.2	Grounding Rods		1	Lot		
3.9.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)		1	Lot		
3.9.4	Embedded Grounding System - 220kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)		1	Lot		
3.9.5	Embedded Grounding System - Control Room		1	Lot		
3.9.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.9	
3.10	**Lightning Protection System**					
3.10.1	Overhead Galvanized Steel Wire, Including Hardware		1	Lot		
3.10.2	Lightening Mast as required for total protection of equipment		1	Lot		
3.10.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
					Sub Total 3.10	
3.11	**Firefighting System**					
3.11.1	Fire protection/detection for 7 (Seven) auto transformers		1	Lot		
3.11.2	Fire protection/detection for 400kV GIS Building		1	Lot		
3.11.3	Fire protection/detection for 220kV GIS Building		1	Lot		
3.11.4	Fire protection/detection for Control House		1	Lot		
3.11.5	Fire protection/detection system for pump house building		1	Lot		
3.11.6	Fire protection/detection system for generator diesel tank		1	Lot		
3.11.7	Portable fire extinguishers		1	Lot		
3.11.8	Clean-agent fire extinguishers		1	Lot		
3.11.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.11	
3.12	**HVAC And Ventilation Systems**					
3.12.1	400kV GIS Building HVAC and Ventilation Systems		1	Lot		
3.12.2	220kV GIS Building HVAC and Ventilation Systems		1	Lot		
3.12.3	Control House HVAC and Ventilation Systems		1	Lot		
					Sub Total 3.12	
3.13	**Accessories and Ancillary Material**					
3.13.1	Junction and marshalling boxes, outdoor		1	Lot		
3.13.2	Junction and marshalling boxes, indoor		1	Lot		
3.13.3	Outdoor lighting, including lighting fixtures		1	Lot		
3.13.4	Indoor lighting, including lighting fixtures		1	Lot		
3.13.5	Water Supply System as per TS		1	Lot		
3.13.6	Rainwater harvesting as per TS		1	Lot		
3.13.7	Control Cabinet for outdoor lighting		1	Lot		
3.13.8	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.		1	Lot		
3.13.9	Electric Overhead Travelling Crane for installation and removal of GIS Equipment (For 400 and 220 kV each)		2	Lot		
3.13.10	Visual Monitoring System		1	Lot		
3.13.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.13	
3.14	**Mandatory Maintenance, Repair tools and Testing Instruments**					
3.14.1	**GIS Equipment**					
3.14.1.1	400kV GIS SF6 leakage detector, analyzer and processing unit all complete		1	Lot		
3.14.1.2	220kV GIS SF6 leakage detector, analyzer and processing unit all complete		1	Lot		
3.14.1.3	400kV GIS Wrenches and tools		1	Lot		
3.14.1.4	220kV GIS Wrenches and tools		1	Lot		
3.14.1.5	400kV GIS Pressure gauge		1	Nos		
3.14.1.6	220kV GIS Pressure gauge		1	Nos		
3.14.1.7	400kV GIS Gas sampling and moisture meter		1	Nos		
3.14.1.8	220kV GIS Gas sampling and moisture meter		1	Nos		
3.14.1.9	400kV GIS Micro-Ohmmeter		1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.14.1.10	220kV GIS Micro-Ohmmeter		1	Nos		
3.14.1.11	400kV GIS Circuit-breaker, timing tester		1	Nos		
3.14.1.12	220kV GIS Circuit-breaker, timing tester		1	Nos		
3.14.1.13	400kV GIS Laptop computer with specialized software for GIS setting and monitoring		1	Nos		
3.14.1.14	220kV GIS Laptop computer with specialized software for GIS setting and monitoring		1	Nos		
3.14.1.15	Complete set of SF6 gas service cart mounted on a trailer for mobile application. SF6 gas refilling cart equipped with 1 SF6 gas cylinder and the necessary instruments and adapters for easy and quick gas refilling in case of losses		1	Lot		
3.14.1.16	HV Test Bushing for GIS		1	Lot		
3.14.1.17	Online Partial Discharge Monitoring System		1	Nos		
3.14.2	**Auto Transformer & Station Service Transformer**					
3.14.2.1	Oil-treatment unit 6000lph along with suitable size and quantity of connection arrangement (MCCB (240-300 Amp),terminal lugs etc.) all complete (autotransformer)		1	Nos		
3.14.2.2	Oil dielectric tester		1	Nos		
3.14.2.3	Dielectric tester based on tan δ and dielectric losses , 10 kV		1	Nos		
3.14.2.4	Megger, electronic, 5 kV		1	Nos		
3.14.2.5	Wrenches and tools		1	Lot		
3.14.3	**Complete set of Control and Protection for Sub-Station**					
3.14.3.1	Relay Test kit		1	Lot		
3.14.3.2	Test Equipment & tools for SAS SYSTEM for measuring, configuration & diagnostics.		1	Lot		
					Sub Total 3.14	
3.15	**Mandatory Spare Parts**					
3.15.1	**HV Equipment**					
3.15.1.1	Unit of 400kV surge arrester, complete with grading ring, terminals and surge counter		2	Nos		
3.15.1.2	Capacitive voltage transformer, 400kV		1	Nos		
3.15.1.3	Current transformer, 400kV		1	Nos		
3.15.1.4	Current transformer, 72.5kV		1	Nos		
3.15.2	**Auto Transformer**					
3.15.2.1	Complete set of gaskets with grease, for cover, manholes, hand holes, and pipping fittings.		2	Lot		
3.15.2.2	Lot of LV control and protective components, minimum one unit of each type of components used		2	Lot		
3.15.2.3	Pressure relief device, complete with accessories		2	Nos		
3.15.2.4	Bushings, one complete unit of each type used, with accessories		2	Lot		
3.15.2.5	Current transformer, one unit of each type		2	Lot		
3.15.2.6	Oil-circulating pump with motor, complete with accessories		2	Nos		
3.15.2.7	Cooling fan, complete with motor		2	Nos		
3.15.2.8	Buchholz relay, complete (2 each for main tank and OLTC tank)		4	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.15.2.9	One instrument of each type used (temperature, oil level, pressure vent, etc.)		2	Lot		
3.15.2.10	One valve of each type used		2	Lot		
3.15.2.11	Insulating oil, 5% of the volume used		1	Lot		
3.15.2.12	Silica gel, quantity for one load		1	Lot		
3.15.2.13	Tap changer diverter switch, spare contacts and transition resistance		2	Lot		
3.15.2.14	Tap changer selector switch spare contacts		2	Lot		
3.15.2.15	Rolls of Kraft insulating paper		2	Lot		
3.15.2.16	LA for HV,IV and LV side each		2	Lot		
3.15.2.17	Additional spare parts as per Chapter 3: Auto Transformer Specification of Part 2: Employer's Requirements, Section V – B1 (Technical Specifications).		1	Lot		
3.15.3	**630 kVA Transformer**					
3.15.3.1	All Bushing with metal parts (each voltage rating) for 630 kVA Transformer		1	Lot		
3.15.3.2	Oil Temperature Indicator with sensing device		1	Lot		
3.15.3.3	Tap Changer Contacts		1	Lot		
3.15.3.4	Buchholz Relay		1	Nos		
3.15.3.5	Explosion vent diaphragm		1	Nos		
3.15.3.6	Set of valve (each type)		1	Lot		
3.15.3.7	3-Phase 11 kV Horn Gap Fuse		1	Lot		
3.15.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.15	
3.16	**Spare Parts for AC and DC Station Supply**					
3.16.1	**Spare for LV Switchgear**					
3.16.1.1	LV circuit breaker, complete, with CT's and protection devices		1	Lot		
3.16.1.2	Outgoing thermomagnetic breakers - one unit of each type used		1	Lot		
3.16.1.3	Metering - one instrument of each type used		1	Lot		
3.16.1.4	Protection (other than included in LV breaker) One unit of each type used		1	Lot		
3.16.1.5	Automatic Transfer Switch One complete controller including sensors		1	Nos		
3.16.1.6	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Lot		
3.16.2	**Spare for DC Distribution Panels**					
3.16.2.1	Thermomagnetic breakers one unit of each type used		1	Lot		
3.16.2.2	Metering - one metering instrument of each type used		1	Lot		
3.16.2.3	Protection (other than included in LV breaker) One unit of each type used		1	Lot		
3.16.2.4	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Lot		
3.16.3	**Spare for Diesel Generator Set**					
3.16.3.1	Replaceable elements for air filter		1	Nos		
3.16.3.2	Replaceable elements for oil filter		1	Nos		
3.16.3.3	Replaceable elements for fuel filter		1	Nos		
3.16.3.4	Complete set of injectors		1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.16.3.5	Fuel injector pump		1	Nos		
3.16.3.6	Oil pump		1	Nos		
3.16.3.7	Intake valves		1	Nos		
3.16.3.8	Seats for intake valves		1	Nos		
3.16.3.9	Exhaust valves		1	Nos		
3.16.3.10	Set for exhaust valves		1	Nos		
3.16.3.11	Disconnect switch, with grounding blades, 220 kV, 3 Ø		1	Nos		
3.16.3.12	Set of pistons		1	Nos		
3.16.3.13	Set of complete bearings of the engine		1	Nos		
3.16.3.14	Set of all gaskets needed for the engine		1	Nos		
3.16.3.15	Set of thermostats		1	Nos		
3.16.3.16	Set of bearings for the alternator		1	Nos		
3.16.3.17	Set of control cards, at least one unit of each type used		1	Lot		
3.16.3.18	Diodes and thyristors of each type used		3	Nos		
3.16.3.19	Lamp, one unit of each type used		10	Nos		
3.16.3.20	Auxiliary relay, one unit of each type used		1	Lot		
3.16.3.21	Multifunction metering instrument		1	Nos		
3.16.3.22	Voltage and speed regulator component and actuator		1	Nos		
3.16.3.23	Controller components		1	Nos		
3.16.3.24	Instrument, detectors		1	Nos		
3.16.4	**Spare for Batteries**					
3.16.4.1	One unit of battery used in 220 V DC system		1	Nos		
3.16.4.2	Loose parts for 220 V DC - connection elements, cables, links, etc.		1	Lot		
3.16.4.3	One unit of battery used in 48 Vdc system		1	Nos		
3.16.4.4	Loose parts for 48 V DC - connection elements, cables, links, etc.		1	Lot		
3.16.5	**Spare for Battery Chargers**					
3.16.5.1	Complete bridge of thyristors assembled on a cooling base		1	Nos		
3.16.5.2	Controller, complete including each type of card used		1	Nos		
3.16.5.3	Loose elements - auxiliary relays, breakers, metering instruments, control switches, fuses, etc.		1	Lot		
3.16.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.16	
3.17	**Mandatory spare parts - Miscellaneous material**					
3.17.1	Junction and marshalling boxed, outdoor, one of each type used		1	Lot		
3.17.2	Junction and marshalling boxed, indoor, one of each type used		1	Lot		
3.17.3	Outdoor lighting fixture, one unit of each type used		1	Lot		
3.17.4	Post-type insulator, one unit of each type used		1	Lot		
3.17.5	Suspension insulator, 5% of the total used		1	Lot		
3.17.6	Bus bar (rigid and strain) hardware, including, connectors, terminals, separator, corona rings, 5% of each type used, minimum one unit		1	Lot		
3.17.7	Grounding conductors, 5% of the installed conductors (stranded copper conductor, rectangular-shape copper bar and grounding rod)		1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.17.8	Fission connection material, including molds, welding powder and installation tools, quantity required to make 5% of the total executed connections		1	Lot		
3.17.9	Mechanical connectors for grounding, 5% of the total executed connections		1	Lot		
3.17.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.17	
3.18	**Mandatory spare parts for 400kV and 220kV GIS**					
3.18.1	**Spare Gas**					
3.18.1.1	SF6 bottles required to fill the two largest volume compartments for 400kV and 220kV		2	Lot		
2.18.2	**Circuit Breakers, 4000 A, 50kA (For 400kV)**					
3.18.2.1	Circuit breaker, complete pole assembly		1	Lot		
3.18.2.2	Complete sets of main contacts		1	Lot		
3.18.2.3	Complete sets of arcing contacts		2	Lot		
3.18.2.4	Operating mechanism, complete		1	Lot		
3.18.2.5	Closing coils		10	Nos		
3.18.2.6	Tripping coils		10	Nos		
3.18.3	**Circuit Breakers, 4000 A, 50kA (For 220kV)**					
3.18.3.1	Circuit breaker, complete pole assembly		1	Lot		
3.18.3.2	Complete sets of main contacts		1	Lot		
3.18.3.3	Complete sets of arcing contacts		2	Lot		
3.18.3.4	Operating mechanism, complete		1	Lot		
3.18.3.5	Closing coils		10	Nos		
3.18.3.6	Tripping coils		10	Nos		
3.18.4	**Disconnect-Switches, 4000 A (For 400kV)**					
3.18.3.1	Disconnect-Switch, complete pole		1	Nos		
3.18.3.2	Complete set of contacts		2	Nos		
3.18.3.3	Operating mechanism, complete		1	Nos		
3.18.3.4	Operating mechanism motor		2	Nos		
3.18.5	**Disconnect-Switches, 4000 A (For 220kV)**					
3.18.5.1	Disconnect-Switch, complete pole		1	Nos		
3.18.5.2	Complete set of contacts		2	Nos		
3.18.5.3	Operating mechanism, complete		1	Nos		
3.18.5.4	Operating mechanism motor		2	Nos		
3.18.6	**Maintenance Earthing Switches (For 400kV)**					
3.18.6.1	Earthing-Switch, complete pole		1	Lot		
3.18.6.2	Complete set of contacts		2	Nos		
3.18.6.3	Operating mechanism, complete		1	Lot		
3.18.6.4	Operating mechanism motor		2	Nos		
3.18.7	**Maintenance Earthing Switches (For 220kV)**					
3.18.7.1	Earthing-Switch, complete pole		1	Lot		
3.18.7.2	Complete set of contacts		2	Nos		
3.18.7.3	Operating mechanism, complete		1	Lot		
3.18.7.4	Operating mechanism motor		2	Nos		
3.18.8	**High-speed earthing Switches (For 400kV)**					
3.18.8.1	High-speed earthing switch, complete pole		1	Lot		
3.18.8.2	Complete set of contacts		2	Nos		
3.18.8.3	Operating mechanism, complete		1	Lot		
3.18.8.4	Operating mechanism motor		2	Nos		
3.18.9	**High-speed earthing Switches (For 220kV)**					

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.18.9.1	High-speed earthing switch, complete pole		1	Lot		
3.18.9.2	Complete set of contacts		2	Nos		
3.18.9.3	Operating mechanism, complete		1	Lot		
3.18.9.4	Operating mechanism motor		2	Nos		
3.18.10	**Other Equipment**					
3.18.10.1	Voltage transformer, 400 kV, complete with disconnecting and earthing switch		3	Nos		
3.18.10.2	Voltage transformer, 220 kV, complete with disconnecting and earthing switch		3	Nos		
3.18.10.3	Current transformer, metering core, loose part for 400kV		6	Nos		
3.18.10.4	Current transformer, metering core, loose part for 220kV		6	Nos		
3.18.10.5	Current transformer, protection core, loose part for 400kV		6	Nos		
3.18.10.6	Current transformer, protection core, loose part for 220kV		6	Nos		
3.18.11	**400kV GIS and 220kV GIS Bay, Local Control Cabinet**					
3.18.11.1	One Bay Local Control Cabinet complete, wired, with all specified devices		2	Lot		
3.18.12	**Bus bar Elements (For 400kV)**					
3.18.12.1	Bus conductor elements		2	Lot		
3.18.12.2	Bus connection elements		2	Lot		
3.18.12.3	GIS insulators, one of each type used		2	Lot		
3.18.12.4	Pressure relief elements		2	Lot		
3.18.13	**Bus bar Elements (For 220kV)**					
3.18.13.1	Bus conductor elements		2	Lot		
3.18.13.2	Bus connection elements		2	Lot		
3.18.13.3	GIS insulators, one of each type used		2	Lot		
3.18.13.4	Pressure relief elements		2	Lot		
3.18.14	**SF6-to-Air Bushing Modules**					
3.18.14.1	SF6-to-air bushing module, 400 kV, single phase		1	Lot		
3.18.14.2	SF6-to-air bushing module, 220 kV, single phase		1	Lot		
3.18.15	**Loose Spare Parts**					
3.18.15.1	5% of auxiliary relays, control devices, fuses, terminal blocks, etc. minimum one unit of each type used		2	Lot		
3.18.16	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.18	
3.19	**Spare of LV control and power cables**					
3.19.1	LV control cable, 5% of the installed cables		1	Lot		
3.19.2	LV power cable, 5% of the installed cables		1	Lot		
3.19.3	Cable installation accessories - 5% of the installed material		1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
3.19.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.19	
3.20	**Spare parts of Mechanical Equipment**					
3.20.1	**Fire protection**					
3.20.1.1	Fire protection/detection for auto transformer - one unit of each type used		1	Lot		
3.20.1.2	Clean-agent fire extinguisher		1	Lot		
3.20.1.3	Control building general fire protection/detection system, one unit of each component used		1	Lot		
3.20.1.4	GIS building general fire protection/detection system, one unit of each component used		1	Lot		
3.20.2	**Control building HVAC system**					
3.20.2.1	Throwaway air filters per air conditioning unit		1	Lot		
3.20.2.2	Pulley belts per air conditioning unit motor		1	Lot		
3.20.2.3	Thermostat per air conditioning unit		1	Lot		
3.20.3	**GIS building ventilation system**					
3.20.3.1	Throwaway air filters per ventilation system		1	Lot		
3.20.3.2	Pulley belts per ventilation unit motor		1	Lot		
3.20.3.3	Thermostat per ventilation unit		1	Lot		
3.20.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 3.20	
3.21	**Works at New-Hetauda**					
3.21.1	Approach cable and hardware for termination of OPGW including joint box of Ratmate – Hetauda D/C Lines at New Hetauda Substation End including necessary AC,DC and Interfacing cable for tele protection application. Addition to the above Telecommunication works should include connection, extension and configuration of the local and network remote fiber optic equipment and all works required for the connection, extension and configuration of the phone system as well as for tele protection		1	Lot		
					Sub Total 3.21	
3.22	**Works at Lapsiphedi**					
3.22.1	Supply and installation of necessary approach cable and hardware for termination of OPGW of Ratmate – Lapsiphedi D/C Lines at Lapsiphedi Substation End, it's interfacing with existing DPC for tele protection application and necessary SDH, MUX/DMUX telecommunication terminal equipment required for the communication of the 400 kV Lines and its integrations with SAS at both end substations and SCADA system of the LDC. Addition to above Telecommunication works should include connection, extension and configuration of the local and network remote fiber optic equipment and all works required for the connection, configuration and extension of the phone system as well as for tele protection		1	Lot		
					Sub Total 3.22	

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
					Total (Carried forward to Grand SC-5)	
					Name of Bidder:	
					Signature of Bidder:	
Note:						
***:This value is indicative, the Contractor will validate as per item 1.1.6 of Design Works (Electrical)*						

Breakdown of Rates and Prices Schedule No. 4. Installation and Other Services including all related Civil Works

Item No.	Description	Total
4.1	Breakdown of General Installation and Construction Items (from Schedule No. 4.1)	
4.2	Breakdown of Earthworks (from Schedule No.4.2)	
4.3	Breakdown of Civil Works (from Schedule No.4.3)	
4.4	Other Installation Services (from Schedule No.4.5)	
4.5	**Total Excluding Summary of Breakdown of Day works (from Schedule 4.4) (Carried forward to Grand SC-5)**	
4.6	**Summary of Breakdown of Day works (from Schedule 4.4) (Carried**	
4.7	**Total Including Breakdown of Day works.**	
	Name of the Bidder:	
	Signature of Bidder:	

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.1	**Electromechanical Works General**				
4.1.1.1	Indoor and outdoor storage facilities for storing equipment and material in substation	1	Lot		
4.1.1.2	Site Office, Accommodation and vehicular arrangement as Specified in PSR	1	Lot		
4.1.1.3	Operation and Maintenance Manuals and Procedures	1	Lot		
4.1.1.4	"As-Built" Drawings for All Works including civil, building, mechanical etc.	1	Lot		
4.1.1.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.1	
4.1.2	**AIS HV and MV Equipment Installation**				
4.1.2.1	167 MVA, (400/√3/220/√3/33) kV, Single Phase Auto-Transformer with OLTC, RTCC Facility, Surge protection arrangement (AIS) for HV, IV and LV side and with Bushing CT complete with all accessories as specified	7	Nos		
4.1.2.2	Capacitor Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering	18	Nos		
4.1.2.3	Current Transformer (CT), 400kV, Single Phase, Live Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA	18	Nos		
4.1.2.4	Current Transformer (CT), 72.5kV, Single Phase 2 Windings	6	Nos		
4.1.2.5	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV	18	Nos		
4.1.2.6	Substation Service Transformer, 630 kVA, 33/0.400kV	2	Nos		
4.1.2.7	30kV,10kA Lightning arrester for 33kV line bays with support structure, earthing arrangement all complete	6	Nos		
4.1.2.8	30kV,10kA Lightning arrester for 33/0.4kV station service transformers with support structure, earthing arrangement all complete	6	Nos		
4.1.2.9	72.5kV Double Break Isolator, Single Phase	1	Lot		
4.1.2.10	72.5kV Circuit Breaker, Three Phase, 50Hz.	2	Nos		
4.1.2.11	72.5kV Current Transformer	6	Nos.		
4.1.2.12	400kV Bus Support Post Insulator	1	Lot		
4.1.2.13	Hydrological study to carryout a flood risk assessment	1	Lot		
4.1.2.14	72.5kV Bus Support Post Insulator	1	Lot		
4.1.2.15	Suspension/Tension Insulator Strings, Including Hardware	1	Lot		
4.1.2.16	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.2	
4.1.3	**Hot-Dip Galvanized Steel Installation**				
4.1.3.1	Gantry Column for 400 kV Incoming Line	7	Ea.		
4.1.3.2	Gantry Girder for 400 kV Incoming Line	6	Ea.		
4.1.3.3	Support Structure for 400 kV Current Transformer	18	Ea.		
4.1.3.4	Support Structure for 400 kV Capacitive Voltage Transformer	18	Ea.		
4.1.3.5	Support Structure for 400 kV Surge Arrester	18	Ea.		
4.1.3.6	Support Structure for 400 kV Bus Support	1	Lot		
4.1.3.7	Support Structure for 220 kV Bus Support	1	Lot		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.3.8	Support Structure for 72.5 kV Current Transformer	6	Ea.		
4.1.3.9	Support Structure for 72.5 kV Bus Support or Pot Head	1	Lot		
4.1.3.10	Support Structure for 72.5 kV Single Switch Stand	1	Lot		
4.1.3.11	Structures for Lightning Mast and other Lighting structures	1	Lot		
4.1.3.12	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.3	
4.1.4	**Bus Bar and Overhead Connections Installation**				
4.1.4.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness	1	Lot		
4.1.4.2	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)	1	Lot		
4.1.4.3	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel	1	Lot		
4.1.4.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.4	
4.1.5	**LV Control and Power Cable Installation**				
4.1.5.1	LV Control Cables	1	Lot		
4.1.5.2	LV Power Cables	1	Lot		
4.1.5.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)	1	Lot		
4.1.5.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)	1	Lot		
4.1.5.5	33kV Cable Pothead	1	Lot		
4.1.5.6	Power Cable for Filter Plant (Transformer) 3.5CX240 sqmm (Armoured, PVC Insulated) with suitable termination arrangement all complete	1	Lot		
4.1.5.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.	1	Lot		
4.1.5.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.5	
4.1.6	**AC and DC Station Supply Installation**				
4.1.6.1	**400 V AC Main Switch Board**				
4.1.6.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	3	Nos		
4.1.6.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers	1	Nos		
4.1.6.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer	1	Nos		
4.1.6.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer	1	Nos		
4.1.6.2	**400 V AC Main Lighting Board**				
4.1.6.2.1	100kVA Lighting Transformer	2	Nos		
4.1.6.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker	1	Nos		
4.1.6.3	**400 V AC Emergency Lighting Distribution Board**				
4.1.6.3.1	100kVA Lighting Transformer	1	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.6.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker	1	Nos		
4.1.6.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers	1	Nos		
4.1.6.4	**400 V AC Distribution Board**				
4.1.6.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	1	Nos		
4.1.6.4.2	400/110V, 50VA, Potential Transformer	3	Nos		
4.1.6.4.3	400/1A Current Transformer, Class 5P20	1	Nos		
4.1.6.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers	1	Nos		
4.1.6.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker	1	Nos		
4.1.6.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers	1	Nos		
4.1.6.5	**400 V AC AMF Panel**				
4.1.6.5.1	400/1A Current Transformer, Class 1	3	Nos		
4.1.6.5.2	400/1A Current Transformer, Class 5P20	1	Nos		
4.1.6.6	**DC Chargers and Batteries**				
4.1.6.6.1	220V Battery Charger (Float/Boost)	6	Nos		
4.1.6.6.2	48V Battery charger (Float/Boast)	6	Nos		
4.1.6.6.3	250A Throw over Switch, Interlock	12	Nos		
4.1.6.6.4	Battery, 220Vdc, 108 Minimum Cells	4	Nos		
4.1.6.6.5	Battery, 48Vdc, 24 Minimum Cells	4	Nos		
4.1.6.7	**DC Distribution Boards**				
4.1.6.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions	6	Nos		
4.1.6.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions	4	Nos		
4.1.6.7.3	DC Fuse Box, 220Vdc	1	Lot		
4.1.6.7.4	DC Fuse Box, 48Vdc	1	Lot		
4.1.6.8	**Other Equipment**				
4.1.6.8.1	Diesel Generator Set, 250kVA (Including Fuel Tank) and all accessories	1	Nos		
4.1.6.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.6	
4.1.7	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement) Installation**				
4.1.7.1	**Line/Feeder Bay**				
4.1.7.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole	10	Nos		
4.1.7.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set (1 set = 3 single phase)	20	Nos		
4.1.7.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	20	Nos		
4.1.7.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	20	Nos		
4.1.7.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	10	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.7.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set (1 set = 3 single phase)	10	Nos		
4.1.7.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	10	Nos		
4.1.7.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	10	Nos		
4.1.7.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	10	Nos		
4.1.7.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	10	Nos		
4.1.7.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.1.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.1.14	Gas Insulated bus (GIB) with required GIS Termination along with supports for GIB run for whole Line/Feeder Bay (Three phase set)	10	Bays		
4.1.7.2	**Transformer Bay**				
4.1.7.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
4.1.7.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set (1 set = 3 single phase)	8	Nos		
4.1.7.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	8	Nos		
4.1.7.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	8	Nos		
4.1.7.2.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	3	Nos		
4.1.7.2.6	Voltage Transformers, 400kV, dual secondary, with disconnect switch and maintenance earthing switch, single-phase, three-phase set (1 set = 3 single phase)	3	Nos		
4.1.7.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	6	Nos		
4.1.7.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	6	Nos		
4.1.7.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	4	Nos		
4.1.7.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	4	Nos		
4.1.7.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.2.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.7.2.14	Isolating & Earthing Switches, 400kV, 4000A, 50kA Single phase, and Auxiliary Gas Insulated Bus (GIB) for Spare Transformer Operation,GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete. 33kV isolators, 33kV cables , jumpers as required all complete	3	Nos		
4.1.7.2.15	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for whole Transformer Bay Lot	3	Bays		
4.1.7.3	**Diameter Middle Breaker Bay**				
4.1.7.3.1	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole	4	Nos		
4.1.7.3.2	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	2	Nos		
4.1.7.3.3	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set (1 set = 3 single phase)	12	Nos		
4.1.7.3.4	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	12	Nos		
4.1.7.3.5	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	12	Nos		
4.1.7.3.6	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	6	Nos		
4.1.7.3.7	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	6	Nos		
4.1.7.3.8	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.3.9	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.3.10	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.4	**Gas Insulated BUSBAR**				
4.1.7.4.1	400kV , Double Bus Bar of 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures per diameter	7	Diameter		
4.1.7.4.2	Voltage Transformers, 400kV, dual secondary, single-phase, three-phase set (1 set = 3 single phase)	2	Nos		
4.1.7.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three phase set (1 set = 3 single phase)	2	Nos		
4.1.7.4.4	Main Bus Bar Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	2	Nos		
4.1.7.4.5	Bus Bar Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	2	Nos		
4.1.7.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.7	
4.1.8	**220kV Gas Insulated Switchgear (1-1/2 breaker arrangement) Installation**				
4.1.8.1	**Line/Feeder Bay**				
4.1.8.1.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole	8	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.8.1.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set (1 set = 3 single phase)	16	Nos		
4.1.8.1.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	16	Nos		
4.1.8.1.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	16	Nos		
4.1.8.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	8	Nos		
4.1.8.1.6	Voltage Transformers, 220kV, dual secondary, with earthing link, single-phase, three-phase set (1 set = 3 single phase)	8	Nos		
4.1.8.1.7	Line/Feeder Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	8	Nos		
4.1.8.1.8	Line/Feeder Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	8	Nos		
4.1.8.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	8	Nos		
4.1.8.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	8	Nos		
4.1.8.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.8.1.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.8.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.8.1.14	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for the whole Line/Feeder	8	Bays		
4.1.8.2	**Transformer Bay**				
4.1.8.2.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole	6	Nos		
4.1.8.2.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set (1 set = 3 single phase)	12	Nos		
4.1.8.2.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	12	Nos		
4.1.8.2.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	12	Nos		
4.1.8.2.5	Transformer High Speed Earthing Switches, with removable earthing link 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	5	Nos		
4.1.8.2.6	Voltage Transformers, 220kV, dual secondary, with earthing link, single-phase, three-phase set (1 set = 3 single phase)	5	Nos		
4.1.8.2.7	Transformer Disconnect Switches,220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	8	Nos		
4.1.8.2.8	Transformer Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	8	Nos		
4.1.8.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	6	Nos		
4.1.8.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	6	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.8.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.8.2.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.8.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.8.2.14	Isolating & Earthing Switches, 220kV, 4000A, 50kA,Single phase, and Gas Insulated Bus (GIB) for Spare Transformer, with auxiliary Bus,GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete.	3	Set		
4.1.8.2.15	Three Single Phase Gas Insulated bus (GIB) and required GIS Termination along with supports for GIB run for the whole Transformer Bay	6	Nos		
4.1.8.3	**Diameter Middle Breaker Bay**				
4.1.8.3.1	SF6 Circuit Breakers, 220kV, 4000A, 50kA, three-pole	6	Nos		
4.1.8.3.2	Current Transformer Modules, three cores, 220kV, single-phase, three-phase set (1 set = 3 single phase)	12	Nos		
4.1.8.3.3	Circuit Breaker Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	12	Nos		
4.1.8.3.4	Circuit Breaker Maintenance Earthing Switches, 220kV, 50kA, single-phase, three-phase set (1 set = 3 single phase)	12	Nos		
4.1.8.3.5	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	6	Nos		
4.1.8.3.6	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	6	Nos		
4.1.8.3.7	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.8.3.8	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.8.3.9	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.8.4	**Gas Insulated Bus Bars**				
4.1.8.4.1	220kV , Double 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures per diameter	7	Diameter		
4.1.8.4.2	Voltage Transformers, 220kV, dual secondary, single-phase, three-phase set (1 set = 3 single phase)	2	Nos		
4.1.8.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 220kV, 50kA, Single-phase, Three phase set (1 set = 3 single phase)	2	Nos		
4.1.8.4.4	Main Bus Bar Earthing Switches, with removable earthing link 220kV, 50kA, Single-phase, Three-phase set (1 set = 3 single phase)	#REF!	Nos		
4.1.8.4.5	Bus Bar Isolating Disconnect Switches, 220kV, 4000A, 50kA, single-phase, three-phase set (1 set = 3 single phase)	2	Nos		
4.1.8.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.8	
4.1.9	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**				
4.1.9.1	**Installation of Control and Protection panels for 400 kV station as specified in Scope and Employers**				

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.9.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)(NHet=2nos,Lap=2nos,NDM=2nos,AutoTrans=2nos ,TieCB=4nos)	12	Nos		
4.1.9.1.2	Line Protection Panel (N-Het=2no,NDM=2no,Lap=2no) (Note: line protection should include tele protection terminals)	12	Nos		
4.1.9.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	4	Nos		
4.1.9.1.4	400kV (Duplicate Bus Bar Protection)	2	Set		
4.1.9.1.5	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.9.2	**Installation set of Control and Protection panels for 220 kV station as specified in Scope and Employers**				
4.1.9.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the relay panel) (Auto Trans Bay 1=2nos,Auto Trans Bay 2=2nos,Tie CB=2nos)	6	Nos		
4.1.9.2.2	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	4	Nos		
4.1.9.2.3	220kV (Duplicate Bus Bar Protection)	2	Nos		
4.1.9.2.4	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.9.3	**Installation of Control and Protection panels for 33 kV station as specified in Scope and Employers**				
4.1.9.3.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	2	Nos		
4.1.9.3.2	Transformer Protection Panel	2	Nos		
4.1.9.3.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.9.4	**Installation of Substation Automation & Metering**				
2.8.4.1	SAS Operator Station for control of 400/220/33 kV	1	Set		
4.1.9.4.1	Substation Automation System (SAS) for 400 kV System per diameter	7	Set		
4.1.9.4.2	Substation Automation System (SAS) for 220kV System per diameter	7	Set		
4.1.9.4.3	Substation Automation System (SAS) for 33kV System per feeder	2	Set		
4.1.9.4.4	Substation Automation System (SAS) for Auxiliary System	1	Set		
4.1.9.4.5	Integration of all 400/220kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.	1	Lot		
4.1.9.4.6	Telecommunication system for Ratmate	1	Lot		
4.1.9.4.7	Fibre Optic SDH System	1	Lot		
4.1.9.4.8	Phone System	1	Lot		
4.1.9.4.9	400 kV Metering	1	Lot		
4.1.9.4.10	220 kV Metering	1	Lot		
4.1.9.4.13	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
				Sub-Total 4.1.9	
4.1.10	**Grounding System**				
4.1.10.1	Stranded Bare Copper 240 Sq. mm***Grid (Including Fusion and Mechanical Connectors)	1	Lot		
4.1.10.2	Grounding Rods	1	Lot		
4.1.10.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)	1	Lot		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.10.4	Embedded Grounding System - 220kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)	1	Lot		
4.1.10.5	Embedded Grounding System - Control room	1	Lot		
4.1.10.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.10	
4.1.11	**Lightning Protection System**				
4.1.11.1	Overhead Galvanized Steel Wire, Including Hardware	1	Lot		
4.1.11.2	Lightening Mast for complete protection	1	Lot		
4.1.11.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.11	
4.1.12	**Firefighting System**				
4.1.12.1	Fire protection/detection for 7 (Seven) auto transformers	1	Lot		
4.1.12.2	Fire protection/detection for 400kV GIS Building	1	Lot		
4.1.12.3	Fire protection/detection for 220kV GIS Building	1	Lot		
4.1.12.4	Fire protection/detection for Control House	1	Lot		
4.1.12.5	Fire protection/detection system for pump house building	1	Lot		
4.1.12.6	Fire protection/detection system for generator diesel tank	1	Lot		
4.1.12.7	Portable fire extinguishers	1	Lot		
4.1.12.8	Clean-agent fire extinguishers	1	Lot		
4.1.12.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.12	
4.1.13	**HVAC And Ventilation Systems**				
4.1.13.1	400kV GIS Building HVAC and Ventilation Systems	1	Lot		
4.1.13.2	220kV GIS Building HVAC and Ventilation Systems	1	Lot		
4.1.13.3	Control House HVAC and Ventilation Systems	1	Lot		
				Sub Total 4.1.13	
4.1.14	**Accessories and Ancillary Material**				
4.1.14.1	Junction and marshalling boxes, outdoor	1	Lot		
4.1.14.2	Junction and marshalling boxes, indoor	1	Lot		
4.1.14.3	Outdoor lighting, including lighting fixtures	1	Lot		
4.1.14.4	Indoor lighting, including lighting fixtures	1	Lot		
4.1.14.5	Water Supply System as per TS	1	Lot		
4.1.14.6	Rainwater harvesting as per TS	1	Lot		
4.1.14.7	Control Cabinet for outdoor lighting	1	Lot		
4.1.14.8	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.	1	Lot		
4.1.14.9	Electric Overhead Travelling Crane for installation and removal of GIS Equipment (For 400 and 220 kV each)	2	Lot		
4.1.14.10	Visual Monitoring System	1	Lot		
4.1.14.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.14	
4.1.15	**Works at New-Hetauda**				

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.15.1	Approach cable and hardware for termination of OPGW including joint box of Ratmate – Hetauda D/C Lines at New Hetauda Substation End including necessary AC,DC and Interfacing cable for tele protection application. Addition to the above Telecommunication works should include connection, extension and configuration of the local and network remote fiber optic equipment and all works required for the connection, extension and configuration of the phone system as well as for tele protection	1	Lot		
				Sub Total 4.1.15	
4.1.16	**Works at Lapsiphedi**				
4.1.16.1	Supply and installation of necessary approach cable and hardware for termination of OPGW of Ratmate – Lapsiphedi D/C Lines at Lapsiphedi Substation End, it's interfacing with existing DPC for tele protection application and necessary SDH, MUX/DMUX telecommunication terminal equipment required for the communication of the 400 kV Lines and its integrations with SAS at both end substations and SCADA system of the LDC. Addition to above Telecommunication works should include connection, extension and configuration of the local and network remote fiber optic equipment and all works required for the connection, configuration and extension of the phone system as well as for tele protection	1	Lot		
				Sub-Total 4.1.16	
				Total (Carried forward to SC-4)	
				Name of the Bidder:	
				Signature of Bidder:	

Schedule No. 4.2: Breakdown of Earthworks					
Item	**Description**	**Qty.**	**Unit**	**Unit Rate in US$**	**Amount in**
4.2.1	Site Clearing, Including Removal of Trees and Stumps	1	Lot		
4.2.2	Top Soil Stripping	1	Lot		
4.2.3	General Excavation	1	Lot		
4.2.4	Compacted Back Fill	1	Lot		
4.2.5	Uncompact Back Fill	1	Lot		
4.2.6	Surplus Disposal	1	Lot		
4.2.7	Surface Works, Including Compaction/Consolidation	1	Lot		
4.2.8	Other necessary works as per Employer's Requirement	1	Lot		
				Total (Carried to SC-4)	
	Name of the Bidder:				
	Signature of Bidder:				

Schedule No. 4.3: Breakdown of Civil Works					
Item no.	**Description**	**Qty.**	**Unit**	**Unit Rate in US$**	**Amount in US$**
			2	*3*	*(1)x(3)*
4.3.1	**Foundations**				
4.3.1.1	Foundations of 400 kV Gantries	7	Nos		
4.3.1.2	Foundations of 400 kV Capacitor Voltage Transformers & Tank Type Current Transformers	36	Nos		
4.3.1.3	Foundation of 400 kV Surge Arrestor	18	Nos		
4.3.1.4	Foundations of 400 kV Post Type Insulator Bus Support	1	Lot		
4.3.1.5	Foundation, Oil Containment, and Sump Pit For 400/220kV 167 MVA Single Phase Autotransformer	7	Nos		
4.3.1.6	Autotransformer 22kg/m Railway System (22kg/m Steel Rails, Rail Ties, Elastomeric Pad, Screws, Baseplate, and Rail Clamps)	7	Nos		
4.3.1.7	Firewalls Between Auto-Transformers	8	Nos		
4.3.1.8	Foundation for 400kV GIB Bus Runs to AIS Equipment	1	Lot		
4.3.1.9	Foundation for 220kV GIB Bus Runs to AIS Equipment	1	Lot		
4.3.1.10	Foundation of 220kV Post Type Insulator Bus Support	1	Lot		
4.3.1.11	Foundation of 33kV Post Type Insulator Bus Support	1	Lot		
4.3.1.12	Foundation of Station Service Transformer	2	Nos		
4.3.1.13	Foundation of 72.5kV Circuit Breaker	2	Nos		
4.3.1.14	Foundation of 72.5kV Current Transformer	6	Nos		
4.3.1.15	Foundation of 33kV Single Phase Switches	1	Lot		
4.3.1.16	Foundation of 30kV,10kA Lightning arrester for line bays	6	Nos		
4.3.1.17	Foundations of 30kV,10kA Lightning arrester for 33/0.4kV station service transformers	6	Nos		
4.3.1.18	Foundation of Diesel Generator Set & Fuel Tank	1	Nos		
4.3.1.19	Foundation for Lightening Mast as required for total protection of equipment	1	Lot		
4.3.1.20	Hydrological study to carryout a flood risk assessment	1	Lot		
				Sub Total 4.3.1	
4.3.2	**External Works and Landscaping**				
4.3.2.1	Improvements of existing earthen access road to asphalted road up to substation	1	Lot		
4.3.2.2	Internal Paving	1	Lot		
4.3.2.3	Landscaping, Including Maintenance up to Taking Over	1	Lot		
4.3.2.4	Construction of reinforced concrete trenches/duct banks with manholes for all types of HV/MV power and control cables between switchgear building, substation control building and Autotransformer and all substation equipment as specified in Scope and Employers Requirements.	1	Lot		
4.3.2.5	Anti-weed treatment & stone spreading along with cement concrete layer, Internal drainage system, external drainage system and the rainwater harvesting system, Sewage handling as defined in the technical specifications.	1	Lot		
4.3.2.6	Superficial storm drainage system to drain water outside substation during heavy rainfall	1	Lot		
4.3.2.7	Parking Areas	1	Lot		
4.3.2.8	Guard House	1	Lot		
4.3.2.9	Substation Perimeter Fence	1	Lot		
4.3.2.10	Potable Water System (Including Water Treatment Plant, Pumping Facilities, Storage Tank and all Required Facilities)	1	Lot		
4.3.2.11	Firefighting Pump House and Water Tank	1	Lot		
4.3.2.12	Security Lighting along the Fence and Inside the Perimeter	1	Lot		
4.3.2.13	Retaining wall as per the Employer's requirements	1	Lot		

Schedule No. 4.3: Breakdown of Civil Works					
Item no.	**Description**	**Qty.**	**Unit**	**Unit Rate in US$**	**Amount in US$**
			2	*3*	*(1)x(3)*
4.3.2.14	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.2	
4.3.3	**General**				
4.3.3.1	Soil Investigation and Test (Including Post-Construction Grounding Test)	1	Lot		
4.3.3.2	Surveys	1	Lot		
4.3.3.3	Mobilization & Demobilization, Site Infrastructure, Temporary Works at site related to site activities.	1	Lot		
4.3.3.4	Final Cleanup (Including Removal of Excess Materials and Temporary Works) Demobilization	1	Lot		
4.3.3.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.3	
4.3.4	**Substation Buildings**				
4.3.4.1	Substation Control Building	1	Lot		
4.3.4.2	400kV GIS Building	1	Lot		
4.3.4.3	220kV GIS Building	1	Lot		
4.3.4.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.4	
				Total Carried to SC-4)	
			Name of the Bidder:		
			Signature of Bidder:		

Schedule 4.4: Summary of Breakdown for Day work

Description	Amount in US$
1. Sub-Total for Day work: Labor (4.4.1)	
2. Sub-Total for Day work: Materials (4.4.2)	
3. Sub-Total for Day work: Contractor's Equipment (4.4.3)	
Total (to be carried forward to Schedule 4.0)	
Name of the Bidder:	
Signature of Bidder:	

Schedule of 4.4.1: Breakdown for Day work Rates: Labor

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in
4.4.1	**Supervision and Labor**				
4.4.1.1	Engineer	350	h		
4.4.1.2	Foreman	400	h		
4.4.1.3	Surveyor	150	h		
4.4.1.4	Technician	600	h		
4.4.1.5	Skilled labor	600	h		
4.4.1.6	Semiskilled labor	600	h		
4.4.1.7	Unskilled labor	600	h		
4.4.1.8	Other necessary works as per Employer's		specif		
				Total (Carried to SC-4.4)	
				Name of the Bidder:	
				Signature of Bidder:	

Note: The labor rate should include all cost needed to provide the Labor at required place including all related cost for poviding the labour, ensuring that the labor is qualified for his/her job and can perform the required task professionally.

Schedule of 4.4.2: Breakdown for Day work Rates: Materials

Item no.	Description	Qty.	Unit	Unit Rate in	Amount
4.4.2.1	**Concrete Work**				
4.4.2.1.1	Lean Concrete	50	m3		
4.4.2.1.2	Concrete to foundation	150	m3		
4.4.2.1.3	Concrete to superstructure	200	m3		
4.4.2.2	**Steel Reinforcement**				
4.4.2.2.1	Mild Steel reinforcement, including cutting, bending	10	t		
4.4.2.2.2	High tensile steel reinforcement, including cutting, bending	25	t		
4.4.2.3	**Structural Steel**				
4.4.2.3.1	Commercial sections, including cutting, welding, bolting	10	t		
4.4.2.4	**Excavation Work**				
4.4.2.4.1	Excavation in rock (type R), including shoring, backfill, haul	200	m3		
4.4.2.4.2	Ditto, in soil (type MB and LB)	400	m3		
4.4.2.5	**Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above**				
4.4.2.6	**Price for Control Point on Wave Switching Device (CPWSD) to be installed on 400kV Breaker supplied as per Schedule-2**	**1**	**No**		
4.4.2.7	**Price for Pre-Insertion Resistor (PIR) to be installed on 400kV Breaker supplied as per schedule-2**	**1**	**No**		
4.4.2.8	**Price for Stub-Bus Differential Protection for 400kV Future Bay**	**1**	**No**		
4.4.2.9	**Price for Stub-Bus Differential Protection for 220kV Future Bay**	**1**	**No**		
				Total (carried forward to SC-4.4)	
				Name of the Bidder:	
				Signature of Bidder:	

Note:

Note: Quoted Unit Price shall include all the cost required to perform task successfully such as loading, transportation, insurance, unloading, cutting (if required), placing as per intended required task, while insuring the quality of the material and health and safety, storing at proper storage place with security and carrying out works as per Employer's requirement and Conditions of Contract.

Schedule No. 4.4.3 : Breakdown of Day work Rates: Contractor's Equipment

Item no.	Description	Nominal quantity (hours)	Unit	Basic hourly rental rate	Amount
4.4.3	**Contractors' Equipment**				
4.4.3.1	Concrete Mixer, up to 5 m3/h	20	h		
4.4.3.2	Concrete Mixer, above to 5 m3/h	20	h		
4.4.3.3	Concrete Pump (Self-Propelled) up to 20 m3/h	40	h		
4.4.3.4	Concrete Pump (Self-Propelled) above to 20 m3/h	40	h		
4.4.3.5	Concrete batch plant, up to 20 m3/h	20	h		
4.4.3.6	Concrete batch plant, above 20 m3/h	20	h		
4.4.3.7	Transit mixer, up to 5 m3	40	h		
4.4.3.8	Transit mixer, above to 5 m3	40	h		
4.4.3.9	Bulldozer, with ripper, up to CAT D8 class	50	h		
4.4.3.10	Bulldozer, with ripper, above to CAT D8 class	50	h		
4.4.3.11	Track loader, up CAT 953 class	30	h		
4.4.3.12	Track loader, above CAT 953 class	50	h		
4.4.3.13	Wheel loader, up to CAT 930 class	50	h		
4.4.3.14	Wheel loader, above CAT 930 class	50	h		
4.4.3.15	Track excavator	100	h		
4.4.3.16	Air Compressor	100	h		
4.4.3.17	Mobile crane, up to 10 t	50	h		
4.4.3.18	Mobile crane, above 10 t, up to 20 t	50	h		
4.4.3.19	Mobile crane, above 20 t	50	h		
4.4.3.20	Lorry, up to 10 t	100	h		
4.4.3.21	Hydrological study to carryout a flood risk assessment	100	h		
4.4.3.22	Tipper, up to 10 t	100	h		
4.4.3.23	Tipper, above 10 t	100	h		
4.4.3.24	Pick-up	200	h		
4.4.3.25	Diesel generator, up to 100 kW	100	h		
4.4.3.26	Diesel generator, above 100 kW, up to 250 kW	100	h		
4.4.3.27	Diesel generator, above 250 kW	100	h		
4.4.3.28	Welding Set, Including Welding Rods	300	h		
				Total (Carried forward to SC-4.4)	
				Name of the Bidder:	
				Signature of Bidder:	

Note:

The Basic Hourly rates includes all cost that require to run and perform the task, such as Equipment rental with operator, maintenance of vehicle, running responsibility, health and safety protection, petrol, diesel, lubricants, driver, assistance etc. required for carrying the task with the equipment.

Schedule No. 4.5 : Other Installation Services

Item no.	Description	Unit	Quantity	Unit Rate in US$	Amount in US$
4.5.1	**Environmental, Social, Health and Safety Management Plan**				
4.5.1.1	**General Mitigation Measures**				
4.5.1.1.1	Develop a detailed Environmental, Social, Health, and Safety (ESHS) Management Plan for Contractor's employees.	Lot	1		
4.5.1.1.2	Develop, provide training and enforce a Worker Code of Conduct	Lot	1		
4.5.1.1.3	Conduct Employee Induction Training on H&S and environmental/social/cultural sensitivity	Lot	1		
4.5.1.1.4	Implement Community Grievance Redress Plan	Lot	1		
4.5.1.1.5	Personal Protection equipment all complete (Safety Boots, Reflection Jackets, Safety Helmet, Safety Goggles, Safety Mask, Safety earplugs, Safety hand gloves etc.)	Lot	1		
				Sub Total 4.5.1.1	
4.5.1.2	**Physical Environment Mitigation Measures**				
4.5.1.2.1	Hydrological study to carryout a flood risk assessment	1	Lot		
4.5.1.2.2	Manage excavated soils	1	Lot		
4.5.1.2.3	Spray disturbed areas with water if substantive off-site fugitive dust impacts occur	1	Lot		
4.5.1.2.4	Provide a pit toilet and bury all organic wastes at tower construction sites	1	Lot		
4.5.1.2.5	Install septic systems/package and proper wastewater disposal system for workers	1	Lot		
4.5.1.2.6	Provide hazardous material training to concerned staff	1	Lot		
4.5.1.2.7	Stockpile materials for use in controlling spills	1	Lot		
4.5.1.2.8	Provide secondary containment for any fuel or hazardous materials	1	Lot		
4.5.1.2.9	Collect and segregate all waste for reuse, recycle, or disposal	1	Lot		
4.5.1.2.10	Dispose of solid waste at approved waste disposal facilities	1	Lot		
				Sub Total 4.5.1.2	
4.5.1.3	**Socio-economic and Cultural Environment Mitigation Measures**				
4.5.1.3.1	Implement Workforce Management Plan	1	Lot		
4.5.1.3.2	Implement Worker Access Management Protocol	1	Lot		
4.5.1.3.3	Implement Traffic Management Plan and maintain the damaged roads caused by contractors	1	Lot		
4.5.1.3.4	Develop and Implement Worker Grievance Redress Mechanism	1	Lot		
4.5.1.3.5	Conduct community awareness on EMF risks	1	Lot		
				Sub Total 4.5.1.3	
4.5.1.4	**Gender, Social Inclusion and Counter-TIP Measures**				
4.5.1.4.1	Develop and implement Anti-Sexual Harassment Policy, provide orientation to the entire workers	Lot	1		
4.5.1.4.2	Conduct awareness raising and community meetings to encourage women, socially excluded, historically marginalized, vulnerable groups to apply for jobs	Lot	1		
4.5.1.4.3	Develop and Implement TIP Risk Management Plan	Lot	1		
4.5.1.4.4	Training to the Contractor's employees/staff on Gender and Social Inclusion, prevention on sexual harassment, gender-based violence, child labor and TIP	Lot	1		
4.5.1.4.5	Community TIP risk prevention sensitization and community consultation	Lot	1		
4.5.1.4.6	Community Grievance Redress Plan must have system of Anonymous reporting for TIP suspected cases	Lot	1		

Schedule No. 4.5 : Other Installation Services

Item no.	Description	Unit	Quantity	Unit Rate in US$	Amount in US$
				Sub Total 4.5.1.4	
4.5.2	**Testing And Commissioning**				
4.5.2.1	Site Testing and Commissioning of HV AIS Equipment	1	Lot		
4.5.2.2	Site Testing and Commissioning of Autotransformers	1	Lot		
4.5.2.3	Site Testing and Commissioning of 400kV GIS Equipment	1	Lot		
4.5.2.4	Site Testing and Commissioning of 220kV GIS Equipment	1	Lot		
4.5.2.5	Site Testing and Commissioning of Electrical Auxiliary Service Equipment and Power MV and LV Cables	1	Lot		
4.5.2.6	Site Testing and Commissioning of Protection/Communication and Control (SCADA and SAS) equipment	1	lot		
4.5.2.7	Site Testing and Commissioning of Mechanical Auxiliary Service Equipment	1	Lot		
4.5.2.8	One Month Commercial Operation after Commissioning	1	Lot		
4.5.2.9	End to End Test for all points as specified, including Control, Protection & Remote End Modification	1	Lot		
4.5.2.10	Closed loop test of equipment all complete	1	Lot		
4.5.2.11	PQ (Power Quality), Revenue Energy meter and all remaining equipment of S/S	1	Lot		
4.5.2.12	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.5.2	
4.5.3	**Training and O&M Assistance**				
	Training at Manufacturers Work				
4.5.3.1	Control & Protection, Substation Automation System and Communication System.(Refer PSR for more details)	1	Lot		
4.5.3.2	400 kV GIS Equipment and System (Circuit Breaker, Isolator, CT, PT & LA) and EHV GIS/AIS Substation Design (Refer PSR for more details)	1	Lot		
4.5.3.3	220 kV GIS Equipment and System (Circuit Breaker, Isolator, CT, PT & LA) and EHV GIS/AIS Substation Design (Refer PSR for more details)	1	Lot		
	Training at Site				
4.5.3.4	Control & Protection (Refer PSR for more details)	1	Lot		
4.5.3.5	Substation Automation System including the integration aspect of SCADA (Refer PSR for more details)	1	Lot		
4.5.3.6	For 400kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance. (Refer PSR for more details)	1	Lot		
4.5.3.7	For 220kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance.(Refer PSR for more details)	1	Lot		
4.5.3.8	Operation and maintenance of Transformers (Refer PSR for more details)	1	Lot		
4.5.3.9	AC/DC auxiliaries and mechanical system (Refer PSR for more details)	1	Lot		
4.5.3.10	Training at site for other systems (provide list)	1	Lot		
				Sub Total 4.5.3	
				Total (Carried forward to SC-4)	
				Name of the Bidder:	
				Signature of Bidder:	

Price Schedule No. 5 : Grand Summary

Item No	Description	Total Price in US$
5.1	Total Schedule No. 1. Design Services	
5.2	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Abroad	
5.3	Total Schedule No. 3. Plant, and Mandatory Spare Parts Supplied from within the Employer's Country	
5.4	Total Schedule No. 4. Installation and Other Servicesincluding all related Civil Works (Excluding Summary of Breakdown of Day works) (includes SC-4.1, SC-4.2, SC-4.3 and SC-4.5)	
5.5	**TOTAL (to Bid Form - Resulting contract Price after correction if any)**	
5.6	**Output VAT (if applicable)**	
5.7	**Total including Output VAT (5.5+5.6)**	
5.8	Total of Summary of Breakdown of Day works (to bid form) (from item No.4.6 of SC-4)	
5.9	**Grand Total Including Day work for Evaluation and Comparison Purpose (5.5+5.8)**	
	Name of Bidder:	
	Signature of Bidder:	

Note:

Quoted Unit Price shall include all the cost required to perform task successfully such as all resources required to carry out the Work, personnel, material, equipemnt, loading, transportation, insurance, unloading and storing at proper storage place and carrying out works as per Employer's requirement and Conditions of Contract.

The purpose of price schedules is to identify the Bid Price which will be used to determine progress payment and tthe rates can be used to determine the price of any variation to scope . The Bid Price if accepted and included in the Contract shall become Contract Price and the Contract price shall not be adjusted (except as stated under Conditions of Contract under Sub-Clause 13.8) in case any quantity varies. The Price quoted under Price Schedule is as per provision of Employer's Requirements and Conditions of Contract.

Price Schedule No. 6 : Recommended Spare Parts, Repair and Maintenance Tools (Breakdown of Rates)

Item No	Description	Qty.	CIP Price in US$	EXW Price in US$	Total Price (CIP)	Total Price (EXW)
			Foreign Parts	Local Parts		
		1	*2*	*3*	*(1) x (2)*	*(1)x(3)*
				(CIP and EXW) TOTAL		
				Name of Bidder:		
				Signature of Bidder:		

Note:

The price of recommended spare parts quoted in Price Schedule No. 6 shall not be considered for evaluation. This is because such spare parts would normally be used after long time durations beyond the MCC Compact end date, and could not be financed from the Compact funds. Still the recommended spare parts may be financed directly by the government. Quoted Unit Price shall include all the cost required to perform task successfully such as loading, transportation, insurance, unloading and storing at proper storage place and carrying out works as per Employer's requirement and Conditions of Contract.

EXW-Works site in Nepal: All Plant and Mandatory Spare Parts Supplied within the country shall be quoted as EXW. The Contractor will also be responsible for other associate charge to bring all goods and equipment to site.

CIP-Works site in Nepal: All Plant and Mandatory Spare Parts Supplied from Abroad shall be quoted as CIP- Works site in Nepal basis. The Contractor will be responsible for custom clearance, insurance and other associate charge to bring all goods and equipment to site.

Quoted Unit Price shall include all the cost required to perform task successfully such as cost of goods, resouces, loading, transportation, insurance, unloading and storing at proper storage place.

Lot 2 - Price Schedules

Millennium Challenge Account Nepal
Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of
Lot 2: 400kV New Butwal Substation
Price Schedule

Breakdown of Rates and Prices Schedule No. 1. Design Services

Item No	Description	Qty	Unit	Unit Rate US$	Total Price US$
		1		*2*	*(1) x (2)*
1.1	**Design Works (Electrical)**				
Complete Electromechanical and Electrical Design of New Substation as Specified in Scope and Employers Requirements including but					
1.1.1	Substation Design: (SLD, Layout, Section elevation, P&C, SCADA, 400/220kV Switchgear, Auto Transformers along with connections, Auxiliary System, Control, LV & Fiber Optic Cables along with connections for the same, etc.)	1	Lot		
1.1.2	Thermal Calculations for normal and emergency continuous current ratings of the switchgear and each main current path component	1	Lot		
1.1.3	Insulation Coordination Study	1	Lot		
1.1.4	Lightning Surge Overvoltage Study	1	Lot		
1.1.5	Transient Recovery Voltage (TRV) Study for GIS	1	Lot		
1.1.6	Grounding Analysis for entire station	1	Lot		
1.1.8	All the requested settings for Protection Coordination, Relay Test Plan, Configuration and Programming on Intelligent Electronic Device (IEDs) such as Relays, RTUs, Automation system, etc. to ensure normal function of integrated system at substation and with other facilities in the entire power system as referred to LOT 2 works.	1	Lot		
1.1.9	GIS System Earthing and Bonding Study	1	Lot		
1.1.10	Outdoor Switchyard Lighting Study	1	Lot		
1.1.11	Power Cable Ampacity Study	1	Lot		
1.1.12	Rigid Bus Study	1	Lot		
1.1.13	Power Cable Pulling Tension Calculation	1	Lot		
1.1.14	Any other design work not specifically mentioned above but deemed necessary or as required by Engineer/Employer for satisfactory completion of design work.	1	Lot		
				Sub Total 1.1	
1.2	**Design Works (Civil)**				
Complete Civil Design of New Substation as Specified in Scope and Employers Requirements including but not limited to:					
1.2.1	Geotechnical investigation data and drawings including on-site support during excavation and compaction.	1	Lot		
1.2.2	Hydrological, Environmental and Social Assessment of New Butwal Substation area as described in the Technical Specification	1	Lot		
1.2.3	Surveying and benchmarking design and drawings including on-site support during site preparation.	1	Lot		
1.2.4	Substation Design in Civil, Structural, Mechanical and Architectural, such as foundation works, hot dip galvanised steel supporting structures for all outdoor electrical equipment structures, other civil works like boundary wall etc., substation buildings, roads, cable trenches, water drainage system, oil containment chamber and sump pit, fire walls, earthing works, etc. of new substation complete in all respect.	1	Lot		
1.2.5	Design of rail tracks for movement of power transformers on the reinforced concrete foundations.	1	Lot		
1.2.6	Any Architectural-Related Calculations and Analysis	1	Lot		
1.2.7	Any Mechanical-Related Calculations and Analysis	1	Lot		
1.2.8	Any other design work not specifically mentioned above but deemed necessary or as required by employer for satisfactory completion of design work.	1	Lot		
				Sub Total 1.2	
				Total (To Schedule No. 5. Grand Summary)	
				Name of Bidder:	
				Signature of Bidder:	

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.1	**AIS HV and MV Equipment**					
2.1.1	Auto-Transformer, 315 MVA, 400/220/33 kV, Three Phase, OLTC, RTCC facility, surge protection arrangement (AIS) on both sides including tertiary Bushing CT, all fittings & accessories as specified/ required for completion of the scope of works as per technical specification		3	Nos		
2.1.2	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application: Metering		6	Nos		
2.1.3	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application: Metering and PLC Coupling		6	Nos		
2.1.4	Current Transformer (CT), 400kV, Single Phase, Live tank Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA		12	Nos		
2.1.5	Current Transformer (CT), 220kV Single Phase, Tank Type, 5 Core, 1600A, 120% Extended Current Rating		9	Nos		
2.1.6	Current Transformer (CT), 72.5kV, Single Phase 2 Windings		6	Nos		
2.1.7	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV		12	Nos		
2.1.8	220kV Surge Arrester (SA), Zinc Oxide 216kV Rated Voltage, 10kA, 12kJ/kV		9	Nos		
2.1.9	Substation Service Transformer, 630 kVA, 33/0.4kV		2	Nos		
2.1.10	30kV,10kA Lightning arrester for 33kV line bays		6	Nos		
2.1.11	30kV,10kA Lightning arrester for 33/0.4kV station service transformers		6	Nos		
2.1.12	Tandem Isolator without Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)		9	Nos		
2.1.13	Isolator with One Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)		3	Nos		
2.1.14	Isolator with Two Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)		3	Nos		
2.1.15	72.5kV Double Break Isolator, Single Phase		1	Lot		
2.1.16	220kV Circuit Breaker, Three Phase, 1600A		3	Nos		
2.1.17	72.5kV Circuit Breaker, Three Phase, 50Hz.		2	Nos		
2.1.18	72.5kV Current Transformer		6	Nos.		
2.1.19	400kV Bus Support Post Insulator		1	Lot		
2.1.20	220kV Bus Support Post Insulator		1	Lot		
2.1.21	72.5kV Bus Support Post Insulator		1	Lot		
2.1.22	Suspension/Tension Insulator Strings, Including Hardware		1	Lot		
2.1.23	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.1	
2.2	**Hot-Dip Galvanized Steel**					
2.2.1	Gantry Column for 400 kV Incoming Line		6	Nos		
2.2.2	Gantry Column for 220 kV Incoming Line		5	Nos		
2.2.3	Gantry Girder for 400 kV Incoming Line		4	Nos		
2.2.4	Gantry Girder for 220 kV Incoming Line		3	Nos		
2.2.5	Support Structure for 400 kV Current Transformer		12	Nos		
2.2.6	Support Structure for 400 kV Capacitor Voltage Transformer		12	Nos		
2.2.7	Support Structure for 400 kV Surge Arrester		12	Nos		
2.2.8	Support Structure for 400 kV Bus Support		1	Lot		
2.2.9	Support Structure for Tandem Isolator without Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)		9	Nos		
2.2.10	Support Structure for Isolator with One Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)		3	Nos		
2.2.11	Support Structure for Isolator with Two Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)		3	Nos		
2.2.12	Support Structure for 72.5 kV Disconnecting Switch		1	Lot		
2.2.13	Support Structure for 220 kV Current Transformer		9	Nos		
2.2.14	Support Structure for 220 kV Surge Arrester		9	Nos		
2.2.15	Support Structure for 220 kV Bus Support		1	Lot		
2.2.16	Support Structure for 72.5 kV Current Transformer		6	Nos		
2.2.17	Support Structure for 72.5 kV Bus Support or Pot Head		1	Lot		
2.2.18	Support Structure for 72.5 kV Single Switch Stand		1	Lot		
2.2.19	Support Structure for 30kV Lightning Arrestor		15	Nos.		
2.2.20	Structures for Lightning Mast and other Lighting structures		1	Lot		
2.2.21	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
					Sub Total 2.2	
2.3	**Bus Bar and Overhead Connections**					
2.3.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness		1	Lot		
2.3.2	4" AL. Tubular Bus Bar 114.2mm Outer Diameter, 8.51mm Thickness		1	Lot		
2.3.3	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)		1	Lot		
2.3.4	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel		1	Lot		
2.3.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.3	
2.4	**LV Control and Power Cable**					
2.4.1	LV Control Cables		1	Lot		
2.4.2	LV Power Cables		1	Lot		
2.4.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)		1	Lot		
2.4.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)		1	Lot		
2.4.5	33 kV Cable Pothead		1	Lot		
2.4.6	Power Cable for Filter Plant (Transformer) 3.5CX240 sq.mm. (Armoured, PVC Insulated) with suitable termination arrangement all complete		1	Lot		
2.4.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.		1	Lot		
2.4.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.4	
2.5	**AC AND DC STATION SUPPLY**					
2.5.1	**400 V AC Main Switch Board**					
2.5.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		3	Nos		
2.5.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers		1	Nos		
2.5.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer		1	Nos		
2.5.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer		1	Nos		
2.5.2	**400 V AC Main Lighting Board**					
2.5.2.1	100 kVA Lighting Transformer		2	Nos		
2.5.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker		1	Nos		
2.5.3	**400 V AC Emergency Lighting Distribution Board**					
2.5.3.1	100 kVA Lighting Transformer		1	Nos		
2.5.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker		1	Nos		
2.5.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers,		1	Nos		
2.5.4	**400 V AC Distribution Board**					
2.5.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		1	Nos		
2.5.4.2	400/110V, 50VA, Potential Transformer		3	Nos		
2.5.4.3	400/1A Current Transformer, Class 5P20		1	Nos		
2.5.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.5.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker		1	Nos		
2.5.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers		1	Nos		
2.5.5	**400 V AC AMF Panel**					
2.5.5.1	400/1A Current Transformer, Class 1		3	Nos		
2.5.5.2	400/1A Current Transformer, Class 5P20		1	Nos		
2.5.6	**DC Chargers and Batteries**					
2.5.6.1	220V Battery Charger (Float/Boost)		3	Nos		
2.5.6.2	48V Battery charger (Float/Boast)		3	Nos		
2.5.6.3	250A Throw over Switch, Interlock		6	Nos		
2.5.6.4	Battery, 220Vdc, 108 Minimum Cells		2	Nos		
2.5.6.5	Battery, 48Vdc, 24 Minimum Cells		2	Nos		
2.5.7	**DC Distribution Boards**					
2.5.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions		2	Nos		
2.5.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions		2	Nos		
2.5.7.3	DC Fuse Box, 220Vdc		1	Lot		
2.5.7.4	DC Fuse Box, 48Vdc		1	Lot		
2.5.8	**Other Equipment**					
2.5.8.1	Diesel Generator Set, 250kVA (Including Fuel Tank)		1	Nos		
2.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.5	
2.6	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**					
2.6.1	**Line/feeder Bay**					
2.6.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole		10	Nos		
2.6.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set		20	Nos		
2.6.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set		20	Nos		
2.6.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		20	Nos		
2.6.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set		10	Nos		
2.6.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set		10	Nos		
2.6.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set		10	Nos		
2.6.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		10	Nos		
2.6.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		10	Nos		
2.6.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		10	Nos		
2.6.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.1.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Line/Feeder Bay Lot all complete		10	Bays		
2.6.2	**Transformer Bay**					
2.6.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		4	Nos		
2.6.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set		8	Nos		
2.6.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single phase, three-phase set		8	Nos		
2.6.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		8	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.6.2.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set		4	Nos		
2.6.2.6	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set		4	Nos		
2.6.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set		4	Nos		
2.6.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set		4	Nos		
2.6.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		4	Nos		
2.6.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		4	Nos		
2.6.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.2.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.2.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Transformer Bay Lot all complete		4	Bays		
2.6.3	**Diameter Middle Breaker Bay**					
2.6.3.1	SF6 Circuit breaker					
a.	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole		3	Nos		
b.	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		4	Nos		
2.6.3.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set		14	Nos		
2.6.3.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single phase, three-phase set		14	Nos		
2.6.3.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		14	Nos		
2.6.3.5	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		7	Nos		
2.6.3.6	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		7	Nos		
2.6.3.7	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.3.8	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.3.9	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.4	**Gas Insulated BUSBAR**					
2.6.4.1	400kV , 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures		7	Diameter		
2.6.4.2	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set		2	Nos		
2.6.4.3	High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set		2	Nos		
2.6.4.4	Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set		2	Nos		
2.6.4.5	Bus Bar Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set		2	Nos		
2.6.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.6	
2.7	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**					
2.7.1	**Complete set of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but**					
2.7.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		21	Nos		
2.7.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)		8	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.7.1.3	Transformer Protection Panel		6	Nos		
2.7.1.4	400kV (Double Bus Bar Protection)		2	Set		
2.7.1.5	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.7.2	**Complete set of Control and Protection panels for 220 kV station as specified in Scope and Employers Requirements including but**					
2.7.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		4	Nos		
2.7.2.2	Transformer Protection Panel		6	Nos		
2.7.2.3	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.7.3	**Complete set of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**					
2.7.3.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		2	Nos		
2.7.3.2	Transformer Protection Panel		2	Nos		
2.7.3.3	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.7.4	**Substation Automation & Metering**					
2.7.4.1	SAS Operator Station for control of 400/220/33 kV		1	Set		
2.7.4.2	Substation Automation System (SAS) for 400 kV System per diameter		7	Set		
2.7.4.3	Integration/connection of proposed 3 nos of 220 kV ICT bays with existing 220kV SAS system.		1	Lot		
2.7.4.4	Substation Automation System (SAS) for 33kV System per feeder		2	Set		
2.7.4.5	Substation Automation System (SAS) for Auxiliary System		1	Set		
2.7.4.6	Integration of all 400kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.		1	Lot		
2.7.4.7	Telecommunication system for New Butwal		1	Lot		
2.7.4.8	Fibre Optic SDH System		1	Lot		
2.7.4.9	Phone System		1	Lot		
2.7.4.10	Line traps (4 required), complete with hardware and supporting material, and the power line carrier equipment, complete with necessary coupling equipment and cables for 2 sets of PLCC system complete.		1	Lot		
2.7.4.11	400 kV Metering		1	Lot		
2.7.4.12	220kV Metering		1	Lot		
2.7.4.13	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
					Sub Total 2.7	
2.8	**Grounding System**					
2.8.1	Stranded Bare Copper 240 Sq. mm** Grid (Including Fusion and Mechanical Connectors)		1	Lot		
2.8.2	Grounding Rods		1	Lot		
2.8.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)		1	Lot		
2.8.4	Embedded Grounding System - Control Room		1	Lot		
2.8.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.8	
2.9	**Lightning Protection System**					
2.9.1	Overhead Galvanized Steel Wire, Including Hardware		1	Lot		
2.9.2	Lightening Mast for equipment Protection		1	Lot		
2.9.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.9	
2.10	**Firefighting System**					
2.10.1	Fire protection/detection for 3 (three) auto transformers		1	Lot		
2.10.2	Fire protection/detection for 400kV GIS Building		1	Lot		
2.10.3	Fire protection/detection for Control House		1	Lot		
2.10.4	Fire protection/detection system for pump house building		1	Lot		
2.10.5	Fire protection/detection system for generator diesel tank		1	Lot		
2.10.6	Portable fire extinguishers		1	Lot		
2.10.7	Clean-agent fire extinguishers		1	Lot		
2.10.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.10	
2.11	**HVAC And Ventilation Systems**					
2.11.1	400kV GIS Building HVAC and Ventilation Systems		1	Lot		
2.11.2	Control House HVAC and Ventilation Systems		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.12	**Accessories and Ancillary Material**					
2.12.1	Junction and marshalling boxes, outdoor		1	Lot		
2.12.2	Junction and marshalling boxes, indoor		1	Lot		
2.12.3	Outdoor lighting, including lighting fixtures		1	Lot		
2.12.4	Indoor lighting, including lighting fixtures		1	Lot		
2.12.5	Water Supply System as per TS		1	Lot		
2.12.6	Rainwater harvesting as per TS		1	Lot		
2.12.7	Control Cabinet for outdoor lighting		1	Lot		
2.12.8	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.		1	Lot		
2.12.9	Electric Overhead Travelling Crane for installation and removal of GIS Equipment		1	Lot		
2.12.10	Visual Monitoring System		1	Lot		
2.12.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.12	
2.13	**Mandatory Maintenance, Repair tools and Testing Instruments**					
2.13.1	**GIS Equipment**					
2.13.1.1	400kV GIS SF6 leakage detector, analyzer and processing unit all complete		1	Lot		
2.13.1.2	400kV GIS Wrenches and tools		1	Lot		
2.13.1.3	400kV GIS Pressure gauge		1	Nos		
2.13.1.4	400kV GIS Gas sampling and moisture meter		1	Nos		
2.13.1.5	400kV GIS Micro-Ohmmeter		1	Nos		
2.13.1.6	400kV GIS Circuit-breaker, timing tester		1	Nos		
2.13.1.7	400kV GIS Laptop computer with Specialized software for GIS setting and monitoring		1	Nos		
2.13.1.8	Complete set of SF6 gas service cart mounted on a trailer for mobile application. SF6 gas refilling cart equipped with 1 SF6 gas cylinder and the necessary instruments and adapters for easy and quick gas refilling in case o losses		1	Lot		
2.13.1.9	HV Test Bushing for GIS		1	Lot		
2.13.1.10	Online Partial Discharge Monitor System		1	Nos		
2.13.2	**Auto Transformer**					
2.13.2.1	Oil-treatment unit 6000lph along with suitable size and quantity of connection arrangement (MCCB (240-300 Amp),terminal lugs etc.) all complete (autotransformer)		1	Nos		
2.13.2.2	Oil dielectric tester		1	Nos		
2.13.2.3	Dielectric tester based on tan δ and dielectric losses , 10 kV		1	Nos		
2.13.2.4	Megger, electronic, 5 kV		1	Nos		
2.13.2.5	Wrenches and tools		1	Lot		
2.13.3	**Complete set of Control and Protection panels for Substation**					
2.13.3.1	Relay Test Kit		1	Lot		
2.13.3.2	Test Equipment & tools for SAS SYSTEM for measuring, configuration & diagnostics.		1	Lot		
2.13.3.3	Coupling Device without base plate (For PLCC)		2	Sets		
2.13.3.4	Co-axial connector (For PLCC)		10	Nos		
2.13.3.5	Co-axial cable (For PLCC)		500	M		
2.13.3.6	PLCC tool kit		1	Set		
2.13.3.7	Line Trap LA		1	No		
					Sub Total 2.13	
2.14	**Mandatory Spare Parts**					
2.14.1	**HV Equipment**					
2.14.1.1	Unit of 400kV surge arrester, complete with grading ring, terminals and surge counter		1	Lot		
2.14.1.2	Capacitive voltage transformer, 400kV		1	Nos		
2.14.1.3	Current transformer, 400kV		1	Nos		
2.14.1.4	Current transformer, 220kV		1	Nos		
2.14.1.5	Current transformer, 72.5kV		1	Nos		
2.14.2	**Auto Transformer**					
2.14.2.1	Complete set of gaskets with grease, for cover, manholes, hand holes, and pipping fittings.		1	Lot		
2.14.2.2	Lot of LV control and protective components, minimum one unit of each type of components used		1	Lot		
2.14.2.3	Pressure relief device, complete with accessories		1	Lot		
2.14.2.4	Bushings, one complete unit of each type used, with accessories		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.14.2.5	Current transformer, one unit of each type		1	Nos		
2.14.2.6	Oil-circulating pump with motor, complete with accessories		1	Lot		
2.14.2.7	Cooling fan, complete with motor		1	Lot		
2.14.2.8	Buchholz relay, complete		1	Nos		
2.14.2.9	One instrument of each type used (temperature, oil level, pressure vent, etc.)		1	Lot		
2.14.2.10	One valve of each type used		1	Lot		
2.14.2.11	Insulating oil, 5% of the volume used		1	Lot		
2.14.2.12	Silica gel, quantity for one load		1	Lot		
2.14.2.13	Tap changer diverter switch, spare contacts and transition resistance		1	Nos		
2.14.2.14	Tap changer selector switch spare contacts		1	Lot		
2.14.2.15	Rolls of Kraft insulating paper		1	Nos		
2.14.2.16	LA with accessories for HV,IV and LV side		1	Lot		
2.14.2.17	Additional spare parts as per Chapter 3: Auto Transformer Specification of Part 2: Employer's Requirements, Section V – B1 (Technical Specifications).		1	Lot		
2.14.3	**630kVA Transformer**					
2.14.3.1	All Bushing with metal parts (each voltage rating) for 630 KVA Transformer		1	Lot		
2.14.3.2	Oil Temperature Indicator with sensing device		1	Lot		
2.14.3.3	Tap Changer Contacts		1	Lot		
2.14.3.4	Buchholz Relay		1	Nos		
2.14.3.5	Explosion vent diaphragm		1	Nos		
2.14.3.6	Set of valve (each type)		1	Lot		
2.14.3.7	3-Phase 33 kV Horn Gap Fuse		1	Lot		
2.14.3.8	LA with accessories for both sides		1	Lot		
2.14.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.14	
2.15	**Spare Parts for AC and DC Station Supply**					
2.15.1	**Spare for LV Switchgear**					
2.15.1.1	LV circuit breaker, complete, with CT's and protection devices		1	Nos		
2.15.1.2	Outgoing thermomagnetic breakers - one unit of each type used		2	Nos		
2.15.1.3	Metering - one instrument of each type used		1	Nos		
2.15.1.4	Protection (other than included in LV breaker) One unit of each type used		1	Nos		
2.15.1.5	Automatic Transfer Switch One complete controller including sensors		1	Nos		
2.15.1.6	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Nos		
2.15.2	**Spare for DC Distribution Panels**					
2.15.2.1	Thermomagnetic breakers one unit of each type used		1	Nos		
2.15.2.2	Metering - one metering instrument of each type used		1	Nos		
2.15.2.3	Protection (other than included in LV breaker) One unit of each type used		1	Nos		
2.15.2.4	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Nos		
2.15.3	**Spare for Diesel Generator Set**					
2.15.3.1	Replaceable elements for air filter		1	Nos		
2.15.3.2	Replaceable elements for oil filter		1	Nos		
2.15.3.3	Replaceable elements for fuel filter		1	Nos		
2.15.3.4	Complete set of injectors		1	Nos		
2.15.3.5	Fuel injector pump		1	Nos		
2.15.3.6	Oil pump		1	Nos		
2.15.3.7	Intake valves		1	Nos		
2.15.3.8	Seats for intake valves		1	Nos		
2.15.3.9	Exhaust valves		1	Nos		
2.15.3.10	Set for exhaust valves		1	Nos		
2.15.3.11	Disconnect switch, with grounding blades, 245 kV, 3 Ø		1	Nos		
2.15.3.12	Set of pistons		1	Nos		
2.15.3.13	Set of complete bearings of the engine		1	Nos		
2.15.3.14	Set of all gaskets needed for the engine		1	Nos		
2.15.3.15	Set of thermostats		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.15.3.16	Set of bearings for the alternator		1	Nos		
2.15.3.17	Set of control cards, at least one unit of each type used		1	Nos		
2.15.3.18	Diodes and thyristors of each type used		3	Nos		
2.15.3.19	Lamp, one unit of each type used		10	Nos		
2.15.3.20	Auxiliary relay, one unit of each type used		1	Nos		
2.15.3.21	Multifunction metering instrument		1	Nos		
2.15.3.22	Voltage and speed regulator component and actuator		1	Nos		
2.15.3.23	Controller components		1	Nos		
2.15.3.24	Instrument, detectors		1	Nos		
2.15.4	**Spare for Batteries**					
2.15.4.1	One unit of battery used in 220 V DC system		1	Nos		
2.15.4.2	Loose parts for 220 V DC - connection elements, cables, links, etc.		1	Nos		
2.15.4.3	One unit of battery used in 48 Vdc system		1	Nos		
2.15.4.4	Loose parts for 48 V DC - connection elements, cables, links, etc.		1	Nos		
2.15.5	**Spare for Battery Chargers**					
2.15.5.1	Complete bridge of thyristors assembled on a cooling base		1	Nos		
2.15.5.2	Controller, complete including each type of card used		1	Nos		
2.15.5.3	Loose elements - auxiliary relays, breakers, metering instruments, control switches, fuses, etc.		1	Nos		
2.15.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.15	
2.16	**Mandatory spare parts - Miscellaneous material**					
2.16.1	Junction and marshalling boxed, outdoor, one of each type used		1	Nos		
2.16.2	Junction and marshalling boxed, indoor, one of each type used		1	Nos		
2.16.3	Outdoor lighting fixture, one unit of each type used		1	Nos		
2.16.4	Post-type insulator, one unit of each type used		1	Nos		
2.16.5	Suspension insulator, 5% of the total used		1	Nos		
2.16.6	Bus bar (rigid and strain) hardware, including, connectors, terminals, separator, corona rings, 5% of each type used, minimum one unit		1	Nos		
2.16.7	Grounding conductors, 5% of the installed conductors (stranded copper conductor, rectangular-shape copper bar and grounding rod)		1	Nos		
2.16.8	Fusion connection material, including molds, welding powder and installation tools, quantity required to make 5% of the total executed connections		1	Nos		
2.16.9	Mechanical connectors for grounding, 5% of the total executed connections		1	Nos		
2.16.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.16	
2.17	**Mandatory spare parts for 400kV GIS**					
2.17.1	**Spare Gas**					
2.17.1.1	SF6 bottles required to fill the two largest volume compartments		1	Lot		
2.17.2	**Circuit Breakers, 4000 A, 50kA**					
2.17.2.1	Circuit breaker, complete pole assembly		1	Lot		
2.17.2.2	Complete sets of main contacts		1	Lot		
2.17.2.3	Complete sets of arcing contacts		2	Lot		
2.17.2.4	Operating mechanism, complete		1	Lot		
2.17.2.5	Closing coils		4	Lot		
2.17.2.6	Tripping coils		4	Lot		
2.17.3	**Disconnect-Switches, 4000 A**					
2.17.3.1	Disconnect-Switch, complete pole		1	Nos		
2.17.3.2	Complete set of contacts		2	Nos		
2.17.3.3	Operating mechanism, complete		1	Nos		
2.17.3.4	Operating mechanism motor		2	Nos		
2.17.4	**Maintenance Earthing Switches**					
2.17.4.1	Earthing-Switch, complete pole		1	Nos		
2.17.4.2	Complete set of contacts		2	Nos		
2.17.4.3	Operating mechanism, complete		1	Nos		
2.17.4.4	Operating mechanism motor		2	Nos		
2.17.5	**High-speed earthing Switches**					
2.17.5.1	High-speed earthing switch, complete pole		1	Nos		
2.17.5.2	Complete set of contacts		2	Nos		
2.17.5.3	Operating mechanism, complete		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*
2.17.5.4	Operating mechanism motor		2	Nos		
2.17.6	**Other Equipment**					
2.17.6.1	Voltage transformer, 400 kV, complete with disconnecting and earthing switch		3	Nos		
2.17.6.2	Current transformer, metering core, loose part		6	Nos		
2.17.6.3	Current transformer, protection core, loose part		6	Nos		
2.17.7	**400kV GIS Bay, Local Control Cabinet**					
2.17.7.1	One Bay Local Control Cabinet complete, wired, with all specified devices		1	Lot		
2.17.8	**Bus Bar Elements**					
2.17.8.1	Bus conductor elements		1	Lot		
2.17.8.2	Bus connection elements		1	Lot		
2.17.8.3	GIS insulators, one of each type used		1	Lot		
2.17.8.4	Pressure relief elements		1	Lot		
2.17.9	**SF6-to-Air Bushing Modules**					
2.17.9.1	SF6-to-air bushing module, 400 kV, single phase		1	Lot		
2.17.10	**Loose Spare Parts**					
2.17.10.1	5% of auxiliary relays, control devices, fuses, terminal blocks, etc. minimum one unit of each type used		1	Lot		
2.17.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.17	
2.18	**Spare of LV control and power cables**					
2.18.1	LV control cable, 5% of the installed cables		1	Lot		
2.18.2	LV power cable, 5% of the installed cables		1	Lot		
2.18.3	Cable installation accessories - 5% of the installed material		1	Lot		
2.18.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.18	
2.19	**Spare parts of Mechanical Equipment**					
2.19.1	**Fire protection**					
2.19.1.1	Fire protection/detection for auto transformer - one unit of each type used		1	Lot		
2.19.1.2	Clean-agent fire extinguisher		1	Lot		
2.19.1.3	Control Building general fire protection/detection system, one unit of each component used		1	Lot		
2.19.1.4	GIS Building general fire protection/detection system, one unit of each component used		1	Lot		
2.19.2	**Control building HVAC system**					
2.19.2.1	Throwaway air filters per air conditioning unit		1	Lot		
2.19.2.2	Pulley belts per air conditioning unit motor		1	Lot		
2.19.2.3	Thermostat per air conditioning unit		1	Lot		
2.19.3	**GIS building ventilation system**					
2.19.3.1	Throwaway air filters per ventilation system		1	Lot		
2.19.3.2	Pulley belts per ventilation unit motor		1	Lot		
2.19.3.3	Thermostat per ventilation unit		1	Lot		
2.19.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.19	
					Total(Carried forward to Grand SC-5)	
					Name of Bidder:	
					Signature of Bidder:	
Note:						
***:*This value is indicative, the Contractor will validate as per item 1.1.6 of Design Works (Electrical)*						

Country of Origin Declaration Form		
Item No.	Description	Code

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
				2	*3*	*(1) x (3)*

***Note** : Bidders shall enter the full name of the country of origin of all imported plant and equipment. Enter the code as per the Country of Origin Declaration Form.*

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
		1	*2*	*3*	*(1) x (3)*
3.1	**AIS HV and MV Equipment**				
3.1.1	Auto-Transformer, 315 MVA, 400/220/33 kV, Three Phase, OLTC, RTCC facility, surge protection arrangement (AIS) on both sides including tertiary, Bushing CT, all fittings & accessories as specified/ required for completion of the scope of works as per technical specification	3	Nos		
3.1.2	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering	6	Nos		
3.1.3	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application: Metering and PLC Coupling	6	Nos		
3.1.4	Current Transformer (CT), 400kV, Single Phase, Live tank Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA	12	Nos		
3.1.5	Current Transformer (CT), 220kV Single Phase, Tank Type, 5 Core, 1600A, 120% Extended Current Rating	9	Nos		
3.1.6	Current Transformer (CT), 72.5kV, Single Phase 2 Windings	6	Nos		
3.1.7	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV	12	Nos		
3.1.8	220kV Surge Arrester (SA), Zinc Oxide 216kV Rated Voltage, 10kA, 12kJ/kV	9	Nos		
3.1.9	Substation Service Transformer, 630 kVA, 33/0.4kV	2	Nos		
3.1.10	30kV,10kA Lightning arrester for 33kV line bays	6	Nos		
3.1.11	30kV,10kA Lightning arrester for 33/0.4kV station service transformers	6	Nos		
3.1.12	Tandem Isolator without Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	9	Nos		
3.1.13	Isolator with One Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	3	Nos		
3.1.14	Isolator with Two Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	3	Nos		
3.1.15	72.5kV Double Break Isolator, Single Phase	1	Lot		
3.1.16	220kV Circuit Breaker, Three Phase, 1600A	3	Nos		
3.1.17	72.5kV Circuit Breaker, Three Phase, 50Hz.	2	Nos		
3.1.18	72.5kV Current Transformer	6	Nos.		
3.1.19	400kV Bus Support Post Insulator	1	Lot		
3.1.20	220kV Bus Support Post Insulator	1	Lot		
3.1.21	72.5kV Bus Support Post Insulator	1	Lot		
3.1.22	Suspension/Tension Insulator Strings, Including Hardware	1	Lot		
3.1.23	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.1	
3.2	**Hot-Dip Galvanized Steel**				
3.2.1	Gantry Column for 400 kV Incoming Line	6	Nos		
3.2.2	Gantry Column for 220 kV Incoming Line	5	Nos		
3.2.3	Gantry Girder for 400 kV Incoming Line	4	Nos		
3.2.4	Gantry Girder for 220 kV Incoming Line	3	Nos		
3.2.5	Support Structure for 400 kV Current Transformer	12	Nos		
3.2.6	Support Structure for 400 kV Capacitor Voltage Transformer	12	Nos		
3.2.7	Support Structure for 400 kV Surge Arrester	12	Nos		
3.2.8	Support Structure for 400 kV Bus Support	1	Lot		
3.2.9	Support Structure for Tandem Isolator without Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	9	Nos		
3.2.10	Support Structure for Isolator with One Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	3	Nos		
3.2.11	Support Structure for Isolator with Two Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	3	Nos		
3.2.12	Support Structure for 72.5 kV Disconnecting Switch	1	Lot		
3.2.13	Support Structure for 220 kV Current Transformer	9	Nos		
3.2.14	Support Structure for 220 kV Surge Arrester	9	Nos		
3.2.15	Support Structure for 220 kV Bus Support	1	Lot		
3.2.16	Support Structure for 72.5 kV Current Transformer	6	Nos		
3.2.17	Support Structure for 72.5 kV Bus Support or Pot Head	1	Lot		
3.2.18	Support Structure for 72.5 kV Single Switch Stand	1	Lot		
3.2.19	Support Structure for 30kV Lightning Arrestor	15	Nos.		
3.2.20	Structures for Lightning Mast and other Lighting structures	1	Lot		
3.2.21	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
		1	*2*	*3*	*(1) x (3)*
				Sub Total 3.2	
3.3	**Bus Bar and Overhead Connections**				
3.3.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness	1	Lot		
3.3.2	4" AL. Tubular Bus Bar 114.2mm Outer Diameter, 8.51mm Thickness	1	Lot		
3.3.3	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)	1	Lot		
3.3.4	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel	1	Lot		
3.3.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.3	
3.4	**LV Control and Power Cable**				
3.4.1	LV Control Cables	1	Lot		
3.4.2	LV Power Cables	1	Lot		
3.4.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)	1	Lot		
3.4.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)	1	Lot		
3.4.5	33 kV Cable Pothead	1	Lot		
3.4.6	Power Cable for Filter Plant (Transformer) 3.5CX240 sq.mm. (Armoured, PVC Insulated) with suitable termination arrangement all complete	1	Lot		
3.4.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.	1	Lot		
3.4.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.4	
3.5	**AC AND DC STATION SUPPLY**				
3.5.1	**400 V AC Main Switch Board**				
3.5.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	3	Nos		
3.5.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers	1	Nos		
3.5.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer	1	Nos		
3.5.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer	1	Nos		
3.5.2	**400 V AC Main Lighting Board**				
3.5.2.1	100KVA Lighting Transformer	2	Nos		
3.5.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker	1	Nos		
3.5.3	**400 V AC Emergency Lighting Distribution Board**				
3.5.3.1	100KVA Lighting Transformer	1	Nos		
3.5.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker	1	Nos		
3.5.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers,	1	Nos		
3.5.4	**400 V AC Distribution Board**				
3.5.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	1	Nos		
3.5.4.2	400/110V, 50VA, Potential Transformer	3	Nos		
3.5.4.3	400/1A Current Transformer, Class 5P20	1	Nos		
3.5.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers	1	Nos		
3.5.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker	1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
		1	***2***	***3***	***(1) x (3)***
3.5.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers	1	Nos		
3.5.5	**400 V AC AMF Panel**				
3.5.5.1	400/1A Current Transformer, Class 1	3	Nos		
3.5.5.2	400/1A Current Transformer, Class 5P20	1	Nos		
3.5.6	**DC Chargers and Batteries**				
3.5.6.1	220V Battery Charger (Float/Boost)	3	Nos		
3.5.6.2	48V Battery charger (Float/Boast)	3	Nos		
3.5.6.3	250A Throw over Switch, Interlock	6	Nos		
3.5.6.4	Battery, 220Vdc, 108 Minimum Cells	2	Nos		
3.5.6.5	Battery, 48Vdc, 24 Minimum Cells	2	Nos		
3.5.7	**DC Distribution Boards**				
3.5.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
3.5.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
3.5.7.3	DC Fuse Box, 220Vdc	1	Lot		
3.5.7.4	DC Fuse Box, 48Vdc	1	Lot		
3.5.8	**Other Equipment**				
3.5.8.1	Diesel Generator Set, 250kVA (Including Fuel Tank)	1	Nos		
3.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.5	
3.6	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**				
3.6.1	**Line/feeder Bay**				
3.6.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole	10	Nos		
3.6.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set	20	Nos		
3.6.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	20	Nos		
3.6.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	20	Nos		
3.6.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set	10	Nos		
3.6.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set	10	Nos		
3.6.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	10	Nos		
3.6.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	10	Nos		
3.6.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	10	Nos		
3.6.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	10	Nos		
3.6.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
3.6.1.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
3.6.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
3.6.1.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Line/Feeder Bay Lot all complete	10	Bays		
3.6.2	**Transformer Bay**				
3.6.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
3.6.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	8	Nos		
3.6.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	8	Nos		
3.6.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	8	Nos		
3.6.2.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	4	Nos		
3.6.2.6	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set	4	Nos		
3.6.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	4	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
		1	***2***	***3***	***(1) x (3)***
3.6.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set	4	Nos		
3.6.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	4	Nos		
3.6.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	4	Nos		
3.6.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
3.6.2.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
3.6.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
3.6.2.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Transformer Bay Lot all complete	4	Bays		
3.6.3	**Diameter Middle Breaker Bay**				
3.6.3.1	SF6 Circuit breaker				
a.	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole	3	Nos		
b.	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
3.6.3.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	14	Nos		
3.6.3.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	14	Nos		
3.6.3.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	14	Nos		
3.6.3.5	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	7	Nos		
3.6.3.6	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	7	Nos		
3.6.3.7	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
3.6.3.8	All metallic structures and supports required for GIS complete with accessories	1	Lot		
3.6.3.9	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
3.6.4	**Gas Insulated BUSBAR**				
3.6.4.1	400kV , 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures	7	Diameter		
3.6.4.2	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set	2	Nos		
3.6.4.3	High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	2	Nos		
3.6.4.4	Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set	2	Nos		
3.6.4.5	Bus Bar Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	2	Nos		
3.6.4.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.6	
3.7	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**				
3.7.1	**Complete set of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**				
3.7.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	21	Nos		
3.7.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)	8	Nos		
3.7.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	6	Nos		
3.7.1.4	400kV (Double Bus Bar Protection)	2	Set		
3.7.1.5	Miscellaneous Relay and Control Equipment, not included above	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
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		1	*2*	*3*	*(1) x (3)*
3.7.2	**Complete set of Control and Protection panels for 220 kV station as specified in Scope and Employers Requirements including but not limited to:**				
3.7.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	4	Nos		
3.7.2.2	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	6	Nos		
3.7.2.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
3.7.3	**Complete set of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**				
3.7.3.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	2	Nos		
3.7.3.2	Transformer Protection Panel	2	Nos		
3.7.3.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
3.7.3.4	**Substation Automation & Metering**				
3.7.3.4.1	SAS Operator Station for control of 400/220/33 kV	1	Set		
3.7.3.4.2	Substation Automation System (SAS) for 400 kV System per diameter	7	Set		
3.7.3.4.3	Integration/connection of proposed 3 nos of 220 kV ICT bays with existing 220kV SAS system.	1	Lot		
3.7.3.4.4	Substation Automation System (SAS) for 33kV System per feeder	2	Set		
3.7.3.4.5	Substation Automation System (SAS) for Auxiliary System	1	Set		
3.7.3.4.6	Integration of all 400kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.	1	Lot		
3.7.3.4.7	Telecommunication system for New Butwal	1	Lot		
3.7.3.4.8	Fibre Optic SDH System	1	Lot		
3.7.3.4.9	Phone System	1	Lot		
3.7.3.4.10	Line traps (4 required), complete with hardware and supporting material, and the power line carrier equipment, complete with necessary coupling equipment and cables for 2 sets of PLCC system complete.	1	Lot		
3.7.3.4.11	400 kV Metering	1	Lot		
3.7.3.4.12	220kV Metering	1	Lot		
3.7.3.4.13	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
				Sub Total 3.7	
3.8	**Grounding System**				
3.8.1	Stranded Bare Copper 240 Sq. mm** Grid (Including Fusion and Mechanical Connectors)	0	0		
3.8.2	Grounding Rods	0	0		
3.8.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)	0	0		
3.8.4	Embedded Grounding System - Control Room	0	0		
3.8.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	0	0		
				Sub Total 3.8	
3.9	**Lightning Protection System**				
3.9.1	Overhead Galvanized Steel Wire, Including Hardware	1	Lot		
3.9.2	Lightening Mast for equipment Protection	1	Lot		
3.9.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.9	
2.10	**Firefighting System**				
3.10.1	Fire protection/detection for 3 (three) auto transformers	1	Lot		
3.10.2	Fire protection/detection for 400kV GIS Building	1	Lot		
3.10.3	Fire protection/detection for Control House	1	Lot		
3.10.4	Fire protection/detection system for pump house building	1	Lot		
3.10.5	Fire protection/detection system for generator diesel tank	1	Lot		
3.10.6	Portable fire extinguishers	1	Lot		
3.10.7	Clean-agent fire extinguishers	1	Lot		
3.10.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.10	
3.11	**HVAC And Ventilation Systems**				
3.11.1	400kV GIS Building HVAC and Ventilation Systems	1	Lot		
3.11.2	Control House HVAC and Ventilation Systems	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
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		1	*2*	*3*	*(1) x (3)*
				Sub Total 3.11	
3.12	**Accessories and Ancillary Material**				
3.12.1	Junction and marshalling boxes, outdoor	1	Lot		
3.12.2	Junction and marshalling boxes, indoor	1	Lot		
3.12.3	Outdoor lighting, including lighting fixtures	1	Lot		
3.12.4	Indoor lighting, including lighting fixtures	1	Lot		
3.12.5	Water Supply System as per TS	1	Lot		
3.12.6	Rainwater harvesting as per TS	1	Lot		
3.12.7	Control Cabinet for outdoor lighting	1	Lot		
3.12.8	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.	1	Lot		
3.12.9	Electric Overhead Travelling Crane for installation and removal of GIS Equipment	1	Lot		
3.12.10	Visual Monitoring System	1	Lot		
3.12.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.12	
3.13	**Mandatory Maintenance, Repair tools and Testing Instruments**				
3.13.1	**GIS Equipment**				
3.13.1.1	400kV GIS SF6 leakage detector, analyzer and processing unit all complete	1	Lot		
3.13.1.2	400kV GIS Wrenches and tools	1	Lot		
3.13.1.3	400kV GIS Pressure gauge	1	Nos		
3.13.1.4	400kV GIS Gas sampling and moisture meter	1	Nos		
3.13.1.5	400kV GIS Micro-Ohmmeter	1	Nos		
3.13.1.6	400kV GIS Circuit-breaker, timing tester	1	Nos		
3.13.1.7	400kV GIS Laptop computer with Specialized software for GIS setting and monitoring	1	Nos		
3.13.1.8	Complete set of SF6 gas service cart mounted on a trailer for mobile application. SF6 gas refilling cart equipped with 1 SF6 gas cylinder and the necessary instruments and adapters for easy and quick gas refilling in case of losses	1	Lot		
3.13.1.9	HV Test Bushing for GIS	1	Lot		
3.13.1.10	Online Partial Discharge Monitor System	1	Nos		
3.13.2	**Auto Transformer**				
3.13.2.1	Oil-treatment unit 6000lph along with suitable size and quantity of connection arrangement (MCCB (240-300 Amp),terminal lugs etc.) all complete (autotransformer)	1	Nos		
3.13.2.2	Oil dielectric tester	1	Nos		
3.13.2.3	Dielectric tester based on tan δ and dielectric losses , 10 kV	1	Nos		
3.13.2.4	Megger, electronic, 5 kV	1	Nos		
3.13.2.5	Wrenches and tools	1	Lot		
3.13.3	**Complete set of Control and Protection panels for Substation**				
3.13.3.1	Relay Test Kit	1	Lot		
3.13.3.2	Test Equipment & tools for SAS SYSTEM for measuring, configuration & diagnostics.	1	Lot		
				Sub Total 3.13	
3.14	**Mandatory Spare Parts**				
3.14.1	**HV Equipment**				
3.14.1.1	Unit of 400kV surge arrester, complete with grading ring, terminals and surge counter	1	Lot		
3.14.1.2	Capacitive voltage transformer, 400kV	1	Nos		
3.14.1.3	Current transformer, 400kV	1	Nos		
3.14.1.4	Current transformer, 220kV	1	Nos		
3.14.1.5	Current transformer, 72.5kV	1	Nos		
3.14.2	**Auto Transformer**				
3.14.2.1	Complete set of gaskets with grease, for cover, manholes, hand holes, and pipping fittings.	1	Lot		
3.14.2.2	Lot of LV control and protective components, minimum one unit of each type of components used	1	Lot		
3.14.2.3	Pressure relief device, complete with accessories	1	Lot		
3.14.2.4	Bushings, one complete unit of each type used, with accessories	1	Lot		
3.14.2.5	Current transformer, one unit of each type	1	Nos		
3.14.2.6	Oil-circulating pump with motor, complete with accessories	1	Lot		
3.14.2.7	Cooling fan, complete with motor	1	Lot		
3.14.2.8	Buchholz relay, complete	1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
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		1	*2*	*3*	*(1) x (3)*
3.14.2.9	One instrument of each type used (temperature, oil level, pressure vent, etc.)	1	Lot		
3.14.2.10	One valve of each type used	1	Lot		
3.14.2.11	Insulating oil, 5% of the volume used	1	Lot		
3.14.2.12	Silica gel, quantity for one load	1	Lot		
3.14.2.13	Tap changer diverter switch, spare contacts and transition resistance	1	Nos		
3.14.2.14	Tap changer selector switch spare contacts	1	Lot		
3.14.2.15	Rolls of Kraft insulating paper	1	Nos		
3.14.2.16	LA with accessories for HV,IV and LV side	1	Lot		
3.14.2.17	Additional spare parts as per Chapter 3: Auto Transformer Specification of Part 2: Employer's Requirements, Section V – B1 (Technical Specifications).	1	Lot		
3.14.3	**630kVA Transformer**				
3.14.3.1	All Bushing with metal parts (each voltage rating) for 630 KVA Transformer	1	Lot		
3.14.3.2	Oil Temperature Indicator with sensing device	1	Lot		
3.14.3.3	Tap Changer Contacts	1	Lot		
3.14.3.4	Buchholz Relay	1	Nos		
3.14.3.5	Explosion vent diaphragm	1	Nos		
3.14.3.6	Set of valve (each type)	1	Lot		
3.14.3.7	3-Phase 33 kV Horn Gap Fuse	1	Lot		
3.14.3.8	LA with accessories for both sides	1	Lot		
3.14.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.14	
3.15	**Spare Parts for AC and DC Station Supply**				
3.15.1	**Spare for LV Switchgear**				
3.15.1.1	LV circuit breaker, complete, with CT's and protection devices	1	Nos		
3.15.1.2	Outgoing thermomagnetic breakers - one unit of each type used	2	Nos		
3.15.1.3	Metering - one instrument of each type used	1	Nos		
3.15.1.4	Protection (other than included in LV breaker) One unit of each type used	1	Nos		
3.15.1.5	Automatic Transfer Switch One complete controller including sensors	1	Nos		
3.15.1.6	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.	1	Nos		
3.15.2	**Spare for DC Distribution Panels**				
3.15.2.1	Thermomagnetic breakers one unit of each type used	1	Nos		
3.15.2.2	Metering - one metering instrument of each type used	1	Nos		
3.15.2.3	Protection (other than included in LV breaker) One unit of each type used	1	Nos		
3.15.2.4	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.	1	Nos		
3.15.3	**Spare for Diesel Generator Set**				
3.15.3.1	Replaceable elements for air filter	1	Nos		
3.15.3.2	Replaceable elements for oil filter	1	Nos		
3.15.3.3	Replaceable elements for fuel filter	1	Nos		
3.15.3.4	Complete set of injectors	1	Nos		
3.15.3.5	Fuel injector pump	1	Nos		
3.15.3.6	Oil pump	1	Nos		
3.15.3.7	Intake valves	1	Nos		
3.15.3.8	Seats for intake valves	1	Nos		
3.15.3.9	Exhaust valves	1	Nos		
3.15.3.10	Set for exhaust valves	1	Nos		
3.15.3.11	Disconnect switch, with grounding blades, 245 kV, 3 Ø	1	Nos		
3.15.3.12	Set of pistons	1	Nos		
3.15.3.13	Set of complete bearings of the engine	1	Nos		
3.15.3.14	Set of all gaskets needed for the engine	1	Nos		
3.15.3.15	Set of thermostats	1	Nos		
3.15.3.16	Set of bearings for the alternator	1	Nos		
3.15.3.17	Set of control cards, at least one unit of each type used	1	Nos		
3.15.3.18	Diodes and thyristors of each type used	3	Nos		
3.15.3.19	Lamp, one unit of each type used	10	Nos		
3.15.3.20	Auxiliary relay, one unit of each type used	1	Nos		
3.15.3.21	Multifunction metering instrument	1	Nos		
3.15.3.22	Voltage and speed regulator component and actuator	1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
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		1	***2***	***3***	***(1) x (3)***
3.15.3.23	Controller components	1	Nos		
3.15.3.24	Instrument, detectors	1	Nos		
3.15.4	**Spare for Batteries**				
3.15.4.1	One unit of battery used in 220 V DC system	1	Nos		
3.15.4.2	Loose parts for 220 V DC - connection elements, cables, links, etc.	1	Nos		
3.15.4.3	One unit of battery used in 48 Vdc system	1	Nos		
3.15.4.4	Loose parts for 48 V DC - connection elements, cables, links, etc.	1	Nos		
3.15.5	**Spare for Battery Chargers**				
3.15.5.1	Complete bridge of thyristors assembled on a cooling base	1	Nos		
3.15.5.2	Controller, complete including each type of card used	1	Nos		
3.15.5.3	Loose elements - auxiliary relays, breakers, metering instruments, control switches, fuses, etc.	1	Nos		
3.15.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.15	
3.16	**Mandatory spare parts - Miscellaneous material**				
3.16.1	Junction and marshalling boxed, outdoor, one of each type used	1	Nos		
3.16.2	Junction and marshalling boxed, indoor, one of each type used	1	Nos		
3.16.3	Outdoor lighting fixture, one unit of each type used	1	Nos		
3.16.4	Post-type insulator, one unit of each type used	1	Nos		
3.16.5	Suspension insulator, 5% of the total used	1	Nos		
3.16.6	Bus bar (rigid and strain) hardware, including, connectors, terminals, separator, corona rings, 5% of each type used, minimum one unit	1	Nos		
3.16.7	Grounding conductors, 5% of the installed conductors (stranded copper conductor, rectangular-shape copper bar and grounding rod)	1	Nos		
3.16.8	Fusion connection material, including molds, welding powder and installation tools, quantity required to make 5% of the total executed connections	1	Nos		
3.16.9	Mechanical connectors for grounding, 5% of the total executed connections	1	Nos		
3.16.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.16	
3.17	**Mandatory spare parts for 400kV GIS**				
3.17.1	**Spare Gas**				
3.17.1.1	SF6 bottles required to fill the two largest volume compartments	1	Lot		
3.17.2	**Circuit Breakers, 4000 A, 50kA**				
3.17.2.1	Circuit breaker, complete pole assembly	1	Lot		
3.17.2.2	Complete sets of main contacts	1	Lot		
3.17.2.3	Complete sets of arcing contacts	2	Lot		
3.17.2.4	Operating mechanism, complete	1	Lot		
3.17.2.5	Closing coils	4	Lot		
3.17.2.6	Tripping coils	4	Lot		
3.17.3	**Disconnect-Switches, 4000 A**				
3.17.3.1	Disconnect-Switch, complete pole	1	Nos		
3.17.3.2	Complete set of contacts	2	Nos		
3.17.3.3	Operating mechanism, complete	1	Nos		
3.17.3.4	Operating mechanism motor	2	Nos		
3.17.4	**Maintenance Earthing Switches**				
3.17.4.1	Earthing-Switch, complete pole	1	Nos		
3.17.4.2	Complete set of contacts	2	Nos		
3.17.4.3	Operating mechanism, complete	1	Nos		
3.17.4.4	Operating mechanism motor	2	Nos		
3.17.5	**High-speed earthing Switches**				
3.17.5.1	High-speed earthing switch, complete pole	1	Nos		
3.17.5.2	Complete set of contacts	2	Nos		
3.17.5.3	Operating mechanism, complete	1	Nos		
3.17.5.4	Operating mechanism motor	2	Nos		
3.17.6	**Other Equipment**				
3.17.6.1	Voltage transformer, 400 kV, complete with disconnecting and earthing switch	3	Nos		
3.17.6.2	Current transformer, metering core, loose part	6	Nos		
3.17.6.3	Current transformer, protection core, loose part	6	Nos		
3.17.7	**400kV GIS Bay, Local Control Cabinet**				
3.17.7.1	One Bay Local Control Cabinet complete, wired, with all specified devices	1	Lot		
3.17.8	**Bus Bar Elements**				

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
		1	***2***	***3***	***(1) x (3)***
3.17.8.1	Bus conductor elements	1	Lot		
3.17.8.2	Bus connection elements	1	Lot		
3.17.8.3	GIS insulators, one of each type used	1	Lot		
3.17.8.4	Pressure relief elements	1	Lot		
3.17.9	**SF6-to-Air Bushing Modules**				
3.17.9.1	SF6-to-air bushing module, 400 kV, single phase	1	Lot		
3.17.10	**Loose Spare Parts**				
3.17.10.1	5% of auxiliary relays, control devices, fuses, terminal blocks, etc. minimum one unit of each type used	1	Lot		
3.17.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.17	
3.18	**Spare of LV control and power cables**				
3.18.1	LV control cable, 5% of the installed cables	1	Lot		
3.18.2	LV power cable, 5% of the installed cables	1	Lot		
3.18.3	Cable installation accessories - 5% of the installed material	1	Lot		
3.18.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.18	
3.19	**Spare parts of Mechanical Equipment**				
3.19.1	**Fire protection**				
3.19.1.1	Fire protection/detection for auto transformer - one unit of each type used	1	Lot		
3.19.1.2	Clean-agent fire extinguisher	1	Lot		
3.19.1.3	Control Building general fire protection/detection system, one unit of each component used	1	Lot		
3.19.1.4	GIS Building general fire protection/detection system, one unit of each component used	1	Lot		
3.19.2	**Control building HVAC system**				
3.19.2.1	Throwaway air filters per air conditioning unit	1	Lot		
3.19.2.2	Pulley belts per air conditioning unit motor	1	Lot		
3.19.2.3	Thermostat per air conditioning unit	1	Lot		
3.19.3	**GIS building ventilation system**				
3.19.3.1	Throwaway air filters per ventilation system	1	Lot		
3.19.3.2	Pulley belts per ventilation unit motor	1	Lot		
3.19.3.3	Thermostat per ventilation unit	1	Lot		
3.19.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.19	
				Total (Carried forward to Grand SC-5)	
			Name of Bidder:		
			Signature of Bidder:		
Note:					
***:*This value is indicative, the Contractor will validate as per item 1.1.6 of Design Works (Electrical)*					

Breakdown of Rates and Prices Schedule No. 4. Installation and Other Services including all related Civil Works

Item No.	Description	Total
	Option A (No Future)	
4.1	Breakdown of General Installation and Construction Items (from Schedule No. 4.1)	
4.2	Breakdown of Earthworks (from Schedule No.4.2)	
4.3	Breakdown of Civil Works (from Schedule No.4.3)	
4.4	Other Installation Services (from Schedule No.4.5)	
4.5	**Total Excluding Summary of Breakdown of Day works (from Schedule 4.4) (Carried forward to Grand SC-5)**	
4.6	**Summary of Breakdown of Day works (from Schedule 4.4) (Carried forward to Grand SC-5)**	
4.7	**Total Including Breakdown of Day works.**	
	Name of the Bidder:	
	Signature of Bidder:	

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
		1	*2*	*3*	*(1)x(3)*
4.1.1	**Electromechanical Works General**				
4.1.1.1	Indoor and outdoor storage facilities for storing equipment and material in substation	1	Lot		
4.1.1.2	Site Office, Accommodation and vehicular arrangement as Specified in PSR	1	Lot		
4.1.1.3	Operation and Maintenance Manuals and Procedures	1	Lot		
4.1.1.4	"As-Built" Drawings for All Works including civil, building mechanical etc.	1	Lot		
4.1.1.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.1	
4.1.2	**AIS HV and MV Equipment Installation**				
4.1.2.1	Auto-Transformer, 315 MVA, 400/220/33 kV, Three Phase, OLTC, RTCC facility, necessary arrangement for surge protection on both sides including tertiary, all fittings & accessories as specified/ required for completion of the scope of works as per technical specification	3	Nos		
4.1.2.2	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering	6	Nos		
4.1.2.3	Current Transformer (CT), 400kV, Single Phase, Tank Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA	12	Nos		
4.1.2.4	Current Transformer (CT), 220kV Single Phase, Tank Type, 5 Core, 1600A, 120% Extended Current Rating	9	Nos		
4.1.2.5	Current Transformer (CT), 72.5kV, Single Phase 2 Windings	6	Nos		
4.1.2.6	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV	12	Nos		
4.1.2.7	220kV Surge Arrester (SA), Zinc Oxide 216kV Rated Voltage, 10kA, 12kJ/kV	9	Nos		
4.1.2.8	Substation Service Transformer, 630 kVA, 33/0.4kV	2	Nos		
4.1.2.9	30kV,10kA Lightning arrester for 33kV line bays with support structure, earthing arrangement all complete	6	Nos		
4.1.2.10	30kV,10kA Lightning arrester for 33/0.4kV station service transformers with support structure, earthing arrangement all complete	6	Nos		
4.1.2.11	Tandom Isolator without Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	9	Nos		
4.1.2.12	Isolator with One Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	3	Nos		
4.1.2.13	Isolator with Two Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	3	Nos		
4.1.2.14	72.5kV Double Break Isolator, Single Phase	1	Nos		
4.1.2.15	220kV Circuit Breaker, Three Phase, 1600A	3	Nos		
4.1.2.16	72.5kV Circuit Breaker, Three Phase, 50Hz.	2	Nos		
4.1.2.17	72.5kV Current Transformer	6	Nos.		
4.1.2.18	400kV Bus Support Post Insulator	1	Lot		
4.1.2.19	220kV Bus Support Post Insulator	1	Lot		
4.1.2.20	72.5kV Bus Support Post Insulator	1	Lot		
4.1.2.21	Suspension/Tension Insulator Strings, Including Hardware	1	Lot		
4.1.2.22	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.2	
4.1.3	**Hot Dip Galvanized Steel**				
4.1.3.1	Gantry Column for 400 kV Incoming Line	6	Nos		
4.1.3.2	Gantry Column for 220 kV Incoming Line	5	Nos		
4.1.3.3	Gantry Girder for 400 kV Incoming Line	4	Nos		
4.1.3.4	Gantry Girder for 220 kV Incoming Line	3	Nos		
4.1.3.5	Support Structure for 400 kV Current Transformer	12	Nos		
4.1.3.6	Support Structure for 400 kV Capacitive Voltage Transformer	12	Nos		
4.1.3.7	Support Structure for 400 kV Surge Arrester	12	Nos		
4.1.3.8	Support Structure for 400 kV Bus Support	1	Lot		
4.1.3.9	Support Structure for 220 kV Current Transformer	9	Nos		
4.1.3.10	Support Structure for 220 kV Surge Arrester	9	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
		1	*2*	*3*	*(1)x(3)*
4.1.3.11	Support Structure for 220 kV Bus Support	1	Lot		
4.1.3.12	Tandom Isolator without Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	1	Lot		
4.1.3.13	Isolator with One Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	9	Nos		
4.1.3.14	Isolator with Two Earthing Switch, 220kV,1600 A, 50kA, Three Phase (Set of 3)	9	Nos		
4.1.3.15	Support Structure for 72.5 kV Disconnecting Switch	1	Lot		
4.1.3.16	Support Structure for 72.5 kV Current Transformer	6	Nos		
4.1.3.17	Support Structure for 72.5 kV Bus Support or Pot Head	1	Lot		
4.1.3.18	Support Structure for 72.5 kV Single Switch Stand	1	Lot		
4.1.3.19	Support Structure for 30kV Lightning Arrestor	15	Nos.		
4.1.3.20	Structures for Lightning Mast and other Lighting structures	1	Lot		
4.1.3.21	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.3	
4.1.4	**Bus Bar and Overhead Connections Installation**				
4.1.4.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness	1	Lot		
4.1.4.2	4" AL. Tubular Bus Bar 114.2mm Outer Diameter, 8.51mm Thickness	1	Lot		
4.1.4.3	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)	1	Lot		
4.1.4.4	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel	1	Lot		
4.1.4.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.4	
4.1.5	**LV Control and Power Cable Installation**				
4.1.5.1	LV Control Cables	1	Lot		
4.1.5.2	LV Power Cables	1	Lot		
4.1.5.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)	1	Lot		
4.1.5.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)	1	Lot		
4.1.5.5	33 kV Cable Pothead	1	Lot		
4.1.5.6	Power Cable for Filter Plant (Transformer) 3.5CX240 sqmm (Armoured, PVC Insulated) with suitable termination arrangement all complete	1	Lot		
4.1.5.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.	1	Lot		
4.1.5.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.5	
4.1.6	**AC and DC Station Supply Installation**				
4.1.6.1	**400 V AC Main Switch Board**				
4.1.6.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	3	Nos		
4.1.6.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers	1	Nos		
4.1.6.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer	1	Nos		
4.1.6.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer	1	Nos		
4.1.6.2	**400 V AC Main Lighting Board**				
4.1.6.2.1	100KVA Lighting Transformer	2	Nos		
4.1.6.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker	1	Nos		
4.1.6.3	**400 V AC Emergency Lighting Distribution Board**				
4.1.6.3.1	100KVA Lighting Transformer	1	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
		1	*2*	*3*	*(1)x(3)*
4.1.6.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker	1	Nos		
4.1.6.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers	1	Nos		
4.1.6.4	**400 V AC Distribution Board**				
4.1.6.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	1	Nos		
4.1.6.4.2	400/110V, 50VA, Potential Transformer	3	Nos		
4.1.6.4.3	400/1A Current Transformer, Class 5P20	1			
4.1.6.4.4	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker	1	Nos		
4.1.6.4.5	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers	1	Nos		
4.1.6.5	**400 V AC AMF Panel**				
4.1.6.5.1	400/1A Current Transformer, Class 1	3	Nos		
4.1.6.5.2	400/1A Current Transformer, Class 5P20	1	Nos		
4.1.6.6	**DC Chargers and Batteries**				
4.1.6.6.1	220V Battery Charger (Float/Boost)	3	Nos		
4.1.6.6.2	48V Battery charger (Float/Boast)	3	Nos		
4.1.6.6.3	250A Throw over Switch, Interlock	6	Nos		
4.1.6.6.4	Battery, 220Vdc, 108 Minimum Cells	2	Nos		
4.1.6.6.5	Battery, 48Vdc, 24 Minimum Cells	2	Nos		
4.1.6.7	**DC Distribution Boards**				
4.1.6.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
4.1.6.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
4.1.6.7.3	DC Fuse Box, 220Vdc	1	Lot		
4.1.6.7.4	DC Fuse Box, 48Vdc	1	Lot		
4.1.6.8	**Other Equipment**				
4.1.6.8.1	Diesel Generator Set, 250kVA (Including Full Tank)	1	Nos		
4.1.6.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.6	
4.1.7	**AC and DC Station Supply Installation**				
4.1.7.1	**Line/feeder Bay**				
4.1.7.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole	10	Nos		
4.1.7.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set	20	Nos		
4.1.7.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	20	Nos		
4.1.7.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	20	Nos		
4.1.7.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set	10	Nos		
4.1.7.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set	10	Nos		
4.1.7.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	10	Nos		
4.1.7.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	10	Nos		
4.1.7.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	10	Nos		
4.1.7.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	10	Nos		
4.1.7.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.1.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
		1	*2*	*3*	*(1)x(3)*
4.1.7.1.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Line/Feeder Bay Lot	10	Bays		
4.1.7.2	**Transformer Bay**				
4.1.7.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
4.1.7.2.4	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	8	Nos		
4.1.7.2.5	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	8	Nos		
4.1.7.2.6	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set	8	Nos		
4.1.7.2.7	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	4	Nos		
4.1.7.2.8	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set	4	Nos		
4.1.7.2.9	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	4	Nos		
4.1.7.2.10	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set	4	Nos		
4.1.7.2.11	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	4	Nos		
4.1.7.2.12	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	4	Nos		
4.1.7.2.13	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.2.14	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.2.15	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.2.17	Gas Insulated bus (GIB) and required supports for GIB run whole for Transformer Bay Lot	4	Bays		
4.1.7.3	**Diameter Middle Breaker Bay**				
4.1.7.3.1	SF6 Circuit breaker				
a.	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole	3	Nos		
b.	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
4.1.7.3.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	14	Nos		
4.1.7.3.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	14	Nos		
4.1.7.3.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set	14	Nos		
4.1.7.3.5	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	7	Nos		
4.1.7.3.6	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	7	Nos		
4.1.7.3.7	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.3.8	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.3.9	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.4	**Gas Insulated BUSBAR**				
4.1.7.4.1	400kV , 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures	7	Diameter		
4.1.7.4.2	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set	2	Nos		
4.1.7.4.3	High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	2	Nos		
4.1.7.4.4	Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set	2	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
		1	*2*	*3*	*(1)x(3)*
4.1.7.4.5	Bus Bar Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	2	Nos		
4.1.7.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.7	
4.1.8	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**				
4.1.8.1	**Installation of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**				
4.1.8.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	21	Nos		
4.1.8.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)	8	Nos		
4.1.8.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	6	Nos		
4.1.8.1.4	400kV (Double Bus Bar Protection)	2	Set		
4.1.8.1.5	Stub Bus Differential Protection for Future Bay	6	Bays		
4.1.8.1.6	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.8.2	**Complete set of Control and Protection panels for 220 kV station as specified in Scope and Employers Requirements including but not limited to:**				
4.1.8.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	4	Nos		
4.1.8.2.2	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	6	Nos		
4.1.8.2.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.8.3	**Installation of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**				
4.1.8.3.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	2	Nos		
4.1.8.3.2	Transformer Protection Panel	2	Nos		
4.1.8.3.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.8.4	**Installation of Substation Automation & Metering**				
4.1.8.4.1	SAS Operator Station for control of 400/220/33 kV	1	Set		
4.1.8.4.2	Substation Automation System (SAS) for 400 kV System per diameter	7	Set		
4.1.8.4.3	Integration/connection of proposed 3 nos of 220 kV ICT bays with existing 220kV SAS system.	1	Lot		
4.1.8.4.4	Substation Automation System (SAS) for 33kV System per feeder	2	Set		
4.1.8.4.5	Substation Automation System (SAS) for Auxiliary System	1	Set		
4.1.8.4.6	Integration of all 400kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.	1	Lot		
4.1.8.4.7	Telecommunication system for New Butwal	1	Lot		
4.1.8.4.8	Fibre Optic SDH System	1	Lot		
4.1.8.4.9	Phone System	1	Lot		
4.1.8.4.10	Line traps (4 required), complete with hardware and supporting material, and the power line carrier equipment, complete with necessary coupling equipment and cables for 2 sets of PLCC system complete.	1	Lot		
4.1.8.4.11	400 kV Metering	1	Lot		
4.1.8.4.12	220kV Metering	1	Lot		
4.1.8.4.13	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
				Sub Total 4.1.8	
4.1.9	**Grounding System**				
4.1.9.1	Stranded Bare Copper 240 Sq. mm Grid (Including Fusion and Mechanical Connectors)	1	Lot		
4.1.9.2	Grounding Rods	1	Lot		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
		1	*2*	*3*	*(1)x(3)*
4.1.9.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)	1	Lot		
4.1.9.4	Embedded Grounding System - Control room	1	Lot		
4.1.9.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.9	
4.1.10	**Lightning Protection System**				
4.1.10.1	Overhead Galvanized Steel Wire, Including Hardware	1	Lot		
4.1.10.2	Lightening Mast for Protection	1	Lot		
4.1.10.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.10	
4.1.11	**Firefighting System**				
4.1.11.1	Fire protection/detection for 3 (three) auto transformers	1	Lot		
4.1.11.2	Fire protection/detection for 400kV GIS Building	1	Lot		
4.1.11.3	Fire protection/detection for Control House	1	Lot		
4.1.11.4	Fire protection/detection system for pump house building	1	Lot		
4.1.11.5	Fire protection/detection system for generator diesel tank	1	Lot		
4.1.11.6	Portable fire extinguishers	1	Lot		
4.1.11.7	Clean-agent fire extinguishers	1	Lot		
4.1.11.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.11	
4.1.12	**HVAC and Ventilation Systems**				
4.12.1	400kV GIS Building HVAC and Ventilation Systems	1	Lot		
4.12.2	Control House HVAC and Ventilation Systems	1	Lot		
				Sub-Total 4.1.12	
4.1.13	**Accessories and Ancillary Material**				
4.1.13.1	Junction and marshalling boxes, outdoor	1	Lot		
4.1.13.2	Junction and marshalling boxes, indoor	1	Lot		
4.1.13.3	Outdoor lighting, including lighting fixtures	1	Lot		
4.1.13.4	Indoor lighting, including lighting fixtures	1	Lot		
4.1.13.5	Water Supply System as per TS	1	Lot		
4.1.13.6	Rainwater harvesting as per TS	1	Lot		
4.1.13.7	Control Cabinet for outdoor lighting	1	Lot		
4.1.13.8	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.	1	Lot		
4.1.13.9	Electric Overhead Travelling Crane for installation and removal of GIS Equipment	1	Lot		
4.1.13.10	Visual Monitoring System	1	Lot		
4.1.13.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.13	
				Total(Carried forward to SC-4)	
	Name of Bidder:				
	Signature of Bidder:				

Schedule No. 4.2 : Breakdown of Earthworks

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
4.2.1	Site Clearing, Including Removal of Trees and Stumps	1	Lot		
4.2.2	Top Soil Stripping	1	Lot		
4.2.3	General Excavation	1	Lot		
4.2.4	Compacted Back Fill	1	Lot		
4.2.5	Uncompact Back Fill	1	Lot		
4.2.6	Surplus Disposal	1	Lot		
4.2.7	Surface Works, Including Compaction/Consolidation	1	Lot		
4.2.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Total (Carried forward to SC-4)	
				Name of Bidder:	
				Signature of Bidder:	

Schedule No. 4.3 : Breakdown of Civil Works

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.3.1	**Foundations**				
4.3.1.1	Foundations of 400 kV Gantries	6	Nos		
4.3.1.2	Foundations of 220 kV Gantries	5	Nos		
4.3.1.3	Foundations of 400 kV Capacitor Voltage Transformers & Tank Type Current Transformers	12	Nos		
4.3.1.4	Foundation of 400 kV Surge Arrestor	12	Nos		
4.3.1.5	Foundations of 400 kV Post Type Insulator Bus Support	1	Lot		
4.3.1.6	Foundation, Oil Containment, and Sump Pit For 400/220kV 315 MVA Three Phase Autotransformer	3	Nos		
4.3.1.7	Autotransformer 22kg/m Railway System (22kg/m Steel Rails, Rail Ties, Elastomeric Pad, Screws, Baseplate, and Rail Clamps)	3	Nos		
4.3.1.8	Firewalls Between Auto Transformers	4	Nos		
4.3.1.9	Foundation for 400kV GIB Bus Runs to AIS Equipment	1	Lot		
4.3.1.10	Foundation of 220kV Current Transformer (CT)	9	Nos		
4.3.1.11	Foundation of 220kV Circuit Breaker	3	Nos		
4.3.1.12	Foundation of 220kV Surge Arrestor	9	Nos		
4.3.1.13	Foundation of 220kV Post Type Insulator Bus Support	1	Lot		
4.3.1.14	Foundation of 220kV Disconnecting Switch	1	Lot		
4.3.1.15	Foundation of 220kV Isolator with Earthing Switch	1	Lot		
4.3.1.16	Foundation of 72.5kV Post Type Insulator Bus Support	1	Lot		
4.3.1.17	Foundation of Station Service Transformer	2	Nos		
4.3.1.18	Foundation of 72.5kV Circuit Breaker	2	Nos		
4.3.1.19	Foundation of 72.5kV Current Transformer	6	Nos		
4.3.1.20	Foundation of 72.5kV Disconnecting Switch	1	Lot		
4.3.1.21	Foundation of 33kV Single Phase Switches	1	Lot		
4.3.1.22	Foundation of Diesel Generator Set & Fuel Tank	1	Nos		
4.3.1.23	Foundation of 30kV,10kA Lightning arrester for line bays	6	Nos		
4.3.1.24	Foundations of 30kV,10kA Lightning arrester for 33/0.4kV station service transformers	6	Nos		
4.3.1.25	Foundation for Lightening Mast as required for total protection of equipment	1	Lot		
4.3.1.26	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.1	
4.3.2	**External Works and Landscaping**				
4.3.2.1	Internal Paving	1	Lot		
4.3.2.2	Landscaping, Including Maintenance up to Taking Over	1	Lot		
4.3.2.3	Construction of reinforced concrete trenches/duct banks with manholes for all types of HV/MV power and control cables between switchgear building, substation control building and Autotransformer and all substation equipment as specified in Scope and Employers Requirements.	1	Lot		
4.3.2.4	Anti-weed treatment & stone spreading along with cement concrete layer, Internal drainage system, external drainage system and the rainwater harvesting system, Sewage handling as defined in the technical specifications.	1	Lot		
4.3.2.5	Superficial storm drainage system to drain water outside substation during heavy rainfall	1	Lot		
4.3.2.6	Parking Areas	1	Lot		
4.3.2.7	Guard House	1	Lot		
4.3.2.8	Substation Perimeter Fence	1	Lot		
4.3.2.9	Potable Water System (Including Water Treatment Plant, Pumping Facilities, Storage Tank and all Required Facilities)	1	Lot		
4.3.2.10	Firefighting Pump House and Water Tank	1	Lot		
4.3.2.11	Security Lighting along the Fence and Inside the Perimeter	1	Lot		
4.3.2.12	Retaining wall and River Protection work	1	Lot		
4.3.2.13	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.2	
4.3.3	**General**				
4.3.3.1	Soil Investigation and Test (Including Post-Construction Grounding Test)	1	Lot		
4.3.3.2	Surveys	1	Lot		
4.3.3.3	Mobilization & Demobilization, Site Infrastructure, Temporary Works at site related to site activities.	1	Lot		
4.3.3.4	Final Cleanup (Including Removal of Excess Materials and Temporary Works) Demobilization	1	Lot		
4.3.3.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		

Schedule No. 4.3 : Breakdown of Civil Works

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.3.4	**Substation Buildings**				
4.3.4.1	Substation Control Building	1	Lot		
4.3.4.2	400kV GIS Building	1	Lot		
4.3.4.3	Switchyard Panel Room (SPR) of 30 Sq.m for 220 kV bays as per TS.	1	Lot		
4.3.4.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.4	
				Total (Carried forward to SC-4)	
				Name of Bidder:	
				Signature of Bidder:	

Summary of Breakdown for Schedule 4.4 Day works	
Description	**Amount in US$**
1. Sub-Total for Day work: Labor (4.4.1)	
2. Sub-Total for Day work: Materials (4.4.2)	
3. Sub-Total for Day work: Contractor's Equipment (4.4.3)	
TOTAL (to be carried forward to Schedule 4.0)	
Name of Bidder:	
Signature of Bidder:	

Schedule No. 4.4.1 : Breakdown of Day work Rates: Labor					
Item no.	**Description**	**Qty**	**Unit**	**Unit Rate in US$**	**Amount in US$**
4.4.1	**Supervision and Labor**				
4.4.1.1	Engineer	350	h		
4.4.1.2	Foreman	400	h		
4.4.1.3	Surveyor	150	h		
4.4.1.4	Technician	600	h		
4.4.1.5	Skilled laborer	600	h		
4.4.1.6	Semiskilled laborer	600	h		
4.4.1.7	Unskilled laborer	600	h		
4.4.1.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		specify		
				Total(Carried forward to SC-4.4)	
				Name of Bidder:	
				Signature of Bidder:	
Note:					
Note: The labor rate should include all cost needed to provide the Labor at required place including all related cost for poviding the labour, ensuring that the labor is qualified for his/her job and can perform the required task professionally.					

Schedule No. 4.4.2 : Breakdown of Day work Rates: Materials					
Item no.	**Description**	**Qty**	**Unit**	**Unit Rate in US$**	**Amount in US$**
4.4.2.1	**Concrete Work**				
4.4.2.1.1	Lean Concrete	50	m3		
4.4.2.1.2	Concrete to foundation	150	m3		
4.4.2.1.3	Concrete to superstructure	200	m3		
4.4.2.2	**Steel Reinforcement**				
4.4.2.2.1	Mild Steel reinforcement, including cutting, bending	10	t		
4.4.2.2.2	High tensile steel reinforcement, including cutting, bending	25	t		
4.4.2.3	**Structural Steel**				
4.4.2.3.1	Commercial sections, including cutting, welding, bolting	10	t		
4.4.2.4	**Excavation Work**				
4.4.2.4.1	Excavation in rock (type R), including shoring, backfill, haul and disposal	200	m3		
4.4.2.4.2	Ditto, in soil (type MB and LB)	400	m3		
4.4.2.4.5	**Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)**				
4.4.2.4.6	**Price for Control Point on Wave Switching Device (CPWSD) to be installed on 400kV Breaker supplied as per Schedule-2**	**1**	**Nos**		
4.4.2.4.7	**Price for Pre-Insertion Resistor (PIR) to be installed on 400kV Breaker supplied as per schedule-2**	**1**	**Nos**		
4.4.2.4.8	**Price for Stub-Bus Differential Protection for 400kV Future Bay**	**1**	**Nos**		
				Total(Carried forward to SC-4.4)	
				Name of Bidder:	
				Signature of Bidder:	

Note: Quoted Unit Price shall include all the cost required to perform task successfully such as loading, transportation, insurance, unloading, cutting (if required), placing as per intended required task, while insuring the quality of the material and health and safety, storing at proper storage place with security and carrying out works as per Employer's requirement and Conditions of Contract.

Schedule No. 4.4.3 : Breakdown of Day work Rates: Contractor's Equipment					
Item no.	**Description**	**Nominal quantity (hours)**	**Unit**	**Basic hourly rental rate**	**Amount**
4.4.3	**Contractors' Equipment**				
4.4.3.1	Concrete Mixer, up to 5 m3/h	20	h		
4.4.3.2	Concrete Mixer, above to 5 m3/h	20	h		
4.4.3.3	Concrete Pump (Self-Propelled) up to 20 m3/h	40	h		
4.4.3.4	Concrete Pump (Self-Propelled) above to 20 m3/h	40	h		
4.4.3.5	Concrete batch plant, up to 20 m3/h	20	h		
4.4.3.6	Concrete batch plant, above 20 m3/h	20	h		
4.4.3.7	Transit mixer, up to 5 m3	40	h		
4.4.3.8	Transit mixer, above to 5 m3	40	h		
4.4.3.9	Bulldozer, with ripper, up to CAT D8 class	50	h		
4.4.3.10	Bulldozer, with ripper, above to CAT D8 class	50	h		
4.4.3.11	Track loader, up CAT 953 class	30	h		
4.4.3.12	Track loader, above CAT 953 class	50	h		
4.4.3.13	Wheel loader, up to CAT 930 class	50	h		
4.4.3.14	Wheel loader, above CAT 930 class	50	h		
4.4.3.15	Track excavator	100	h		
4.4.3.16	Air Compressor	100	h		
4.4.3.17	Mobile crane, up to 10 t	50	h		
4.4.3.18	Mobile crane, above 10 t, up to 20 t	50	h		
4.4.3.19	Mobile crane, above 20 t	50	h		
4.4.3.20	Lorry, up to 10 t	100	h		
4.4.3.21	Lorry, above 10 t	100	h		
4.4.3.22	Tipper, up to 10 t	100	h		
4.4.3.23	Tipper, above 10 t	100	h		
4.4.3.24	Pick-up	200	h		
4.4.3.25	Diesel generator, up to 100 kW	100	h		
4.4.3.26	Diesel generator, above 100 kW, up to 250 kW	100	h		
4.4.3.27	Diesel generator, above 250 kW	100	h		
4.4.3.28	Welding Set, Including Welding Rods	300	h		
				Total (Carried forward to SC-4.4)	
				Name of Bidder:	
				Signature of Bidder:	

Note:

The Basic Hourly rates includes all cost that require to run and perform the task, such as Equipment rental with operator, maintenance of vehicle, running responsibility, health and safety protection, petrol, diesel, lubricants, driver, assistance etc. required for carrying the task with the equipment.

Schedule No. 4.5 : Other Installation Services					
Item no.	**Description**	**Unit**	**Quantity**	**Unit Rate in US$**	**Amount in US$**
				Sub Total 4.5.1	
4.5.1	**Environmental, Social, Health and Safety Management Plan**				
4.5.1.1	**General Mitigation Measures**				
4.5.1.1.1	Develop a detailed Environmental, Social, Health, and Safety (ESHS) Management Plan for Contractor's employees.	1	Lot		
4.5.1.1.2	Develop, provide training and enforce a Worker Code of Conduct that includes an anti-sexual harassment policy	1	Lot		
4.5.1.1.3	Conduct Employee Induction Training on H&S and environmental/social/cultural sensitivity	1	Lot		
4.5.1.1.4	Implement Community Grievance Redress Plan	1	Lot		
4.5.1.1.5	Personal Protection equipment all complete (Safety Boots, Reflection Jackets, Safety Helmet, Safety Goggles, Safety Mask, Safety earplugs, Safety hand gloves etc.)	1	Lot		
				Sub Total 4.5.1.1	
4.5.1.2	**Physical Environment Mitigation Measures**				
4.5.1.2.1	Implement an Erosion and Sediment Control Plan	1	Lot		
4.5.1.2.2	Manage excavated soils	1	Lot		
4.5.1.2.3	Spray disturbed areas with water if substantive off-site fugitive dust impacts occur	1	Lot		
4.5.1.2.4	Provide a pit toilet and bury all organic wastes at tower construction sites	1	Lot		
4.5.1.2.5	Install septic systems/package and proper wastewater disposal system for workers	1	Lot		
4.5.1.2.6	Provide hazardous material training to concerned staff	1	Lot		
4.5.1.2.7	Stockpile materials for use in controlling spills	1	Lot		
4.5.1.2.8	Provide secondary containment for any fuel or hazardous materials	1	Lot		
4.5.1.2.9	Collect and segregate all waste for reuse, recycle, or disposal	1	Lot		
4.5.1.2.10	Dispose of solid waste at approved waste disposal facilities	1	Lot		
				Sub Total 4.5.1.2	
4.5.1.3	**Socio-economic and Cultural Environment Mitigation Measures**				
4.5.1.3.1	Implement Workforce Management Plan	1	Lot		
4.5.1.3.2	Implement Worker Access Management Protocol	1	Lot		
4.5.1.3.3	Implement Traffic Management Plan and maintain the damaged roads caused by contractors	1	Lot		
4.5.1.3.4	Develop and Implement Worker Grievance Redress Mechanism	1	Lot		
4.5.1.3.5	Conduct community training on EMF risks	1	Lot		
				Sub Total 4.5.1.3	
4.5.1.4	**Gender, Social Inclusion and Counter-TIP Measures**				
4.5.1.4.1	Develop and implement Anti-Sexual Harassment Policy, provide orientation to the entire workers	Lot	1		
4.5.1.4.2	Conduct awareness raising and community meetings to encourage women, socially excluded, historically marginalized, vulnerable groups to apply for jobs	Lot	1		
4.5.1.4.3	Develop and Implement TIP Risk Management Plan	Lot	1		
4.5.1.4.4	Training to the Contractor's employees/staff on Gender and Social Inclusion, prevention on sexual harassment, gender-based violence, child labor and TIP	Lot	1		
4.5.1.4.5	Community TIP risk prevention sensitization and community consultation	Lot	1		
4.5.1.4.6	Community Grievance Redress Plan must have system of Anonymous reporting for TIP suspected cases	Lot	1		
				Sub Total 4.5.1.4	
4.5.2	**Testing And Commissioning**				
4.5.2.1	Site Testing and Commissioning of HV AIS Equipment	1	Lot		
4.5.2.2	Site Testing and Commissioning of Power Autotransformers	1	Lot		
4.5.2.3	Site Testing and Commissioning of 400kV GIS Equipment	1	Lot		
4.5.2.4	Site Testing and Commissioning of Protection/Communication and Control (SCADA and SAS) Equipment	1	Lot		
4.5.2.5	Site Testing and Commissioning of Electrical Auxiliary Service Equipment and Power MV and LV Cables	1	Lot		
4.5.2.6	Site Testing and Commissioning of Mechanical Auxiliary Service Equipment	1	Lot		
4.5.2.7	One Month Commercial Operation after Commissioning	1	Lot		
4.5.2.8	End to End Test for all points as specified, including Control, Protection & Remote End Modification	1	Lot		
4.5.2.9	Closed loop test of equipment all complete	1	Lot		
4.5.2.10	P.Q (Power Quality), Revenue Energy meter and all remaining equipment of S/S	1	Lot		

Schedule No. 4.5 : Other Installation Services					
Item no.	**Description**	**Unit**	**Quantity**	**Unit Rate in US$**	**Amount in US$**
4.5.2.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.5.2	
4.5.3	**Training and O&M Assistance**				
	Training at Manufacturers Work				
4.5.3.1	Control & Protection, Substation Automation System and Comm	1	Lot		
4.5.3.2	400 kV GIS Equipment and System (Circuit Breaker, Isolator, C	1	Lot		
	Training at Site				
4.5.3.3	Control & Protection (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.4	Substation Automation System including the integration aspect of SCADA (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.5	For 400kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance. (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.6	Operation and maintenance of Transformers (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.7	AC/DC auxiliaries and mechanical system (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.8	Training at site for other systems (provide list)	1	Lot		
				Sub Total 4.5.3	
				Total(Carried forward to SC-4)	
			Name of Bidder:		
			Signature of Bidder:		

Price Schedule No. 5 : Grand Summary

Item No	Description	Total Price in US$
5.1	Total Schedule No. 1. Design Services	
5.2	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Abroad	
5.3	Total Schedule No. 3. Plant, and Mandatory Spare Parts Supplied from within the Employer's Country	
5.4	Total Schedule No. 4. Installation and Other Services including all related Civil Works (Excluding Summary of Breakdown of Day works) (includes SC-4.1, SC-4.2, SC-4.3 and SC-4.5)	
5.5	**TOTAL (to Bid Form - Resulting contract Price after correction if any)**	
5.6	**Output VAT (if applicable)**	
5.7	**Total including Output VAT (5.5+5.6)**	
5.8	Total of Summary of Breakdown of Day works (to bid form) (from item No.4.6 of SC-4)	
5.9	**Grand Total Including Day work for Evaluation and Comparison Purpose (5.5+5.8)**	
	Name of Bidder:	
	Signature of Bidder:	

Note:

Quoted Unit Price shall include all the cost required to perform task successfully such as all resources required to carry out the Work, personnel, material, equipemnt, loading, transportation, insurance, unloading and storing at proper storage place and carrying out works as per Employer's requirement and Conditions of Contract.

The purpose of price schedules is to identify the Bid Price which will be used to determine progress payment and the rates can be used to determine the price of any variation to scope . The Bid Price if accepted and included in the Contract shall become Contract Price and the Contract price shall not be adjusted (except as stated under Conditions of Contract under Sub-Clause 13.8) in case any quantity varies. The Price quoted under Price Schedule is as per provision of Employer's Requirements and Conditions of Contract.

Price Schedule No. 6 : Recommended Spare Parts, Repair and Maintenance Tools (Breakdown of Rates)

Item No	Description	Qty	CIP Price in US$ foreign parts	EXW Price in US$ (Local Parts	Total Price (CIP)	Total Price (EXW)
		1	*2*	*3*	*(1) x (2)*	*(1)x((3)*
				(CIP and EXW) TOTAL		

Name of Bidder:	
Signature of Bidder:	

Note:

The price of recommended spare parts quoted in Price Schedule No. 6 shall not be considered for evaluation. This is because such spare parts would normally be used after long time durations beyond the MCC Compact end date, and could not be financed from the Compact funds. Still the recommended spare parts may be financed directly by the government. Quoted Unit Price shall include all the cost required to perform task successfully such as loading, transportation, insurance, unloading and storing at proper storage place and carrying out works as per Employer's requirement and Conditions of Contract.

EXW-Works site in Nepal: All Plant and Mandatory Spare Parts Supplied within the country shall be quoted as EXW. The Contractor will also be responsible for other associate charge to bring all goods and equipment to site.

CIP-Works site in Nepal: All Plant and Mandatory Spare Parts Supplied from Abroad shall be quoted as CIP- Works site in Nepal basis. The Contractor will be responsible for custom clearance, insurance and other associate charge to bring all goods and equipment to site.

Quoted Unit Price shall include all the cost required to perform task successfully such as cost of goods, resouces, loading, transportation, insurance, unloading and storing at proper storage place.

Lot 3 - Price Schedules

Millennium Challenge Account Nepal
Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of
Lot 3: 400 kV New Damauli Substation
Price Schedule

Breakdown of Rates and Prices Schedule No. 1. Design Services					
Item No	**Description**	**Qty**	**Unit**	**Unit Rate US$**	**Total Price US$**
		1		***2***	***(1) x (2)***
1.1	**Design Works (Electrical)**				
Complete Electromechanical and Electrical Design of New Substation as Specified in Scope and Employers Requirements including but not limited to:					
1.1.1	Substation Design (SLD, Layout, Section elevation, P&C, SCADA, 400/220kV Switchgear, Auto Transformers along with connections, Auxiliary System, Control, LV & Fiber Optic Cables along with connections for the same, etc.)	1	Lot		
1.1.2	Thermal Calculations (Normal and emergency continuous current ratings of the switchgear and each main current path component)	1	Lot		
1.1.3	Insulation Coordination Study	1	Lot		
1.1.4	Lightning Surge Overvoltage Study	1	Lot		
1.1.5	Transient Recovery Voltage (TRV) Study for GIS	1	Lot		
1.1.6	Grounding Analysis for entire station	1	Lot		
1.1.7	All the requested settings, Protection Coordination, Relay Test Plan, Configuration and Programming on Intelligent Electronic Device (IEDs) such as Relays, RTUs, Automation system, etc. to ensure normal function of integrated system at substation and with other facilities in the entire power system.	1	Lot		
1.1.8	GIS System Earthing and Bonding Study	1	Lot		
1.1.9	Outdoor Switchyard Lighting Study	1	Lot		
1.1.10	Power Cable Ampacity Study	1	Lot		
1.1.11	Rigid Bus Study	1	Lot		
1.1.12	Power Cable Pulling Tension Calculation	1	Lot		
1.1.13	Any other design work not specifically mentioned above but deemed necessary or as required by employer for satisfactory completion of design work.	1	Lot		
				Sub Total 1.1	
1.2	**Design Works (Civil)**				
Complete Civil Design of New Substation as Specified in Scope and Employers Requirements including but not limited to:					
1.2.1	Geotechnical investigation data and drawings including on-site support during excavation and compaction.	1	Lot		
1.2.2	Hydrological, Environmental and Social Assessment of New Damauli Substation area as described in the Technical Specification	1	Lot		
1.2.3	Surveying and benchmarking design and drawings including on-site support during site preparation.	1	Lot		
1.2.4	Substation Design in Civil, Structural, Mechanical and Architectural, such as foundation works, hot dip galvanised steel supporting structures for all outdoor electrical equipment structures, other civil works like boundary wall etc., substation buildings, roads, cable trenches, water drainage system, oil containment chamber and sump pit, fire walls, earthing works, etc. of new substation complete in all respect.	1	Lot		
1.2.5	Design of rail tracks for movement of power transformers on the reinforced concrete foundations.	1	Lot		
1.2.6	Any Architectural-Related Calculations and Analysis	1	Lot		
1.2.7	Any Mechanical-Related Calculations and Analysis	1	Lot		
1.2.8	Any other design work not specifically mentioned above but deemed necessary or as required by employer for satisfactory completion of design work.	1	Lot		
				Sub Total 1.2	
				Total(To Schedule No. 5. Grand Summary)	
				Name of Bidder:	
				Signature of Bidder:	

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.1	**AIS HV and MV Equipment**					
2.1.1	167 MVA, (400/√3/220/√3/33) kV, Single Phase Auto-Transformer with OLTC, RTCC Facility, Surge protection arrangement (AIS) for HV, IV and LV side and with Bushing CT complete with all accessories as specified		7	Nos		
2.1.2	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering		12	Nos		
2.1.3	Current Transformer (CT), 400kV, Single Phase, Live Tank Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA		12	Nos		
2.1.4	Current Transformer (CT), 72.5kV, Single Phase 2 Windings		6	Nos		
2.1.5	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV		12	Nos		
2.1.6	Station Service Transformer, 630 kVA, 33/0.4kV		2	Nos		
2.1.7	30kV,10kA Lightning arrester for 33kV line bays		6	Nos		
2.1.8	30kV,10kA Lightning arrester for 33/0.4kV station service transformers		6	Nos		
2.1.9	72.5kV Double Break Isolator, Single Phase		1	Lot		
2.1.10	72.5kV Circuit Breaker, Three Phase, 50Hz.		2	Nos		
2.1.11	400kV Bus Support Post Insulator		1	Lot		
2.1.12	72.5kV Bus Support Post Insulator		1	Lot		
2.1.13	Suspension/Tension Insulator Strings, Including Hardware		1	Lot		
2.1.14	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.1	
2.2	**Hot Dip Galvanized Steel**					
2.2.1	Gantry Column for 400 kV Incoming Line		5	Nos		
2.2.2	Gantry Girder for 400 kV Incoming Line		4	Nos		
2.2.3	Support Structure for 400 kV Current Transformer		12	Nos		
2.2.4	Support Structure for 400 kV Capacitive Voltage Transformer		12	Nos		
2.2.5	Support Structure for 400 kV Surge Arrester		12	Nos		
2.2.6	Support Structure for 400 kV Bus Support		1	Lot		
2.2.7	Support Structure for 72.5 kV Current Transformer		6	Nos		
2.2.8	Support Structure for 72.5 kV Bus Support or Pot Head		1	Lot		
2.2.9	Support Structure for 72.5 kV Single Switch Stand		1	Lot		
2.2.10	Support Structure for 30kV Lightning Arrestor		12	Nos.		
2.2.11	Structures for Lightning Mast and other Lighting structures		1	Lot		
2.2.12	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.2	
2.3	**Bus Bar and Overhead Connections**					
2.3.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness		1	Lot		
2.3.2	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)		1	Lot		
2.3.3	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel		1	Lot		
2.3.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.3	
2.4	**LV, MV, HV Control and Power Cable**					
2.4.1	LV Control Cables		1	Lot		
2.4.2	LV Power Cables		1	Lot		
2.4.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.4.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)		1	Lot		
2.4.5	33kV Cable Pothead		1	Lot		
2.4.6	220 kV HV Cable		1400	mtrs		
	220 kV Termination Bushing Outdoor for Auto connection		7	Nos.		
	220 kV GIS termination		7	Nos.		
2.4.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.		1	Lot		
2.4.8	Power Cable for Filter Plant (Transformer) 3.5CX240 sqmm (Armoured, PVC Insulated) with suitable termination arrangement all complete		1	Lot		
2.4.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.4	
2.5	**AC AND DC STATION SUPPLY**					
2.5.1	**400V AC Main Switch Board**					
2.5.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		3	Nos		
2.5.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers		1	Nos		
2.5.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer		1	Nos		
2.5.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer		1	Nos		
2.5.2	**400V AC Main Lighting Board**					
2.5.2.1	100KVA Lighting Transformer		2	Nos		
2.5.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker		1	Nos		
2.5.3	**400V AC Emergency Lighting Distribution Board**					
2.5.3.1	100KVA Lighting Transformer		1	Nos		
2.5.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker		1	Nos		
2.5.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers,		1	Nos		
2.5.4	**400V AC Distribution Board**					
2.5.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers		1	Nos		
2.5.4.2	400/110V, 50VA, Potential Transformer		3	Nos		
2.5.4.3	400/1A Current Transformer, Class 5P20		1	Nos		
2.5.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers		1	Nos		
2.5.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker		1	Nos		
2.5.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers		1	Nos		
2.5.5	**400V AC AMF Panel**					

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Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.5.5.1	400/1A Current Transformer, Class 1		3	Nos		
2.5.5.2	400/1A Current Transformer, Class 5P20		1	Nos		
2.5.6	**DC Chargers and Batteries**					
2.5.6.1	220V Battery Charger (Float/Boost)		3	Nos		
2.5.6.2	48V Battery charger (Float/Boast)		3	Nos		
2.5.6.3	250A Throw over Switch, Interlock		6	Nos		
2.5.6.4	Battery, 220Vdc, 108 Minimum Cells		2	Nos		
2.5.6.5	Battery, 48Vdc, 24 Minimum Cells		2	Nos		
2.5.7	**DC Distribution Boards**					
2.5.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions		2	Nos		
2.5.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions		2	Nos		
2.5.7.3	DC Fuse Box, 220Vdc		1	Lot		
2.5.7.4	DC Fuse Box, 48Vdc		1	Lot		
2.5.8	**Other Equipment**					
2.5.8.1	Diesel Generator Set, 250kVA (Including Fuel Tank)		1	Nos		
2.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.5	
2.6	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**					
2.6.1	**Line/feeder Bay**					
2.6.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole		8	Nos		
2.6.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set		16	Nos		
2.6.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set		16	Nos		
2.6.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		16	Nos		
2.6.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set		8	Nos		
2.6.1.6	Voltage Transformers, 400kV, dual secondary, with isolating link, Single-phase, Three-phase set		8	Nos		
2.6.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set		8	Nos		
2.6.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		8	Nos		
2.6.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		8	Nos		
2.6.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		8	Nos		
2.6.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.1.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Line/feeder Bay Lot		8	Bays		
2.6.2	**Transformer bay**					
2.6.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		4	Nos		
2.6.2.1.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set		8	Nos		
2.6.2.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set		8	Nos		
2.6.2.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		8	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.6.2.1.5	Transformer Bay High Speed Earthing Switches, with removable earthing link 400kV, 50kA,Three-pole group operated		3	Nos		
2.6.2.1.6	Voltage Transformers, 400kV, dual secondary, with isolating link, single-phase, three-phase set		3	Nos		
2.6.2.1.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set		6	Nos		
2.6.2.1.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set		6	Nos		
2.6.2.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		4	Nos		
2.6.2.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		4	Nos		
2.6.2.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.2.1.12	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.2.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.2.1.14	Isolating & Earthing Switches, 400kV, 4000A, 50kA Single phase, and Auxiliary Gas Insulated Bus (GIB) for Spare Transformer,GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete. 33kV isolators, 33kV cables , jumpers as required all complete		3	Nos		
2.6.2.1.15	Gas Insulated bus (GIB) and required supports for GIB run whole for Transformer Bay Lot		4	Bays		
2.6.3	**Diameter Middle Breaker Bay-400 kV**					
2.6.3.1	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole		3	Nos		
2.6.3.2	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device		2	Nos		
2.6.3.3	Current Transformer Modules, Three cores, 400kV, Three-phase set		10	Nos		
2.6.3.4	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set		10	Nos		
2.6.3.5	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		10	Nos		
2.6.3.6	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)		5	Nos		
2.6.3.7	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)		5	Nos		
2.6.3.8	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices		1	Lot		
2.6.3.9	All metallic structures and supports required for GIS complete with accessories		1	Lot		
2.6.3.10	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices		1	Lot		
2.6.4	**Gas Insulated BUSBAR**					
2.6.4.1	400kV , 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures		6	Diameter		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.6.4.2	Voltage Transformers, 400kV, dual secondary, single-phase, three-phase set		2	Nos		
2.6.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set		2	Nos		
2.6.4.4	Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set		2	Nos		
2.6.4.5	Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set		2	Nos		
2.6.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.6	
2.7	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**					
2.7.1	**Complete set of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**					
2.7.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		17	Nos		
2.7.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)		8	Nos		
2.7.1.3	Transformer Protection Panel		4	Nos		
2.7.1.4	400kV (Duplicate Bus Bar Protection)		2	Set		
2.7.1.5	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.7.2	**Complete set of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**					
2.7.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)		2	Nos		
2.7.2.2	Transformer Protection Panel		2	Nos		
2.7.2.3	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
2.7.3	**Substation Automation & Metering**					
2.7.3.1	SAS Operator Station for control of 400/220/33 kV		1	Set		
2.7.3.2	Substation Automation System (SAS) for 400 kV System per diameter		6	Set		
2.7.3.4	Substation Automation System (SAS) for 33kV System per feeder		2	Set		
2.7.3.5	Substation Automation System (SAS) for Auxiliary System		1	Set		
2.7.3.6	Integration of all 400kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.		1	Lot		
2.7.3.7	Telecommunication system of New Damauli		1	Lot		
2.7.3.8	Fibre Optic SDH System		1	Lot		
2.7.3.9	Phone System		1	Lot		
2.7.3.10	400 kV Metering		1	Lot		
2.7.3.11	Miscellaneous Relay and Control Equipment, not included above		1	Lot		
					Sub Total 2.7	
2.8	**Grounding System**					
2.8.1	Stranded Bare Copper 240 Sq. mm** Grid (Including Fusion and Mechanical Connectors)		1	Lot		
2.8.2	Grounding Rods		1	Lot		
2.8.3	Embedded Grounding System - 400kV and 220kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)		1	Lot		
2.8.4	Embedded Grounding System - Control room		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.8.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.8	
2.9	**Lightning Protection System**					
2.9.1	Overhead Galvanized Steel Wire, Including Hardware		1	Lot		
2.9.2	Lightening Mast for Protection		1	Lot		
2.9.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.9	
2.10	**Firefighting System**					
2.10.1	Fire protection/detection for 7 (Seven) auto transformers		1	Lot		
2.10.2	Fire protection/detection for 400kV GIS Building		1	Lot		
2.10.3	Fire protection/detection for Control House		1	Lot		
2.10.4	Fire protection/detection system for pump house building		1	Lot		
2.10.5	Fire protection/detection system for generator diesel tank		1	Lot		
2.10.6	Portable fire extinguishers		1	Lot		
2.10.7	Clean-agent fire extinguishers		1	Lot		
2.10.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.10	
2.11	**HVAC And Ventilation Systems**					
2.11.1	400kV GIS Building HVAC and Ventilation Systems		1	Lot		
2.11.2	Control House HVAC and Ventilation Systems		1	Lot		
					Sub Total 2.11	
2.12	**Accessories and Ancillary Material**					
2.12.1	Junction and marshalling boxes, outdoor		1	Lot		
2.12.2	Junction and marshalling boxes, indoor		1	Lot		
2.12.3	Outdoor lighting, including lighting fixtures		1	Lot		
2.12.4	Indoor lighting, including lighting fixtures		1	Lot		
2.12.5	Water Supply System as per TS		1	Lot		
2.12.6	Rainwater harvesting as per TS		1	Lot		
2.12.7	Control Cabinet for outdoor lighting		1	Lot		
2.12.8	Electric Overhead Travelling Crane for installation and removal of GIS Equipment		1	Lot		
2.12.9	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.		1	Lot		
2.12.10	Visual Monitoring System		1	Lot		
2.12.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.12	
2.13	**Mandatory Maintenance, Repair tools and Testing Instruments**					
2.13.1	**GIS Equipment**					
2.13.1.1	400kV GIS SF6 leakage detector, analyzer and processing unit all complete		1	Lot		
2.13.1.2	400kV GIS Wrenches and tools		1	Lot		
2.13.1.3	400kV GIS Pressure gauge		1	Nos		
2.13.1.4	400kV GIS Gas sampling and moisture meter		1	Nos		
2.13.1.5	400kV GIS Micro-Ohmmeter		1	Nos		
2.13.1.6	400kV GIS Circuit-breaker, timing tester		1	Nos		
2.13.1.7	400kV GIS Laptop computer with switcialized software for GIS setting and monitoring		1	Nos		
2.13.1.8	Complete set of SF6 gas service cart mounted on a trailer for mobile application. SF6 gas refilling cart equipped with 1 SF6 gas cylinder and the necessary instruments and adapters for easy and quick gas refilling in case of losses		1	Lot		
2.13.1.9	HV Test Bushing for GIS		1	Lot		
2.13.1.10	Online Partial Discharge Monitoring System		1	Nos		
2.13.2	**Auto Transformer & Station Service Transformer**					

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

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			1	*2*	*3*	*(1) x (3)*
2.13.2.1	Oil-treatment unit 6000lph along with suitable size and quantity of connection arrangement (MCCB (240-300 Amp),terminal lugs etc.) all complete (autotransformer)		1	Nos		
2.13.2.2	Oil dielectric tester		1	Nos		
2.13.2.3	Dielectric tester based on tan δ and dielectric losses , 10 kV		1	Nos		
2.13.2.4	Megger, electronic, 5 kV		1	Nos		
2.13.2.5	Wrenches and tools		1	Lot		
2.13.3	**Complete set of Control and Protection panels for Substation**					
2.13.3.1	Relay Test Kit		1	Lot		
2.13.3.2	Test Equipment & tools for SAS SYSTEM for measuring, configuration & diagnostics.		1	Lot		
					Sub Total 2.13	
2.14	**Mandatory Spare Parts**					
2.14.1	**HV Equipment**					
2.14.1.1	Unit of 400kV surge arrester, complete with grading ring, terminals and surge counter		1	Nos		
2.14.1.2	Unit of 220kV surge arrester, complete with grading ring, terminals and surge counter		1	Nos		
2.14.1.3	Capacitive voltage transformer, 400kV		1	Nos		
2.14.1.4	Current transformer, 400kV		1	Nos		
2.14.1.5	Current transformer, 72.5kV		1	Nos		
2.14.2	**Auto Transformer**					
2.14.2.1	Complete set of gaskets with grease, for cover, manholes, hand holes, and pipping fittings.		2	Nos		
2.14.2.2	Lot of LV control and protective components, minimum one unit of each type of components used		2	Nos		
2.14.2.3	Pressure relief device, complete with accessories		2	Nos		
2.14.2.4	Bushings, one complete unit of each type used, with accessories		2	Nos		
2.14.2.5	Current transformer, one unit of each type		2	Nos		
2.14.2.6	Oil-circulating pump with motor, complete with accessories		2	Nos		
2.14.2.7	Cooling fan, complete with motor		2	Nos		
2.14.2.8	Buchholz relay, complete		2	Nos		
2.14.2.9	One instrument of each type used (temperature, oil level, pressure vent, etc.)		2	Nos		
2.14.2.10	One valve of each type used		2	Nos		
2.14.2.11	Insulating oil, 5% of the volume used		2	Nos		
2.14.2.12	Silica gel, quantity for one load		2	Nos		
2.14.2.13	Tap changer diverter switch, spare contacts and transition resistance		2	Nos		
2.14.2.14	Tap changer selector switch spare contacts		2	Nos		
2.14.2.15	Rolls of Kraft insulating paper		2	Nos		
2.14.2.16	Additional spare parts as per Chapter 3: Auto Transformer Specification of Part 2: Employer's Requirements, Section V-B1 (Technical Specifications).		1	Lot		
2.14.3	**630kVA Transformer**					
2.14.3.1	All Bushing with metal parts (each voltage rating) for 630 KVA Transformer		1	Nos		
2.14.3.2	Oil Temperature Indicator with sensing device		1	Lot		
2.14.3.3	Tap Changer Contacts		1	Lot		
2.14.3.4	Buchhloz Relay		1	Nos		
2.14.3.5	Explosion vent diaphragm		1	Nos		
2.14.3.6	Set of valve (each type)		1	Lot		
2.14.3.7	3-Phase 11 kV Horn Gap Fuse		1	Lot		
2.14.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.14	

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.15	**Spare Parts for AC and DC Station Supply**					
2.15.1	**Spare for LV Switchgear**					
2.15.1.1	LV circuit breaker, complete, with CT's and protection devices		1	Nos		
2.15.1.2	Outgoing thermomagnetic breakers - one unit of each type used		2	Nos		
2.15.1.3	Metering - one instrument of each type used		1	Nos		
2.15.1.4	Protection (other than included in LV breaker) One unit of each type used		1	Nos		
2.15.1.5	Automatic Transfer Switch One complete controller including sensors		1	Nos		
2.15.1.6	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Nos		
2.15.2	**Spare for DC Distribution Panels**					
2.15.2.1	Thermomagnetic breakers one unit of each type used		2	Nos		
2.15.2.2	Metering - one metering instrument of each type used		1	Nos		
2.15.2.3	Protection (other than included in LV breaker) One unit of each type used		1	Nos		
2.15.2.4	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.		1	Nos		
2.15.3	**Spare for Diesel Generator Set**					
2.15.3.1	Replaceable elements for air filter		1	Nos		
2.15.3.2	Replaceable elements for oil filter		1	Nos		
2.15.3.3	Replaceable elements for fuel filter		1	Nos		
2.15.3.4	Complete set of injectors		1	Nos		
2.15.3.5	Fuel injector pump		1	Nos		
2.15.3.6	Oil pump		1	Nos		
2.15.3.7	Intake valves		1	Nos		
2.15.3.8	Seats for intake valves		1	Nos		
2.15.3.9	Exhaust valves		1	Nos		
2.15.3.10	Set for exhaust valves		1	Nos		
2.15.3.11	Disconnect switch, with grounding blades, 245 kV, 3 Ø		1	Nos		
2.15.3.12	Set of pistons		1	Nos		
2.15.3.13	Set of complete bearings of the engine		1	Nos		
2.15.3.14	Set of all gaskets needed for the engine		1	Nos		
2.15.3.15	Set of thermostats		1	Nos		
2.15.3.16	Set of bearings for the alternator		1	Nos		
2.15.3.17	Set of control cards, at least one unit of each type used		1	Nos		
2.15.3.18	Diodes and thyristors of each type used		3	Nos		
2.15.3.19	Lamp, one unit of each type used		10	Nos		
2.15.3.20	Auxiliary relay, one unit of each type used		1	Nos		
2.15.3.21	Multifunction metering instrument		1	Nos		
2.15.3.22	Voltage and speed regulator component and actuator		1	Nos		
2.15.3.23	Controller components		1	Nos		
2.15.3.24	Instrument, detectors		1	Nos		
2.15.4	**Spare for Batteries**					
2.15.4.1	One unit of battery used in 220 V DC system		2	Nos		
2.15.4.2	Loose parts for 220 V DC - connection elements, cables, links, etc.		1	Nos		
2.15.4.3	One unit of battery used in 48 Vdc system		1	Nos		
2.15.4.4	Loose parts for 48 V DC - connection elements, cables, links, etc.		1	Nos		
2.15.5	**Spare for Battery Chargers**					
2.15.5.1	Complete bridge of thyristors assembled on a cooling base		1	Nos		
2.15.5.2	Controller, complete including each type of card used		1	Nos		
2.15.5.3	Loose elements - auxiliary relays, breakers, metering instruments, control switches, fuses, etc.		1	Nos		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.15.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.15	
2.16	**Mandatory spare parts - Miscellaneous material**					
2.16.1	Junction and marshalling boxed, outdoor, one of each type used		1	Nos		
2.16.2	Junction and marshalling boxed, indoor, one of each type used		1	Nos		
2.16.3	Outdoor lighting fixture, one unit of each type used		3	Nos		
2.16.4	Post-type insulator, one unit of each type used		2	Nos		
2.16.5	Suspension insulator, 5% of the total used		1	Nos		
2.16.6	Bus bar (rigid and strain) hardware, including, connectors, terminals, separator, corona rings, 5% of each type used, minimum one unit		1	Nos		
2.16.7	Grounding conductors, 5% of the installed conductors (stranded copper conductor, rectangular-shape copper bar and grounding rod)		1	Nos		
2.16.8	Fusion connection material, including molds, welding powder and installation tools, quantity required to make 5% of the total executed connections		1	Nos		
2.16.9	Mechanical connectors for grounding, 5% of the total executed connections		1	Nos		
2.16.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.16	
2.17	**Mandatory spare parts for 400kV**					
2.17.1	**Spare Gas**					
2.17.1.1	SF6 bottles required to fill the two largest volume compartments		1	Lot		
2.17.2	**Circuit Breakers, 4000 A, 50kA**					
2.17.2.1	Circuit breaker, complete pole assembly		1	Lot		
2.17.2.2	Complete sets of main contacts		1	Lot		
2.17.2.3	Complete sets of arcing contacts		2	Lot		
2.17.2.4	Operating mechanism, complete		1	Lot		
2.17.2.5	Operating mechanism motor		2	Lot		
2.17.2.6	Closing coils		4	Lot		
2.17.2.7	Tripping coils		4	Lot		
2.17.3	**Disconnect-Switches, 4000 A**					
2.17.3.1	Disconnect-Switch, complete pole		1	Nos		
2.17.3.2	Complete set of contacts		2	Nos		
2.17.3.3	Operating mechanism, complete		1	Nos		
2.17.3.4	Operating mechanism motor		2	Nos		
2.17.4	**Maintenance Earthing Switches**					
2.17.4.1	Earthing-Switch, complete pole		1	Nos		
2.17.4.2	Complete set of contacts		2	Nos		
2.17.4.3	Operating mechanism, complete		1	Nos		
2.17.4.4	Operating mechanism motor		2	Nos		
2.17.5	**High-speed earthing Switches**					
2.17.5.1	High-speed earthing switch, complete pole		1	Nos		
2.17.5.2	Complete set of contacts		2	Nos		
2.17.5.3	Operating mechanism, complete		1	Nos		
2.17.5.4	Operating mechanism motor		2	Nos		
2.17.6	**Other Equipment**					
2.17.6.1	Voltage transformer, 400 kV, complete with disconnecting and earthing switch		3	Nos		
2.17.6.2	Current transformer, metering core, loose part		6	Nos		
2.17.6.3	Current transformer, protection core, loose part		6	Nos		
2.17.7	**400kV GIS Bay, Local Control Cabinet**					

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.17.7.1	One Bay Local Control Cabinet complete, wired, with all specified devices		1	Lot		
2.17.8	**Bus bar Elements**					
2.17.8.1	Bus conductor elements		1	Lot		
2.17.8.2	Bus connection elements		1	Lot		
2.17.8.3	GIS insulators, one of each type used		1	Lot		
2.17.8.4	Pressure relief elements		1	Lot		
2.17.9	**SF6-to-Air Bushing Modules**					
2.17.9.1	SF6-to-air bushing module, 400 kV, single phase		1	Lot		
2.17.10	**Loose Spare Parts**					
2.17.10.1	5% of auxiliary relays, control devices, fuses, terminal blocks, etc. minimum one unit of each type used		1	Lot		
2.17.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.17	
2.18	**Spare of LV, MV, HV Control and Power cables**					
2.18.1	LV control cable, 5% of the installed cables		1	Lot		
2.18.2	LV, MV power cable, 5% of the installed cables		1	Lot		
2.18.3	Cable installation accessories - 5% of the installed material		1	Lot		
2.18.4	220 kV HV Cable (continuous cable for the longest length installed)		1	Lot		
	220 kV Termination Bushing Outdoor for Auto connection		1	Nos.		
	220 kV GIS termination		1	Nos.		
2.18.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.18	
2.19	**Spare parts of Mechanical Equipment**					
2.19.1	**Fire protection**					
2.19.1.1	Fire protection/detection for auto transformer - one unit of each type used		1	Lot		
2.19.1.2	Clean-agent fire extinguisher		1	Lot		
2.19.1.3	Control building general fire protection/detection system, one unit of each component used		1	Lot		
2.19.1.4	GIS building general fire protection/detection system, one unit of each component used		1	Lot		
2.19.2	**Control building HVAC system**					
2.19.2.1	Throwaway air filters per air conditioning unit		1	Lot		
2.19.2.2	Pulley belts per air conditioning unit motor		1	Lot		
2.19.2.3	Thermostat per air conditioning unit		1	Lot		
2.19.3	**GIS building ventilation system**					
2.19.3.1	Throwaway air filters per ventilation system		1	Lot		

Breakdown of Rates and Prices Schedule No. 2. Plant, Goods and Equipment(Including Mandatory Spare Parts) Supplied from Abroad

Item No.	Description	Code (a)	Qty.	Unit	Unit Rate (b) US$ DDP plus all related cost as defined in foot note	Total Price (c) US$
			1	*2*	*3*	*(1) x (3)*
2.19.3.2	Pulley belts per ventilation unit motor		1	Lot		
2.19.3.3	Thermostat per ventilation unit		1	Lot		
2.19.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		1	Lot		
					Sub Total 2.19	
					Total (Carried forward to Grand SC-5)	
					Name of Bidder:	
					Signature of Bidder:	

Note:

****:This value is indicative, the Contractor will validate as per item 1.1.6 of Design Works (Electrical)*

Country of Origin Declaration Form

Item No.	Description	Code

***Note** : Bidders shall enter the full name of the country of origin of all imported plant and equipment. Enter the code as per the Country of Origin Declaration Form.*

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.1	**AIS HV and MV Equipment**				
3.1.1	167 MVA, (400/√3/220/√3/33) kV, Single Phase Auto-Transformer with OLTC, RTCC Facility, Surge protection arrangement (AIS) for HV, IV and LV side and with Bushing CT complete with all accessories as specified	7	Nos		
3.1.2	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering	12	Nos		
3.1.3	Current Transformer (CT), 400kV, Single Phase, Tank Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA	12	Nos		
3.1.4	Current Transformer (CT), 72.5kV, Single Phase 2 Windings	6	Nos		
3.1.5	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV	12	Nos		
3.1.6	Station Service Transformer, 630 kVA, 33/0.4kV	2	Nos		
3.1.7	30kV,10kA Lightning arrester for 33kV line bays	6	Nos		
3.1.8	30kV,10kA Lightning arrester for 33/0.4kV station service transformers	6	Nos		
3.1.9	72.5kV Double Break Isolator, Single Phase	1	Lot		
3.1.10	72.5kV Circuit Breaker, Three Phase, 50Hz.	2	Nos		
3.1.11	400kV Bus Support Post Insulator	1	Lot		
3.1.12	72.5kV Bus Support Post Insulator	1	Lot		
3.1.13	Suspension/Tension Insulator Strings, Including Hardware	1	Lot		
3.1.14	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.1	
3.2	**Hot Dip Galvanized Steel**				
3.2.1	Gantry Column for 400 kV Incoming Line	5	Nos		
3.2.2	Gantry Girder for 400 kV Incoming Line	4	Nos		
3.2.3	Support Structure for 400 kV Current Transformer	12	Nos		
3.2.4	Support Structure for 400 kV Capacitive Voltage Transformer	12	Nos		
3.2.5	Support Structure for 400 kV Surge Arrester	12	Nos		
3.2.6	Support Structure for 400 kV Bus Support	1	Lot		
3.2.7	Support Structure for 72.5 kV Current Transformer	6	Nos		
3.2.8	Support Structure for 72.5 kV Bus Support or Pot Head	1	Lot		
3.2.9	Support Structure for 72.5 kV Single Switch Stand	1	Lot		
3.2.10	Support Structure for 30kV Lightning Arrestor	12	Nos.		
3.2.11	Structures for Lightning Mast and other Lighting structures	1	Lot		
3.2.12	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.2	
3.3	**Bus Bar and Overhead Connections**				
3.3.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness	1	Lot		
3.3.2	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)	1	Lot		
3.3.3	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel	1	Lot		
3.3.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.3	
3.4	**LV, MV, HV Control and Power Cable**				
3.4.1	LV Control Cables	1	Lot		
3.4.2	LV Power Cables	1	Lot		
3.4.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)	1	Lot		
3.4.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.4.5	33kV Cable Pothead	1	Lot		
3.4.6	220 kV HV Cable	1400	mtrs		
	220 kV Termination Bushing Outdoor for Auto connection	7	Nos.		
	220 kV GIS termination	7	Nos.		
3.4.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.	1	Lot		
3.4.8	Power Cable for Filter Plant (Transformer) of suitable size with termination arrangement	1	Lot		
3.4.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.4	
3.5	**AC AND DC STATION SUPPLY**				
3.5.1	**400v AC Main Switch Board**				
3.5.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	3	Nos		
3.5.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers	1	Nos		
3.5.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer	1	Nos		
3.5.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer	1	Nos		
3.5.2	**400v AC Main Lighting Board**				
3.5.2.1	100KVA Lighting Transformer	2	Nos		
3.5.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker	1	Nos		
3.5.3	**400v AC Emergency Lighting Distribution Board**				
3.5.3.1	100KVA Lighting Transformer	1	Nos		
3.5.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker	1	Nos		
3.5.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers	1	Nos		
3.5.4	**400v AC Distribution Board**				
3.5.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	1	Nos		
3.5.4.2	400/110V, 50VA, Potential Transformer	3	Nos		
3.5.4.3	400/1A Current Transformer, Class 5P20	1	Nos		
3.5.4.4	400V Switchgear with Automation Controls, 630A with 2 Current Transformers	1	Nos		
3.5.4.5	400v Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker	1	Nos		
3.5.4.6	400v Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers	1	Nos		
3.5.5	**400v AC AMF Panel**				
3.5.5.1	400/1A Current Transformer, Class 1	3	Nos		
3.5.5.2	400/1A Current Transformer, Class 5P20	1	Nos		
3.5.6	**DC Chargers and Batteries**				

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.5.6.1	220V Battery Charger (Float/Boost)	3	Nos		
3.5.6.2	48V Battery charger (Float/Boast)	3	Nos		
3.5.6.3	250A Throw over Switch, Interlock	6	Nos		
3.5.6.4	Battery, 220Vdc, 108 Minimum Cells	2	Nos		
3.5.6.5	Battery, 48Vdc, 24 Minimum Cells	2	Nos		
3.5.7	**DC Distribution Boards**				
3.5.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
3.5.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
3.5.7.3	DC Fuse Box, 220Vdc	1	Lot		
3.5.7.4	DC Fuse Box, 48Vdc	1	Lot		
3.5.8	**Other Equipment**				
3.5.8.1	Diesel Generator Set, 250kVA (Including Full Tank)	1	Nos		
3.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.5	
3.6	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**				
3.6.1	**Line/feeder Bay**				
3.6.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole	8	Nos		
3.6.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set	16	Nos		
3.6.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	16	Nos		
3.6.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	16	Nos		
3.6.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set	8	Nos		
3.6.1.6	Voltage Transformers, 400kV, dual secondary, with isolating link, Single-phase, Three-phase set	8	Nos		
3.6.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	8	Nos		
3.6.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	8	Nos		
3.6.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	8	Nos		
3.6.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	8	Nos		
3.6.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
3.6.1.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
3.6.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
3.6.1.14	Gas Insulated bus (GIB) and required supports for GIB run whole for Line/feeder Bay Lot	8	Bays		
3.6.2	**Transformer bay**				
3.6.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
3.6.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	8	Nos		
3.6.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	8	Nos		
3.6.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	8	Nos		
3.6.2.5	Transformer Bay High Speed Earthing Switches, with removable earthing link 400kV, 50kA,Three-pole group operated	3	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.6.2.6	Voltage Transformers, 400kV, dual secondary, with isolating link, single-phase, three-phase set	3	Nos		
3.6.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	6	Nos		
3.6.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set	6	Nos		
3.6.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	4	Nos		
3.6.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	4	Nos		
3.6.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
3.6.2.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
3.6.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
3.6.2.14	Isolating & Earthing Switches, 400kV, 4000A, 50kA Single phase, and Auxiliary Gas Insulated Bus (GIB) for Spare Transformer,GIS to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete. 33kV isolators, 33kV cables , jumpers as required all complete	3	Nos		
3.6.2.15	Gas Insulated bus (GIB) and required supports for GIB run whole for Transformer Bay Lot	4	Bays		
3.6.3	**Diameter Middle Breaker Bay-400 kV**				
3.6.3.1	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole	3	Nos		
3.6.3.2	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	2	Nos		
3.6.3.3	Current Transformer Modules, Three cores, 400kV, Three-phase set	10	Nos		
3.6.3.4	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	10	Nos		
3.6.3.5	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	10	Nos		
3.6.3.6	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	5	Nos		
3.6.3.7	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	5	Nos		
3.6.3.8	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
3.6.3.9	All metallic structures and supports required for GIS complete with accessories	1	Lot		
3.6.3.10	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
3.6.4	**Gas Insulated BUSBAR**				
3.6.4.1	400kV , 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures	6	Diameter		
3.6.4.2	Voltage Transformers, 400kV, dual secondary, single-phase, three-phase set	2	Nos		
3.6.4.3	Main Bus Bar High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	2	Nos		
3.6.4.4	Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	2	Nos		
3.6.4.5	Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	2	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as defined in foot note	Total Price (c) US$
			2	*3*	*(1) x (3)*
3.6.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 3.6	
3.7	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**				
3.7.1	**Complete set of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**				
3.7.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	17	Nos		
3.7.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)	8	Nos		
3.7.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	4	Nos		
3.7.1.4	400kV (Duplicate Bus Bar Protection)	2	Set		
3.7.1.5	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
3.7.2	**Complete set of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**				
3.7.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	2	Nos		
3.7.2.2	Transformer Protection Panel	2	Nos		
3.7.2.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
3.7.3	**Substation Automation & Metering**				
3.7.3.1	SAS Operator Station for control of 400/220/33 kV	1	Set		
3.7.3.2	Substation Automation System (SAS) for 400 kV System per diameter	6	Set		
3.7.3.3	Substation Automation System (SAS) for 33kV System per feeder	2	Set		
3.7.3.4	Substation Automation System (SAS) for Auxiliary System	1	Set		
3.7.3.5	Integration of all 400kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.	1	Lot		
3.7.3.6	Telecommunication system for New Damauli	1	Lot		
3.7.3.7	Fibre Optic SDH System	1	Lot		
3.7.3.8	Phone System	1	Lot		
3.7.3.9	400 kV Metering	1	Lot		
3.7.3.10	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
				Sub Total 3.7	
3.8	**Grounding System**				
3.8.1	Stranded Bare Copper 240 Sq. mm Grid (Including Fusion and Mechanical Connectors)	1	Lot		
3.8.2	Grounding Rods	1	Lot		
3.8.3	Embedded Grounding System - 400kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)	1	Lot		
3.8.5	Embedded Grounding System - Control room	1	Lot		
3.8.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.8	
3.9	**Lightning Protection System**				
3.9.1	Overhead Galvanized Steel Wire, Including Hardware	1	Lot		
3.9.2	Lightening Mast for Protection	1	Lot		
3.9.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.9	
3.10	**Firefighting System**				
3.10.1	Fire protection/detection for 7 (Seven) auto transformers	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country

Item No.	Description	Qty	Unit	Unit Rate (b) US$ EXW plus all related cost as defined in foot note	Total Price (c) US$
			2	*3*	*(1) x (3)*
3.10.2	Fire protection/detection for 400kV GIS Building	1	Lot		
3.10.3	Fire protection/detection for Control House	1	Lot		
3.10.4	Fire protection/detection system for pump house building	1	Lot		
3.10.5	Fire protection/detection system for generator diesel tank	1	Lot		
3.10.6	Portable fire extinguishers	1	Lot		
3.10.7	Clean-agent fire extinguishers	1	Lot		
3.10.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.10	
3.11	**HVAC And Ventilation Systems**				
3.11.1	400kV GIS Building HVAC and Ventilation Systems	1	Lot		
3.11.2	Control House HVAC and Ventilation Systems	1	Lot		
				Sub Total 3.11	
3.12	**Accessories and Ancillary Material**				
3.12.1	Junction and marshalling boxes, outdoor	1	Lot		
3.12.2	Junction and marshalling boxes, indoor	1	Lot		
3.12.3	Outdoor lighting, including lighting fixtures	1	Lot		
3.12.4	Indoor lighting, including lighting fixtures	1	Lot		
3.12.5	Water Supply System as per TS	1	Lot		
3.12.6	Rainwater harvesting as per TS	1	Lot		
3.12.7	Control Cabinet for outdoor lighting	1	Lot		
3.12.8	Electric Overhead Travelling Crane for installation and removal of GIS Equipment	1	Lot		
3.12.9	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.	1	Lot		
3.12.10	Visual Monitoring System	1	Lot		
3.12.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.12	
3.13	**Mandatory Maintenance, Repair tools and Testing Instruments**				
3.13.1	**GIS Equipment**				
3.13.1.1	400kV GIS SF6 leakage detector, analyzer and processing unit all complete	1	Lot		
3.13.1.2	400kV GIS Wrenches and tools	1	Lot		
3.13.1.3	400kV GIS Pressure gauge	1	Nos		
3.13.1.4	400kV GIS Gas sampling and moisture meter	1	Nos		
3.13.1.5	400kV GIS Micro-Ohmmeter	1	Nos		
3.13.1.6	400kV GIS Circuit-breaker, timing tester	1	Nos		
3.13.1.7	400kV GIS Laptop computer with switcialized software for GIS setting and monitoring	1	Nos		
3.13.1.8	Complete set of SF6 gas service cart mounted on a trailer for mobile application. SF6 gas refilling cart equipped with 1 SF6 gas cylinder and the necessary instruments and adapters for easy and quick gas refilling in case of losses	1	Lot		
3.13.1.9	HV Test Bushing for GIS	1	Lot		
3.13.1.10	Online Partial Discharge Monitoring System	1	Nos		
3.13.2	**Auto Transformer & Station Service Transformer**				
3.13.2.1	Oil-treatment unit 6000lph along with suitable size and quantity of connection arrangement (MCCB (240-300 Amp),terminal lugs etc.) all complete (autotransformer)	1	Nos		
3.13.2.2	Oil dielectric tester	1	Nos		
3.13.2.3	Dielectric tester based on tan δ and dielectric losses , 10 kV	1	Nos		
3.13.2.4	Megger, electronic, 5 kV	1	Nos		
3.13.2.5	Wrenches and tools	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	*3*	*(1) x (3)*
3.13.3	**Complete set of Control and Protection panels for Substation**				
3.13.3.1	Relay Test Kit	1	Lot		
3.13.3.2	Test Equipment & tools for SAS SYSTEM for measuring, configuration & diagnostics.	1	Lot		
				Sub Total 3.13	
3.14	**Mandatory Spare Parts**				
3.14.1	**HV Equipment**				
3.14.1.1	Unit of 400kV surge arrester, complete with grading ring, terminals and surge counter	1	Nos		
3.14.1.2	Unit of 220kV surge arrester, complete with grading ring, terminals and surge counter	1	Nos		
3.14.1.3	Capacitive voltage transformer, 400kV	1	Nos		
3.14.1.4	Current transformer, 400kV	1	Nos		
3.14.1.5	Current transformer, 72.5kV	1	Nos		
3.14.2	**Auto Transformer**				
3.14.2.1	Complete set of gaskets with grease, for cover, manholes, hand holes, and pipping fittings.	2	Nos		
3.14.2.2	Lot of LV control and protective components, minimum one unit of each type of components used	2	Nos		
3.14.2.3	Pressure relief device, complete with accessories	2	Nos		
3.14.2.4	Bushings, one complete unit of each type used, with accessories	2	Nos		
3.14.2.5	Current transformer, one unit of each type	2	Nos		
3.14.2.6	Oil-circulating pump with motor, complete with accessories	2	Nos		
3.14.2.7	Cooling fan, complete with motor	2	Nos		
3.14.2.8	Buchholz relay, complete	2	Nos		
3.14.2.9	One instrument of each type used (temperature, oil level, pressure vent, etc.)	2	Nos		
3.14.2.10	One valve of each type used	2	Nos		
3.14.2.11	Insulating oil, 5% of the volume used	2	Nos		
3.14.2.12	Silica gel, quantity for one load	2	Nos		
3.14.2.13	Tap changer diverter switch, spare contacts and transition resistance	2	Nos		
3.14.2.14	Tap changer selector switch spare contacts	2	Nos		
3.14.2.15	Rolls of Kraft insulating paper	2	Nos		
3.14.2.16	Additional spare parts as per Chapter 3: Auto Transformer Specification of Part 2: Employer's Requirements, Section V- B1 (Technical Specifications).	1	Lot		
3.14.3	**630kVA Transformer**				
3.14.3.1	All Bushing with metal parts (each voltage rating) for 630 KVA Transformer	1	Nos		
3.14.3.2	Oil Temperature Indicator with sensing device	1	Lot		
3.14.3.3	Tap Changer Contacts	1	Lot		
3.14.3.4	Buchhloz Relay	1	Nos		
3.14.3.5	Explosion vent diaphragm	1	Nos		
3.14.3.6	Set of valve (each type)	1	Lot		
3.14.3.7	3-Phase 11 kV Horn Gap Fuse	1	Lot		
3.14.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.14	
3.15	**Spare Parts for AC and DC Station Supply**				
3.15.1	**Spare for LV Switchgear**				
3.15.1.1	LV circuit breaker, complete, with CT's and protection devices	1	Nos		
3.15.1.2	Outgoing thermomagnetic breakers - one unit of each type used	2	Nos		
3.15.1.3	Metering - one instrument of each type used	1	Nos		
3.15.1.4	Protection (other than included in LV breaker) One unit of each type used	1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.15.1.5	Automatic Transfer Switch One complete controller including sensors	1	Nos		
3.15.1.6	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.	1	Nos		
3.15.2	**Spare for DC Distribution Panels**				
3.15.2.1	Thermomagnetic breakers one unit of each type used	2	Nos		
3.15.2.2	Metering - one metering instrument of each type used	1	Nos		
3.15.2.3	Protection (other than included in LV breaker) One unit of each type used	1	Nos		
3.15.2.4	One or 5% of loose material Auxiliary relays, contactors, fuses, terminals, etc.	1	Nos		
3.15.3	**Spare for Diesel Generator Set**				
3.15.3.1	Replaceable elements for air filter	1	Nos		
3.15.3.2	Replaceable elements for oil filter	1	Nos		
3.15.3.3	Replaceable elements for fuel filter	1	Nos		
3.15.3.4	Complete set of injectors	1	Nos		
3.15.3.5	Fuel injector pump	1	Nos		
3.15.3.6	Oil pump	1	Nos		
3.15.3.7	Intake valves	1	Nos		
3.15.3.8	Seats for intake valves	1	Nos		
3.15.3.9	Exhaust valves	1	Nos		
3.15.3.10	Set for exhaust valves	1	Nos		
3.15.3.11	Disconnect switch, with grounding blades, 245 kV, 3 Ø	1	Nos		
3.15.3.12	Set of pistons	1	Nos		
3.15.3.13	Set of complete bearings of the engine	1	Nos		
3.15.3.14	Set of all gaskets needed for the engine	1	Nos		
3.15.3.15	Set of thermostats	1	Nos		
3.15.3.16	Set of bearings for the alternator	1	Nos		
3.15.3.17	Set of control cards, at least one unit of each type used	1	Nos		
3.15.3.18	Diodes and thyristors of each type used	3	Nos		
3.15.3.19	Lamp, one unit of each type used	10	Nos		
3.15.3.20	Auxiliary relay, one unit of each type used	1	Nos		
3.15.3.21	Multifunction metering instrument	1	Nos		
3.15.3.22	Voltage and speed regulator component and actuator	1	Nos		
3.15.3.23	Controller components	1	Nos		
3.15.3.24	Instrument, detectors	1	Nos		
3.15.4	**Spare for Batteries**				
3.15.4.1	One unit of battery used in 220 Vdc system	2	Nos		
3.15.4.2	Loose parts for 220 Vdc - connection elements, cables, links, etc.	1	Nos		
3.15.4.3	One unit of battery used in 48 Vdc system	1	Nos		
3.15.4.4	Loose parts for 48 Vdc - connection elements, cables, links, etc.	1	Nos		
3.15.5	**Spare for Battery Chargers**				
3.15.5.1	Complete bridge of thyristors assembled on a cooling base	1	Nos		
3.15.5.2	Controller, complete including each type of card used	1	Nos		
3.15.5.3	Loose elements - auxiliary relays, breakers, metering instruments, control switches, fuses, etc.	1	Nos		
3.15.6	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.15	
3.16	**Mandatory spare parts - Miscellaneous material**				
3.16.1	Junction and marshalling boxed, outdoor, one of each type used	1	Nos		
3.16.2	Junction and marshalling boxed, indoor, one of each type used	1	Nos		
3.16.3	Outdoor lighting fixture, one unit of each type used	3	Nos		
3.16.4	Post-type insulator, one unit of each type used	2	Nos		
3.16.5	Suspension insulator, 5% of the total used	1	Nos		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	*3*	*(1) x (3)*
3.16.6	Bus bar (rigid and strain) hardware, including, connectors, terminals, separator, corona rings, 5% of each type used, minimum one unit	1	Nos		
3.16.7	Grounding conductors, 5% of the installed conductors (stranded copper conductor, rectangular-shape copper bar and grounding rod)	1	Nos		
3.16.8	Fusion connection material, including molds, welding powder and installation tools, quantity required to make 5% of the total executed connections	1	Nos		
3.16.9	Mechanical connectors for grounding, 5% of the total executed connections	1	Nos		
3.16.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.16	
3.17	**Mandatory spare parts for 400kV**				
3.17.1	**Spare Gas**				
3.17.1.1	SF6 bottles required to fill the two largest volume compartments	1	Lot		
3.17.2	**Circuit Breakers, 4000 A, 50kA**				
3.17.2.1	Circuit breaker, complete pole assembly	1	Lot		
3.17.2.2	Complete sets of main contacts	1	Lot		
3.17.2.3	Complete sets of arcing contacts	2	Lot		
3.17.2.4	Operating mechanism, complete	1	Lot		
3.17.2.5	Operating mechanism motor	2	Lot		
3.17.2.6	Closing coils	4	Lot		
3.17.2.7	Tripping coils	4	Lot		
3.17.3	**Disconnect-Switches, 4000 A**				
3.17.3.1	Disconnect-Switch, complete pole	1	Nos		
3.17.3.2	Complete set of contacts	2	Nos		
3.17.3.3	Operating mechanism, complete	1	Nos		
3.17.3.4	Operating mechanism motor	2	Nos		
3.17.4	**Maintenance Earthing Switches**				
3.17.4.1	Earthing-Switch, complete pole	1	Nos		
3.17.4.2	Complete set of contacts	2	Nos		
3.17.4.3	Operating mechanism, complete	1	Nos		
3.17.4.4	Operating mechanism motor	2	Nos		
3.17.5	**High-speed earthing Switches**				
3.17.5.1	High-speed earthing switch, complete pole	1	Nos		
3.17.5.2	Complete set of contacts	2	Nos		
3.17.5.3	Operating mechanism, complete	1	Nos		
3.17.5.4	Operating mechanism motor	2	Nos		
3.17.6	**Other Equipment**				
3.17.6.1	Voltage transformer, 400 kV, complete with disconnecting and earthing switch	3	Nos		
3.17.6.2	Current transformer, metering core, loose part	6	Nos		
3.17.6.3	Current transformer, protection core, loose part	6	Nos		
3.17.7	**400kV GIS Bay, Local Control Cabinet**				
3.17.7.1	One Bay Local Control Cabinet complete, wired, with all specified devices	1	Lot		
3.17.8	**Bus bar Elements**				
3.17.8.1	Bus conductor elements	1	Lot		
3.17.8.2	Bus connection elements	1	Lot		
3.17.8.3	GIS insulators, one of each type used	1	Lot		
3.17.8.4	Pressure relief elements	1	Lot		
3.17.9	**SF6-to-Air Bushing Modules**				
3.17.9.1	SF6-to-air bushing module, 400 kV, single phase	1	Lot		
3.17.10	**Loose Spare Parts**				
3.17.10.1	5% of auxiliary relays, control devices, fuses, terminal blocks, etc. minimum one unit of each type used	1	Lot		

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.17.10.2	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.17	
3.18	**Spare of LV, MV, HV Control and Power cables**				
3.18.1	LV control cable, 5% of the installed cables	1	Lot		
3.18.2	LV, MV power cable, 5% of the installed cables	1	Lot		
3.18.3	Cable installation accessories - 5% of the installed material	1	Lot		
3.18.4	220 kV HV Cable (continuous cable for the longest length installed)	1	Lot		
	220 kV Termination Bushing Outdoor for Auto connection	1	Nos.		
	220 kV GIS termination	1	Nos.		
3.18.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.18	
3.19	**Spare parts of Mechanical Equipment**				
3.19.1	**Fire protection**				
3.19.1.1	Fire protection/detection for auto transformer - one unit of each type used	1	Lot		
3.19.1.2	Clean-agent fire extinguisher	1	Lot		
3.19.1.3	Control building general fire protection/detection system, one unit of each component used	1	Lot		
3.19.1.4	GIS building general fire protection/detection system, one unit of each component used	1	Lot		
3.19.2	**Control building HVAC system**				
3.19.2.1	Throwaway air filters per air conditioning unit	1	Lot		
3.19.2.2	Pulley belts per air conditioning unit motor	1	Lot		
3.19.2.3	Thermostat per air conditioning unit	1	Lot		
3.19.3	**GIS building ventilation system**				

Breakdown of Rates and Prices Schedule No. 3. Plant, Goods and Equipment (Including Mandatory Spare Parts) Supplied from Within the Employer's Country					
Item No.	**Description**	**Qty**	**Unit**	**Unit Rate (b) US$ EXW plus all related cost as defined in foot note**	**Total Price (c) US$**
			2	***3***	***(1) x (3)***
3.19.3.1	Throwaway air filters per ventilation system	1	Lot		
3.19.3.2	Pulley belts per ventilation unit motor	1	Lot		
3.19.3.3	Thermostat per ventilation unit	1	Lot		
3.17.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 3.19	
				Total(To Schedule No. 5. Grand Summary)	
				Name of the Bidder:	
				Signature of Bidder:	

Note:

****:This value is indicative, the Contractor will validate as per item 1.1.6 of Design Works (Electrical)*

Breakdown of Rates and Prices Schedule No. 4. Installation and Other Services including all related Civil Works

Item No.	Description	Total
4.1	Breakdown of General Installation and Construction Items (from Schedule No. 4.1)	
4.2	Breakdown of Earthworks (from Schedule No.4.2)	
4.3	Breakdown of Civil Works (from Schedule No.4.3)	
4.4	Other Installation Services (from Schedule No.4.5)	
4.5	**Total Excluding Summary of Breakdown of Day works (from Schedule 4.4) (Carried forward to Grand SC-5)**	
4.6	**Summary of Breakdown of Day works (from Schedule 4.4) (Carried forward to Grand SC-5)**	
4.7	**Total Including Breakdown of Day works.**	
	Name of the Bidder:	
	Signature of Bidder:	

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.1	**Electromechanical Works General**				
4.1.1.1	Indoor and outdoor storage facilities for storing equipment and material in substation	1	Lot		
4.1.1.2	Site Office, Accommodation and vehicular arrangement as Specified in PSR	1	Lot		
4.1.1.3	Operation and Maintenance Manuals and Procedures	1	Lot		
4.1.1.4	"As-Built" Drawings for All Works including civil, building, mechanical etc.	1	Lot		
4.1.1.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.1	
4.1.2	**AIS HV and MV Equipment Installation**				
4.1.2.1	167 MVA, (400/√3/220/√3/33) kV, Single Phase Auto-Transformer with OLTC, RTCC Facility, Surge protection arrangement (AIS) for HV, IV and LV side and with Bushing CT complete with all accessories as specified	7	Nos		
4.1.2.2	Capacitive Voltage Transformer (CVT) 400kV, Single Phase 2 Windings, Secondary Voltage 110V, Accuracy 0.2, Min Burden 50VA, Application Metering	12	Nos		
4.1.2.3	Current Transformer (CT), 400kV, Single Phase, Tank Type, 3 Core, 2000-1000-500/1A, Class 0.2, Rated Output 15VA	12	Nos		
4.1.2.4	Current Transformer (CT), 72.5kV, Single Phase 2 Windings	6	Nos		
4.1.2.5	400kV Surge Arrester (SA), Zinc Oxide 366 kV Rated Voltage, 20kA, 12kJ/kV	12	Nos		
4.1.2.6	Substation Service Transformer, 630 kVA, 33kV/0.400 V	2	Nos		
4.1.2.7	30kV,10kA Lightning arrester for 33kV line bays	6	Nos		
4.1.2.8	30kV,10kA Lightning arrester for 33/0.4kV station service transformers	6	Nos		
4.1.2.9	72.5kV Double Break Isolator, Single Phase	1	Lot		
4.1.2.10	72.5kV Circuit Breaker, Three Phase, 50Hz.	2	Nos		
4.1.2.11	400kV Bus Support Post Insulator	1	Lot		
4.1.2.12	72.5kV Bus Support Post Insulator	1	Lot		
4.1.2.13	Suspension/Tension Insulator Strings, Including Hardware	1	Lot		
4.1.2.14	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.2	
4.1.3	**Hot Dip Galvanized Steel Installation**				
4.1.3.1	Gantry Column for 400 kV Incoming Line	5	Nos		
4.1.3.2	Gantry Girder for 400 kV Incoming Line	4	Nos		
4.1.3.3	Support Structure for 400 kV Current Transformer	12	Nos		
4.1.3.4	Support Structure for 400 kV Capacitive Voltage Transformer	12	Nos		
4.1.3.5	Support Structure for 400 kV Surge Arrester	12	Nos		
4.1.3.6	Support Structure for 400 kV Bus Support	1	Lot		
4.1.3.7	Support Structure for 72.5 kV Current Transformer	6	Nos		
4.1.3.8	Support Structure for 72.5 kV Bus Support or Pot Head	1	Lot		
4.1.3.9	Support Structure for 72.5 kV Single Switch Stand	1	Nos		
4.1.3.10	Support Structure for 30kV Lightning Arrestor	12	Nos		
4.1.3.11	Structures for Lightning Mast and other Lighting structures	1	Lot		
4.1.3.12	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.3	
4.1.4	**Bus Bar and Overhead Connections Installation**				
4.1.4.1	5" AL. Tubular Bus Bar 141.30mm Outer Diameter, 9.53mm Thickness	1	Lot		
4.1.4.2	Bus bar Connectors and Hardware (Tube to NEMA Pads, Bus Supports, etc..)	1	Lot		
4.1.4.3	Bare Cond. ACSR 54 Strand 3.53mm AL 7 Strands 3.53mm Steel	1	Lot		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.4.4	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.4	
4.1.5	**LV, MV, HV Control and Power Cable Installation**				
4.1.5.1	LV Control Cables	1	Lot		
4.1.5.2	LV Power Cables	1	Lot		
4.1.5.3	Cable Installation Accessories (Cable Gland, Labels Terminal Strips, etc..)	1	Lot		
4.1.5.4	XLPE Power Cable, 33kV (from LV side of the Auto transformer to 33kV line bay arrangement)	1	Lot		
4.1.5.5	33 kV Cable Pothead	1	Lot		
4.1.5.6	220 kV HV Cable	1400	mtrs		
	220 kV Termination Bushing Outdoor for Auto connection	7	Nos.		
	220 kV GIS termination	7	Nos.		
4.1.5.7	Cable carriers (trays, conduits, ducts) for routing the HV & LV power, control, instrumentation and communication interface cables.	1	Lot		
4.1.5.8	Power Cable for Filter Plant (Transformer) 3.5CX240 sq.mm. (Armored, PVC Insulated) with suitable termination arrangement all complete	1	Lot		
4.1.5.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.5	
4.1.6	**AC and DC Station Supply Installation**				
4.1.6.1	**400V AC Main Switch Board**				
4.1.6.1.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	3	Nos		
4.1.6.1.2	400V Switchgear with Automation Controls, 630A CB and 2 Current Transformers	1	Nos		
4.1.6.1.3	Distribution panel Bus-A, 400V, 3 Phase, 1000A, 20kA for 1Sec. (5) 400A Breakers, (1) Potential Transformer	1	Nos		
4.1.6.1.4	Distribution panel Bus-B, 400V, 3 Phase, 1000A, 20kA for 1Sec. (6) 400A Breakers, (1) Potential Transformer	1	Nos		
4.1.6.2	**400V AC Main Lighting Board**				
4.1.6.2.1	100KVA Lighting Transformer	2	Nos		
4.1.6.2.2	Distribution panel, 400V, 3 Phase, 4 Wire, 20kA, 1Sec. Bus-A (4) 63A, (1) 400A Breakers, Bus-B (4) 63A, (1) 400A Breakers, Bus-C (5) 63A TIE A-B 400A breaker, TIE B-C 400A Breaker	1	Nos		
4.1.6.3	**400V AC Emergency Lighting Distribution Board**				
4.1.6.3.1	100 KVA Lighting Transformer	1	Nos		
4.1.6.3.2	Distribution panel Bus-A 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (5) 63A, (1) 400A 4 Pole Breakers, TIE A-B 100A breaker	1	Nos		
4.1.6.3.3	Distribution panel Bus-B 400V, 3 Phase, 4 Wire, 20kA, 1Sec. (3) 63A, (1) 400A 4 Pole Breakers, TIE B-C 100A Breaker	1	Nos		
4.1.6.4	**400V AC Distribution Board**				
4.1.6.4.1	400V Switchgear with Automation Controls, 1000A CB and 2 Current Transformers	1	Nos		
4.1.6.4.2	400/110V, 50VA, Potential Transformer	3	Nos		
4.1.6.4.3	400/1A Current Transformer, Class 5P20	1	Nos		
4.1.6.4.4	400V Distribution panel Bus-A (1) 400A, (4) 100A, (8) 63A, (2) 32A 4 Pole Breakers, (14) 63A, (8) 32A 2 Pole Breakers TIE A-B 400A Breaker	1	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.6.4.5	400V Distribution panel Bus-B (1) 400A, (3) 100A, (8) 63A 4 Pole Breakers (14) 63A, (5) 32A 4 Pole Breakers	1	Nos		
4.1.6.5	**400V AC AMF Panel**				
4.1.6.5.1	400/1A Current Transformer, Class 1	3	Nos		
4.1.6.5.2	400/1A Current Transformer, Class 5P20	1	Nos		
4.1.6.6	**DC Chargers and Batteries**				
4.1.6.6.1	220V Battery Charger (Float/Boost)	3	Nos		
4.1.6.6.2	48V Battery charger (Float/Boast)	3	Nos		
4.1.6.6.3	250A Throw over Switch, Interlock	6	Nos		
4.1.6.6.4	Battery, 220Vdc, 108 Minimum Cells	2	Nos		
4.1.6.6.5	Battery, 48Vdc, 24 Minimum Cells	2	Nos		
4.1.6.7	**DC Distribution Boards**				
4.1.6.7.1	Distribution panel, 220V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
4.1.6.7.2	Distribution panel, 48V, 400A, 4kA for 1 Sec. 50 positions	2	Nos		
4.1.6.7.3	DC Fuse Box, 220Vdc	1	Lot		
4.1.6.7.4	DC Fuse Box, 48Vdc	1	Lot		
4.1.6.8	**Other Equipment**				
4.1.6.8.1	Diesel Generator Set, 250kVA (Including Full Tank)	1	Nos		
4.1.6.9	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.6	
4.1.7	**400 kV Gas Insulated Switchgear (1-1/2 breaker arrangement)**				
4.1.7.1	**Line/feeder Bay**				
4.1.7.1.1	SF6 Circuit Breaker, 400kV, 4000A, 50kA, Three Pole	8	Nos		
4.1.7.1.2	Current Transformer Modules, three cores, 400kV, single-phase, Three-phase set	16	Nos		
4.1.7.1.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	16	Nos		
4.1.7.1.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	16	Nos		
4.1.7.1.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, single-phase, three-phase set	8	Nos		
4.1.7.1.6	Voltage Transformers, 400kV, dual secondary, with earthing link, Single-phase, Three-phase set	8	Nos		
4.1.7.1.7	Line/Feeder Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	8	Nos		
4.1.7.1.8	Line/Feeder Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	8	Nos		
4.1.7.1.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	8	Nos		
4.1.7.1.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	8	Nos		
4.1.7.1.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.1.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.1.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.1.14	Gas Insulated bus (GIB) and required supports for GIB run for whole Line/Feeder Bay Lot	8	Bays		
4.1.7.2	**Transformer bay**				
4.1.7.2.1	SF6 Circuit Breakers, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	4	Nos		
4.1.7.2.2	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	8	Nos		
4.1.7.2.3	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	8	Nos		
4.1.7.2.4	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set	8	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.7.2.5	Line/Feeder High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	3	Nos		
4.1.7.2.6	Voltage Transformers, 400kV, dual secondary, with earthing link, single-phase, three-phase set	3	Nos		
4.1.7.2.7	Transformer Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	6	Nos		
4.1.7.2.8	Transformer Maintenance Earthing Switches, 400kV, 50kA, single-phase, three-phase set	6	Nos		
4.1.7.2.9	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	4	Nos		
4.1.7.2.10	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	4	Nos		
4.1.7.2.11	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.2.12	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.2.13	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.2.14	Isolating & Earthing Switches, 400kV, 4000A, 50kA Single phase, and Gas Insulated Bus (GIB) for Spare Transformer, with auxiliary Busies to AIS Bushing termination, jumpers, required CT, Al. tube, metering, control and protection as required all complete. 33kV isolators, 33kV cables , jumpers as required all complete	3	Nos		
4.1.7.2.15	Gas Insulated bus (GIB) and required supports for GIB run for whole Transformer Bay Lot	4	Bays		
4.1.7.3	**Diameter Middle Breaker Bay-400 kV**				
4.1.7.3.1	Proposed SF6 Diameter middle Circuit Breakers associated with Line Feeder, 400kV, 4000A, 50kA, three-pole	3	Nos		
4.1.7.3.2	Proposed SF6 Diameter middle Circuit Breakers associated with Auto Transformer and Line Feeder, 400kV, 4000A, 50kA, three-pole, with Control Point on Wave Switching Device	2	Nos		
4.1.7.3.3	Current Transformer Modules, Three cores, 400kV, Single-phase, Three-phase set	10	Nos		
4.1.7.3.4	Circuit Breaker Isolating Disconnect Switches, 400kV, 4000A, 50kA, single-phase, three-phase set	10	Nos		
4.1.7.3.5	Circuit Breaker Maintenance Earthing Switches, 400kV, 50kA,Single-phase, Three-phase set	10	Nos		
4.1.7.3.6	Bay Local Control Cabinet including (device controls, instrumentation, interlocking, annunciation, gas density monitoring, circuit breaker monitoring)	5	Nos		
4.1.7.3.7	Partial Discharge Monitoring System including monitoring sensors and diagnostic equipment (per bay)	5	Nos		
4.1.7.3.8	LV control and power cable connections from Local Control Cabinet to all GIS equipment/devices	1	Lot		
4.1.7.3.9	All metallic structures and supports required for GIS complete with accessories	1	Lot		
4.1.7.3.10	All walkways, platforms, stairs, ladders and accessories required for access to all GIS devices	1	Lot		
4.1.7.4	**Gas Insulated BUSBAR**				
4.1.7.4.1	400kV , 3 single phase (isolated), SF6 gas insulated , metal enclosed 4000A bus bars each enclosed in three individual bus enclosures	6	Diameter		
4.1.7.4.2	Disconnect Switches, 400kV, 4000A, 50kA, Single-phase, Three-phase set	2	Nos		
4.1.7.4.3	Voltage Transformers, 400kV, dual secondary, single-phase, three-phase set	2	Nos		
4.1.7.4.4	Main Bus Bar High Speed Earthing Switches, with removable earthing link 400kV, 50kA, Single-phase, Three-phase set	2	Nos		

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.7.4.5	Maintenance Earthing Switches, 400kV, 50kA, Single-phase, Three-phase set	2	Nos		
4.1.7.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.7	
4.1.8	**Complete with control & protection up to GIB sealing end for all Feeder and Transformer Bays.**				
4.1.8.1	**Installation of Control and Protection panels for 400 kV station as specified in Scope and Employers Requirements including but not limited to:**				
4.1.8.1.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	17	Nos		
4.1.8.1.2	Line Protection Panel (Note: line protection should include tele protection terminals)	8	Nos		
4.1.8.1.3	Transformer Protection Panel (Auto Trans Bay 1=1no,Auto Trans Bay 2=1no)	4	Nos		
4.1.8.1.4	400kV (Duplicate Bus Bar Protection)	2	Set		
4.1.8.1.5	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.8.2	**Installation of Control and Protection panels for 33 kV station as specified in Scope and Employers Requirements including but not limited to:**				
4.1.8.2.1	Circuit Breaker Relay Panel (Note: BCU should be included in the Relay Panel)	2	Nos		
4.1.8.2.2	Transformer Protection Panel	2	Nos		
4.1.8.2.3	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
4.1.8.3	**Installation of Substation Automation & Metering**				
4.1.8.3.1	SAS Operator Station for control of 400/220/33 kV	1	Set		
4.1.8.3.2	Substation Automation System (SAS) for 400 kV System per diameter	6	Set		
4.1.8.3.3	Substation Automation System (SAS) for 33kV System per feeder	2	Set		
4.1.8.3.4	Substation Automation System (SAS) for Auxiliary System	1	Set		
4.1.8.3.5	Integration of all 400kV Bays under present scope with the SCADA of SIEMENS (SINAUT Spectrum) at Load Dispatch Centre, Kathmandu including supply of Hardware, Software, accessories etc. complete as per Technical Specification.	1	Lot		
4.1.8.3.6	Telecommunication system for New Damauli	1	Lot		
4.1.8.3.7	400 kV Metering	1	Lot		
4.1.8.3.8	Fibre Optic SDH System	1	Lot		
4.1.8.3.9	Phone System	1	Lot		
4.1.8.3.10	Miscellaneous Relay and Control Equipment, not included above	1	Lot		
				Sub Total 4.1.8	
4.1.9	**Grounding System**				
4.1.9.1	Stranded Bare Copper 240 Sq. mm Grid (Including Fusion and Mechanical Connectors)	1	Lot		
4.1.9.2	Grounding Rods	1	Lot		
4.1.9.3	Embedded Grounding System - 400kV and 220kV GIS (Including Connections to GIS metallic Structures, Supports and Walkways/Platforms)	1	Lot		
4.1.9.4	Embedded Grounding System - Control room	1	Lot		
4.1.9.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.1.9	
4.1.10	**Lightning Protection System**				
4.1.10.1	Overhead Galvanized Steel Wire, Including Hardware	1	Lot		
4.1.10.2	Lightening Mast for Protection	1	Lot		
4.1.10.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.10	

Schedule No. 4.1: Breakdown of General Installation and Construction Items

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.1.11	**Firefighting System**				
4.1.11.1	Fire protection/detection for 7 (Seven) auto transformers	1	Lot		
4.1.11.2	Fire protection/detection for 400kV GIS Building	1	Lot		
4.1.11.3	Fire protection/detection for Control House	1	Lot		
4.1.11.4	Fire protection/detection system for pump house building	1	Lot		
4.1.11.5	Fire protection/detection system for generator diesel tank	1	Lot		
4.1.11.6	Portable fire extinguishers	1	Lot		
4.1.11.7	Clean-agent fire extinguishers	1	Lot		
4.1.11.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.11	
4.1.12	**HVAC And Ventilation Systems**				
4.12.1	400kV GIS Building HVAC and Ventilation Systems	1	Lot		
4.12.2	Control House HVAC and Ventilation Systems	1	Lot		
				Sub-Total 4.1.12	
4.1.13	**Accessories and Ancillary Material**				
4.1.13.1	Junction and marshalling boxes, outdoor	1	Lot		
4.1.13.2	Junction and marshalling boxes, indoor	1	Lot		
4.1.13.3	Outdoor lighting, including lighting fixtures	1	Lot		
4.1.13.4	Indoor lighting, including lighting fixtures	1	Lot		
4.1.13.5	Water Supply System as per TS	1	Lot		
4.1.13.6	Rainwater harvesting as per TS	1	Lot		
4.1.13.7	Control Cabinet for outdoor lighting	1	Lot		
4.1.13.8	Electric Overhead Travelling Crane for installation and removal of GIS Equipment	1	Lot		
4.1.13.9	Rail tracks for movement of power transformers on the reinforced concrete foundations all complete.	1	Lot		
4.1.13.10	Visual Monitoring System	1	Lot		
4.1.13.11	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub-Total 4.1.13	
				Total(Carried forward to SC-4)	
	Name of Bidder:				
	Signature of Bidder:				

Schedule No. 4.2 : Breakdown of Earthworks

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
4.2.1	Site Clearing, Including Removal of Trees and Stumps	1	Lot		
4.2.2	Top Soil Stripping	1	Lot		
4.2.3	General Excavation	1	Lot		
4.2.4	Compacted Back Fill	1	Lot		
4.2.5	Uncompact Back Fill	1	Lot		
4.2.6	Surplus Disposal	1	Lot		
4.2.7	Surface Works, Including Compaction/Consolidation	1	Lot		
4.2.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Total(Carried forward to SC-4)	
				Name of Bidder:	
				Signature of Bidder:	

Schedule No. 4.3 : Breakdown of Civil Works

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.3.1	**Foundations**				
4.3.1.1	Foundations of 400 kV Gantries	5	Nos		
4.3.1.2	Foundations of 400 kV Capacitor Voltage Transformers & Tank Type Current Transformers	12	Nos		
4.3.1.3	Foundation of 400 kV Surge Arrestor	12	Nos		
4.3.1.4	Foundations of 400 kV Post Type Insulator Bus Support	1	Lot		
4.3.1.5	Foundation, Oil Containment, and Sump Pit For 400/220kV 167 MVA Single Phase Autotransformer	7	Nos		
4.3.1.6	Autotransformer 22kg/m Railway System (22kg/m Steel Rails, Rail Ties, Elastomeric Pad, Screws, Baseplate, and Rail Clamps)	7	Nos		
4.3.1.7	Firewalls Between Auto Transformers	8	Nos		
4.3.1.8	Foundation for 400kV GIB Bus Runs to AIS Equipment	1	Lot		
4.3.1.9	Foundation of 33kV Post Type Insulator Bus Support	1	Lot		
4.3.1.10	Foundation of Station Service Transformer	2	Nos		
4.3.1.11	Foundation of 72.5kV Circuit Breaker	6	Nos		
4.3.1.12	Foundation of 72.5kV Current Transformer	6	Nos		
4.3.1.13	Foundation of 72.5kV Single Phase Switches	1	Lot		
4.3.1.14	Foundation of Diesel Generator Set & Fuel Tank	1	Lot		
4.3.1.15	Foundation of 30kV,10kA Lightning arrester for line bays	6	Nos		
4.3.1.16	Foundations of 30kV,10kA Lightning arrester for 33/0.4kV station service transformers	6	Nos		
4.3.1.17	Foundation for Lightening Mast as required for total protection of equipment	1	Lot		
4.3.1.18	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.1	
4.3.2	**External Works and Landscaping**				
4.3.2.1	Improvement of Access Road as required to Substation	1	Lot		
4.3.2.2	Internal Paving	1	Lot		
4.3.2.3	Landscaping, Including Maintenance up to Taking Over	1	Lot		
4.3.2.4	Construction of reinforced concrete trenches/duct banks with manholes for all types of HV/MV power and control cables between switchgear building, substation control building and Autotransformer and all substation equipment as specified in Scope and Employers Requirements.	1			
4.3.2.5	Anti-weed treatment & stone spreading along with cement concrete layer, Internal drainage system, external drainage system and the rainwater harvesting system, Sewage handling as defined in the technical specifications.	1	Lot		
4.3.2.6	Superficial storm drainage system to drain water outside substation during heavy rainfall	1	Lot		
4.3.2.7	River Protection Works and Retaining Wall.	1	Lot		
4.3.2.8	Parking Areas	1	Lot		
4.3.2.9	Guard House	1	Lot		
4.3.2.10	Substation Perimeter Fence	1	Lot		
4.3.2.11	Potable Water System (Including Water Treatment Plant, Pumping Facilities, Storage Tank and all Required Facilities)	1	Lot		
4.3.2.12	Firefighting Pump House and Water Tank	1	Lot		
4.3.2.13	Security Lighting along the Fence and Inside the Perimeter	1	Lot		
4.3.2.14	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.2	

Schedule No. 4.3 : Breakdown of Civil Works

Item no.	Description	Qty	Unit	Unit Rate in US$	Amount in US$
			2	*3*	*(1)x(3)*
4.3.3	**General**				
4.3.3.1	Soil Investigation and Test (Including Post-Construction Grounding Test)	1	Lot		
4.3.3.2	Surveys	1	Lot		
4.3.3.3	Mobilization & Demobilization, Site Infrastructure, Temporary Works at site related to site activities.	1	Lot		
4.3.3.4	Final Cleanup (Including Removal of Excess Materials and Temporary Works) Demobilization	1	Lot		
4.3.3.5	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.3	
4.3.4	**Substation Buildings**				
4.3.4.1	Substation Control Building	1	Lot		
4.3.4.2	400kV GIS Building	1	Lot		
4.3.4.3	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.3.4	
				Total(Carried forward to SC-4)	
	Name of Bidder:				
	Signature of Bidder:				

Summary of Breakdown for Schedule 4.4 Day work

Description	Amount in US$
1. Sub-Total for Day work: Labor (4.4.1)	
2. Sub-Total for Day work: Materials (4.4.2)	
3. Sub-Total for Day work: Contractor's Equipment (4.4.3)	
TOTAL (to be carried forward to Schedule 4.0)	
Name of Bidder:	
Signature of Bidder:	

Schedule No. 4.4.1 : Breakdown of Day work Rates: Labor

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
4.4.1	**Supervision and Labor**				
4.4.1.1	Engineer	350	h		
4.4.1.2	Foreman	400	h		
4.4.1.3	Surveyor	150	h		
4.4.1.4	Technician	600	h		
4.4.1.5	Skilled laborer	600	h		
4.4.1.6	Semiskilled laborer	600	h		
4.4.1.7	Unskilled laborer	600	h		
4.4.1.8	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)		specify		
				Total(Carried forward to SC-4.4)	
				Name of Bidder:	
				Signature of Bidder:	

Note: The labor rate should include all cost needed to provide the Labor at required place including all related cost for poviding the labour, ensuring that the labor is qualified for his/her job and can perform the required task professionally.

Schedule No. 4.4.2 : Breakdown of Day work Rates: Materials

Item no.	Description	Qty.	Unit	Unit Rate in US$	Amount in US$
4.4.2.1	**Concrete Work**				
4.4.2.1.1	Lean Concrete	50	m3		
4.4.2.1.2	Concrete to foundation	150	m3		
4.4.2.1.3	Concrete to superstructure	200	m3		
4.4.2.2	**Steel Reinforcement**				
4.4.2.2.1	Mild Steel reinforcement, including cutting, bending	10	t		
4.4.2.2.2	High tensile steel reinforcement, including cutting, bending	25	t		
4.4.2.3	**Structural Steel**				
4.4.2.3.1	Commercial sections, including cutting, welding, bolting	10	t		
4.4.2.4	**Excavation Work**				
4.4.2.4.1	Excavation in rock (type R), including shoring, backfill, haul and disposal	200	m3		
4.4.2.4.2	Ditto, in soil (type MB and LB)	400	m3		
4.4.2.5	**Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)**				
4.4.2.6	**Price for Control Point on Wave Switching Device (CPWSD) to be installed on 400kV Breaker supplied as per Schedule-2**	**1**	**No**		
4.4.2.7	**Price for Pre-Insertion Resistor (PIR) to be installed on 400kV Breaker supplied as per schedule-2**	**1**	**No**		
4.4.2.8	**Price for Stub-Bus Differential Protection for 400kV Future Bay**	**1**	**No**		
				Total(Carried forward to SC-4.4)	
				Name of Bidder:	
				Signature of Bidder:	

Note: Quoted Unit Price shall include all the cost required to perform task successfully such as loading, transportation, insurance, unloading, cutting (if required), placing as per intended required task, while insuring the quality of the material and health and safety, storing at proper storage place with security and carrying out works as per Employer's requirement and Conditions of Contract.

Schedule No. 4.4.3 : Breakdown of Day work Rates: Contractor's Equipment

Item no.	Description	Nominal quantity (hours)	Unit	Basic hourly rental rate	Amount
4.4.3	**Contractors' Equipment**				
4.4.3.1	Concrete Mixer, up to 5 m3/h	20	h		
4.4.3.2	Concrete Mixer, above to 5 m3/h	20	h		
4.4.3.3	Concrete Pump (Self-Propelled) up to 20 m3/h	40	h		
4.4.3.4	Concrete Pump (Self-Propelled) above to 20 m3/h	40	h		
4.4.3.5	Concrete batch plant, up to 20 m3/h	20	h		
4.4.3.6	Concrete batch plant, above 20 m3/h	20	h		
4.4.3.7	Transit mixer, up to 5 m3	40	h		
4.4.3.8	Transit mixer, above to 5 m3	40	h		
4.4.3.9	Bulldozer, with ripper, up to CAT D8 class	50	h		
4.4.3.10	Bulldozer, with ripper, above to CAT D8 class	50	h		
4.4.3.11	Track loader, up CAT 953 class	30	h		
4.4.3.12	Track loader, above CAT 953 class	50	h		
4.4.3.13	Wheel loader, up to CAT 930 class	50	h		
4.4.3.14	Wheel loader, above CAT 930 class	50	h		
4.4.3.15	Track excavator	100	h		
4.4.3.16	Air Compressor	100	h		
4.4.3.17	Mobile crane, up to 10 t	50	h		
4.4.3.18	Mobile crane, above 10 t, up to 20 t	50	h		
4.4.3.19	Mobile crane, above 20 t	50	h		
4.4.3.20	Lorry, up to 10 t	100	h		
4.4.3.21	Lorry, above 10 t	100	h		
4.4.3.22	Tipper, up to 10 t	100	h		
4.4.3.23	Tipper, above 10 t	100	h		
4.4.3.24	Pick-up	200	h		
4.4.3.25	Diesel generator, up to 100 kW	100	h		
4.4.3.26	Diesel generator, above 100 kW, up to 250 kW	100	h		
4.4.3.27	Diesel generator, above 250 kW	100	h		
4.4.3.28	Welding Set, Including Welding Rods	300	h		
				Total(Carried forward to SC-4.4)	
				Name of Bidder:	
				Signature of Bidder:	
Note:					

The Basic Hourly rates includes all cost that require to run and perform the task, such as Equipment rental with operator, maintenance of vehicle, running responsibility, health and safety protection, petrol, diesel, lubricants, driver, assistance etc. required for carrying the task with the equipment.

Schedule No. 4.5 : Other Installation Services

Item no.	Description	Unit	Quantity	Unit Rate in US$	Amount in US$
4.5.1	**Environmental, Social, Health and Safety Management Plan**				
4.5.1.1	**General Mitigation Measures**				
4.5.1.1.1	Develop a detailed Environmental, Social, Health, and Safety (ESHS) Management Plan for Contractor's employees.	1	Lot		
4.5.1.1.2	Develop, provide training and enforce a Worker Code of Conduct that includes an anti-sexual harassment policy	1	Lot		
4.5.1.1.3	Conduct Employee Induction Training on H&S and environmental/social/cultural sensitivity	1	Lot		
4.5.1.1.4	Implement Community Grievance Redress Plan	1	Lot		
4.5.1.1.5	Personal Protection equipment all complete (Safety Boots, Reflection Jackets, Safety Helmet, Safety Goggles, Safety Mask, Safety earplugs, Safety hand gloves etc.)	1	Lot		
				Sub Total 4.5.1.1	
4.5.1.2	**Physical Environment Mitigation Measures**				
4.5.1.2.1	Implement an Erosion and Sediment Control Plan	1	Lot		
4.5.1.2.2	Manage excavated soils	1	Lot		
4.5.1.2.3	Spray disturbed areas with water if substantive off-site fugitive dust impacts occur	1	Lot		
4.5.1.2.4	Provide a pit toilet and bury all organic wastes at tower construction sites	1	Lot		
4.5.1.2.5	Install septic systems/package and proper wastewater disposal system for workers	1	Lot		
4.5.1.2.6	Provide hazardous material training to concerned staff	1	Lot		
4.5.1.2.7	Stockpile materials for use in controlling spills	1	Lot		
4.5.1.2.8	Provide secondary containment for any fuel or hazardous materials	1	Lot		
4.5.1.2.9	Collect and segregate all waste for reuse, recycle, or disposal	1	Lot		
4.5.1.2.10	Dispose of solid waste at approved waste disposal facilities	1	Lot		
				Sub Total 4.5.1.2	
4.5.1.3	**Socio-economic and Cultural Environment Mitigation Measures**				
4.5.1.3.1	Implement Workforce Management Plan	1	Lot		
4.5.1.3.2	Implement Worker Access Management Protocol	1	Lot		
4.5.1.3.3	Implement Traffic Management Plan and maintain the damaged roads caused by contractors	1	Lot		
4.5.1.3.4	Develop and Implement Worker Grievance Redress Mechanism	1	Lot		
4.5.1.3.5	Conduct community training on EMF risks	1	Lot		
				Sub Total 4.5.1.3	
4.5.1.4	**Gender, Social Inclusion and Counter-TIP Measures**				
4.5.1.4.1	Develop and implement Anti-Sexual Harassment Policy, provide orientation to the entire workers	Lot	1		
4.5.1.4.2	Conduct awareness raising and community meetings to encourage women, socially excluded, historically marginalized, vulnerable groups to apply for jobs	Lot	1		
4.5.1.4.3	Develop and Implement TIP Risk Management Plan	Lot	1		
4.5.1.4.4	Training to the Contractor's employees/staff on Gender and Social Inclusion, prevention on sexual harassment, gender-based violence, child labor and TIP	Lot	1		
4.5.1.4.5	Community TIP risk prevention sensitization and community consultation	Lot	1		
4.5.1.4.6	Community Grievance Redress Plan must have system of Anonymous reporting for TIP suspected cases	Lot	1		
				Sub Total 4.5.1.4	

Schedule No. 4.5 : Other Installation Services

Item no.	Description	Unit	Quantity	Unit Rate in US$	Amount in US$
4.5.2	**Testing And Commissioning**				
4.5.2.1	Site Testing and Commissioning of HV AIS Equipment	1	Lot		
4.5.2.2	Site Testing and Commissioning of Power Autotransformers	1	Lot		
4.5.2.3	Site Testing and Commissioning of 400kV GIS Equipment	1	Lot		
4.5.2.4	Site Testing and Commissioning of Electrical Auxiliary Service Equipment and Power MV and LV Cables	1	Lot		
4.5.2.5	Site Testing and Commissioning of Mechanical Auxiliary Service Equipment	1	Lot		
4.5.2.6	One Month Commercial Operation after Commissioning	1	Lot		
4.5.2.7	End to End Test for all points as specified, including Control, Protection & Remote End Modification	1	Lot		
4.5.2.8	Closed loop test of equipment all complete	1	Lot		
4.5.2.9	PQ (Power Quality), Revenue Energy meter and all remaining equipment of S/S	1	Lot		
4.5.2.10	Other necessary works as per Employer's Requirement and Conditions of Contract, if any, not included above (specify)	1	Lot		
				Sub Total 4.5.2	
4.5.3	**Training and O&M Assistance**				
	Training at Manufacturers Work				
4.5.3.1	Control & Protection, Substation Automation System an	1	Lot		
4.5.3.2	400 kV GIS Equipment and System (Circuit Breaker, Isc	1	Lot		
	Training at Site				
4.5.3.3	Control & Protection (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.4	Substation Automation System including the integration aspect of SCADA (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.5	For 400kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance. (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.6	Operation and maintenance of Transformers (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.7	AC/DC auxiliaries and mechanical system (Refer PSR Section 3.18.1 for more details)	1	Lot		
4.5.3.8	Training at site for other systems (provide list)	1	Lot		
				Sub Total 4.5.3	
				Total(Carried forward to SC-4)	
			Name of Bidder:		
			Signature of Bidder:		

Price Schedule No. 5 : Grand Summary

Item	Description	Total Price in US$
5.1	Total Schedule No. 1. Design Services	
5.2	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Abroad	
5.3	Total Schedule No. 3. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country	
5.4	Total Schedule No. 4. Installation and Other Services including all related Civil Works (Excluding Summary of Breakdown of Day works) (includes SC-4.1, SC-4.2, SC-4.3 and SC-4.5)	
5.5	**TOTAL (to Bid Form - Resulting contract Price after correction if any)**	
5.6	**Output VAT (if applicable)**	
5.7	**Total including Output VAT (5.5+5.6)**	
5.8	Total of Summary of Breakdown of Day works (to bid form) (from item No.4.6 of SC-4)	
5.9	**Grand Total Including Day work for Evaluation and Comparison Purpose (5.5+5.8)**	
	Name of Bidder:	
	Signature of Bidder:	

Note:

Quoted Unit Price shall include all the cost required to perform task successfully such as all resources required to carry out the Work, personnel, material, equipemnt, loading, transportation, insurance, unloading and storing at proper storage place and carrying out works as per Employer's requirement and Conditions of Contract.

The purpose of price schedules is to identify the Bid Price which will be used to determine progress payment and tthe rates can be used to determine the price of any variation to scope . The Bid Price if accepted and included in the Contract shall become Contract Price and the Contract price shall not be adjusted (except as stated under Conditions of Contract under Sub-Clause 13.8) in case any quantity varies. The Price quoted under Price Schedule is as per provision of Employer's Requirements and Conditions of Contract.

Millennium Challenge Account Nepal
Procurement of Plant Design, Supply, Delivery, Installation, Testing and Commissioning of
Lot 2: 400kV New Damauli Substation
Price Schedule

Price Schedule No. 6 : Recommended Spare Parts, Repair and Maintenance Tools (Breakdown of Rates)

Item No	Description	Qty.			Total Price (CIP)	Total Price (EXW)
			CIP Price in US$ foreign parts	EXW Price in US$ (Local Parts		
		1	*3*	*4*	*(1) x ((3)*	*(1)x((4)*
				(CIP and EXW) TOTAL		
				Name of Bidder:		
				Signature of Bidder:		

Note:

The price of recommended spare parts quoted in Price Schedule No. 6 shall not be considered for evaluation. This is because such spare parts would normally be used after long time durations beyond the MCC Compact end date, and could not be financed from the Compact funds. Still the recommended spare parts may be financed directly by the government. Quoted Unit Price shall include all the cost required to perform task successfully such as loading, transportation, insurance, unloading and storing at proper storage place and carrying out works as per Employer's requirement and Conditions of Contract.

EXW-Works site in Nepal: All Plant and Mandatory Spare Parts Supplied within the country shall be quoted as EXW. The Contractor will also be responsible for other associate charge to bring all goods and equipment to site.

CIP-Works site in Nepal: All Plant and Mandatory Spare Parts Supplied from Abroad shall be quoted as CIP- Works site in Nepal basis. The Contractor will be responsible for custom clearance, insurance and other associate charge to bring all goods and equipment to site.

Quoted Unit Price shall include all the cost required to perform task successfully such as cost of goods, resouces, loading, transportation, insurance, unloading and storing at proper storage place.

Attachment #5

PROJECT SPECIFIC REQUIREMENTS

230820_Lot1_RAT_PSR.docx

230820_Lot2_NBW_PSR.docx

230820_Lot3_NDM_PSR.docx

PROJECT SPECIFIC REQUIREMENTS – Lot 1

B1.1

PROJECT SPECIFIC REQUIREMENT (PSR)

I. TABLE OF CONTENTS

1 PROJECT DESCRIPTION AND SCOPE

1.1 GENERAL

a. As part of strengthening the 400 kV grid for Nepal, Millennium Challenge Account Nepal (MCA-Nepal) is establishing 400 kV GIS Substation at Ratmate and supporting works at two 400 kV substations at New Hetauda and Lapsiphedi required for connectivity with 400kV transmission lines entering in these substations.

b. The following transmission lines are associated with substation:

1. Ratmate - New Hetauda 400 kV D/C Lines: 56 km (along with OPGW)
2. Ratmate - Lapsiphedi 400 kV D/C Lines: 59 km (along with OPGW)
3. Ratmate - New Damauli 400 kV D/C Lines: 89 km (along with OPGW)

c. The Ratmate substation shall be established as a 400kV Gas Insulated Substation (GIS) and a 220kV Gas Insulated Substation (GIS), both in One and a Half Breaker bus configuration. It shall also include seven (7), 1-Ph, 400/√3/220/√3/33 kV, 167 MVA, Autotransformers, and all related control and protection systems.

d. The extension at New Hetauda and Lapsiphedi would include connecting the double circuit lines from Ratmate to the spare existing Gas Insulated Substation (GIS) bays at New Hetauda and Lapsiphedi, taking FO approach cable from splicing box installed at the Gantry Tower to Optical Distribution Frame installed inside Control Room, installing, testing and commissioning required and matching communication equipment, etc. in interface with main 400kV S/S Contractor for integration of the whole system with SCADA system of Load Dispatch Centre (LDC) at Kathmandu, etc.

1.2 PHYSICAL AND OTHER PARAMETERS

1.2.1 ENVIRONMENTAL CONDITIONS

The following summarized environmental data shall be considered for planning of site works and form the design data for the working conditions of the equipment.

Altitude

Altitude above sea level	
New Hetauda:	430 m
Lapsiphedi:	1581 m
Ratmate:	492 m

Temperature

Maximum annual ambient temperature	40 °C
Minimum annual ambient temperature	-30 °C
Annual average temperature	23 °C

Humidity

Average relative humidity	70 %

Rain Conditions

Annual rainfall Rainy Season from June to September	1500 mm

Thunderstorms & Lightning

Isokeraunic level	45 days/year

Solar Radiation

Average daily irradiation	780 W/m²

Seismic Condition

Seismic	Acceleration
(PGA: *peak ground acceleration*)	0.50 g

Wind Velocity

Wind velocity	47 m/s

Pollution

Low to medium pollution:	as per IEC 60815

Location

Ratmate:	Lat. - 27°51'40.84"N, Long. - 85° 3'11.45"E
Hetauda:	Lat. - 27°25'46.36"N, Long. - 85° 0'23.86"E
Lapsiphedi:	Lat. - 27°45'60.29"N, Long. - 85°30'30.76"E

1.2.2 VOLTAGE LEVELS

1.2.2.1 HIGH AND MEDIUM VOLTAGE ELECTRICAL PARAMETERS

System electrical parameters for Voltages ≤ 245 kV

High Voltages

Network System Voltage	
Nominal system voltage	220 kV
Equipment Rating	
Highest system voltage (rms)	245 kV
Short time power-frequency withstand voltage (rms)	460 kV
Lighting (or Full wave) impulse voltage withstand level (peak)	1050 kVp
Rated Short-time withstand current	50 kA
Number of phases	3
Frequency	50 Hz

Medium Voltages

Network System Voltage	
Nominal system voltage	33 kV
Equipment Rating	
Highest system voltage (rms)	36 kV
Short time power-frequency withstand voltage (rms)	75 kV
Lightning impulse withstand voltage (peak)	170 kVp
Rated Short-time withstand current	25 kA

Number of phases	3
Frequency	50 Hz

System electrical parameters for Voltages > 245 kV

Network System Voltage	
Nominal system voltage	400 kV
Equipment Rating	
Highest system voltage (rms)	420 kV
Short time power-frequency withstand voltage (rms)	630 kV
Lightning impulse withstand voltage (peak)	1425 kVp
Switching impulse withstand Voltage (peak)	1050 kVp
Rated Short-time withstand current	50 kA
Number of phases	3
Frequency	50 Hz

1.2.2.2 LOW VOLTAGE AC AND DC EQUIPMENT AND INSTALLATIONS

General

All chambers and cubicles shall be designed in accordance with IEC 61439 and separated by-partition or by a metal cover.

AC low voltage equipment

The following basic technical values shall be kept as indicated:

Nominal system voltage:	*230 / 400 V*
Maximum voltage variation:	*± 10%*
System configuration:	*Main system3-phase (4-wires), solidly earthed* *Subsystems:4 Wires (3-phases + N)*
Test voltage (1 min.) for new installation:	*2.5 kV*
Minimum insulation resistance for new installation:	
· phase-to-phase:	*400 kOhm*
· phase-to-earth:	*230 kOhm*

DC low voltage equipment

The DC low voltage installation shall feed the control and protection circuits as well as the telecommunication equipment.

The basic technical design features are as follows (if not otherwise mentioned in the technical specification):

For the control system:

Nominal system voltage:	*220 V DC*
Test voltage (1 min.) for new installation:	*1.5 kV*
Minimum insulation resistance for new installation:	*110 kOhm*

For communication system:

Nominal system voltage:	*48 V DC*
Test voltage (1 min.) for new installation:	*1 kV*
Minimum insulation resistance for new installation:	*48 kOhm*

Control and protection system

The basic technical values shall be as follows:

Trip/close voltage:	*220 V D.C.*
Rated secondary voltage of VTs:	*110/√3 V*
Rated secondary current (max.)	*1 A*
Frequency:	*50 Hz*

1.3 SCOPE OF SUPPLY AND SERVICES

The scope of works for each new substation or specific works of the existing would be:

- Design
- Supply of plant and equipment
- Shipment
- Civil works
- Installation and
- Testing and Commissioning.

The project will be executed on a turnkey basis. The General and Particular Technical Requirements cover the design calculation, manufacturing, assembly, parameterization, settings and acceptance tests in the Contractor's workshop as well as the supply, customs clearance, delivery, unloading, erection, adjusting, painting, identification, testing, commissioning, and acceptance of new equipment to be installed in the new substations, complete in every respect and suitable for satisfactory operation to fulfill the purpose of the Works.

This section covers the main items of plant to be provided and works to be carried out under this Contract, but the Bidder is required to ascertain for himself whether any additional plant or works are necessary to leave the substations complete and in working order on completion of the contract in accordance with the Technical Requirements in order to fulfill the purpose of the Works.

To complete each item of plant and equipment detailed in this Schedule the contractor shall provide all necessary cabling, cable boxes, terminal boards, protective relays, panels for control equipment, supporting steelwork, panel wiring, fuse links, interlocking gear, motors, auxiliary contacts, holding down bolts, screen guards, labels, auxiliary and control cables, and all necessary miscellaneous items whether specified in detail or not.

Only type tested equipment shall be used. Type test reports of similar equipment - in terms of mechanical and electrical size/measures, mechanical and electrical technical data, similar model type, only in accordance with "Part 2, Section V, B02_GTR, 220913_B02_ GTR, Page 15, 10. Type Testing, Inspection, Testing & inspection Certificate, 10.3", shall be accepted. Type Test Reports shall be subject to the Engineer's approval. If no type test certificates are available, the relevant type tests shall be performed at the Contractor's expenses.

2 SCOPE

The scope of work shall include construction of the entire GIS buildings, control buildings, station services, site preparation and grading as shown on the single line and layout drawings. The Bidders are requested to quote the price as per the price schedule attached in Section IV of bid documents.

2.1 SCOPE OF WORK

2.1.1 RATMATE SUBSTATION

The Scope of Work includes the following

a. 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from New Hetauda, along with outdoor CT's, CVT's and LA's. Suspension insulators, connectors, and conductors required to connect the incoming lines to GIB's are also included in the scope.
b. 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from Lapsiphedi, along with outdoor CT's, CVT's and LA's. Suspension insulators, connectors, and conductors required to connect the incoming lines to GIB's are also included in the scope.
c. 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from New Damauli, along with outdoor CT's, CVT's and LA's. Suspension insulators, connectors, and conductors required to connect the incoming lines to GIB's are also included in the scope.
d. 400 kV GIS bays with required GIB, 4 nos. for 400 kV D/C Quad Moose ACSR future lines including GIB termination along with supporting structure but without outdoor AIS equipment.
e. 400 kV GIS Autotransformer Bay with required GIB, 2 Nos, to connect Two Autotransformer Banks each of 3x1ϕ, 400/√3/220/√3/33 kV, 167 MVA with 1ϕ as Spare included in the scope of Work.
f. Two Autotransformer Banks each of 3x1ϕ, 400/√3/220/√3/33 kV, 167 MVA with 1ϕ as Spare.
g. 400 kV GIS bays with required GIB, two circuit breakers diameter, Autotransformer Bay, 1 No., to connect future One Autotransformer Bank of 3x1ϕ, 400/√3/220/√3/33 kV, 167 MVA including GIB termination along with supporting structure.
h. 220 kV GIS Auto Transformer bay with required GIB, 2 nos. bay for connecting 7 Nos (6+1), 1-Ph, 400/√3/220/√3/33 kV, 167 MVA, Interconnecting Autotransformers.
i. 220 kV GIS bays with required GIB, two circuit breakers diameter, 1 no. bay for connecting future 400/220/33 kV, 167 MVA, 1-Ph Interconnecting Autotransformers including GIB termination along with supporting structure..
j. 220 kV GIS bays with required GIB, 8 nos. for 220 kV future lines including GIB termination along with supporting structure but without outdoor AIS equipment

k. 220 kV GIS bays with required GIB , 2 nos. bay for connecting future 220/132/11 KV, 3-Ph Interconnecting Autotransformers including GIB termination along with supporting structure but without outdoor AIS equipment.
l. The scope of supply also includes substation service transformers 630 kVA, 33/.4 kV, 2 nos. LT Transformers along with associated 33 kV Bays.
m. 220 kV GIS bays with required GIB, 2 nos. for 220 kV future lines including GIB termination along with supporting structure.

Summary of Works includes the following:

S.N.	400 kV Line Bay (Nos)	400 kV TFR Bay (Nos.)	220 kV TFR Bay (Nos.)	220 kV Line Bay (Nos)	TFR Bank	Station TFR (Nos.)
1	10	3	5	8	2 *(3+1) 1- ϕ each of 167 MV)	2

The configuration of the scope of works will be seven 400kV diameters and seven 220kV diameters.

The bidders are requested to quote their price considering that the future bays shall not include the feeder Control, Relay & Protection panels but shall include diameter protection, Local Control Panels and, Substation Automation System. The protection of the associated stubs and of the tie breaker shall also be included.

3 DETAILED SCOPE OF WORK

This section describes the detailed scope of works.

3.1 400KV RATMATE GIS SUBSTATION

a. The design, manufacture, spare parts, training, delivery, installation, testing, commissioning and in-service performance of high-voltage sulfur hexafluoride (SF6), gas-insulated switchgear (GIS) including indoor and outdoor gas-insulated bus (GIB) including all GIB supporting structures to overhead and/or underground line terminations or direct connections to auto transformers or other equipment, rated 420kV.

b. The installation of a 400kV gas-insulated switchgear (GIS) hall connecting transmission lines, with provisions for connecting future transmission lines, serving bulk auto transformers and with provisions for serving future bulk auto transformers. The 400kV substation bus arrangement will be a Breaker and Half Bus configuration. The 400kV GIS hall shall include 400kV gas-insulated switchgear, associated Local Control Cubicles (LCCs) and all required auxiliary equipment located in an RCC framed high voltage switchgear building. The GIS shall include all 400kV interconnecting Gas-insulated Bus and Gas-To-Air Bushing interfaces to the lines and auto transformers.

c. The 420 kV SF6 gas-insulated switchgear shall have the following overall design ratings:

Maximum System Voltage: 420kV

Nominal System Voltage: 400kV

Rated Frequency: 50Hz

Rated Continuous Current: 4000A

Rated Short Circuit Current: 50kA

Rated Short Circuit Duration: 1 second

The GIS shall be complete with all necessary terminal boxes, SF6 gas filling equipment, SF6 gas monitoring equipment, interconnecting power, and control wiring, earthing connections, support structures, base plates, foundation anchor bolts, necessary marshalling cabinets and all equipment and accessories specified in the technical specification.

The SF6 gas handling must strictly follow the following compliance standards:-

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

d. Main Bus Elements

Two sets of single-phase encapsulated, metal-enclosed, gas-insulated main bus bars rated 420kV, 4000A, 50kA each enclosed in three individual bus enclosures extending the length of the switchgear to interconnect each of the diameters and associated circuit breaker bays. Each main bus bar set shall comprise of:

ii. (3) three single-phase encapsulated 4000A main bus bars and enclosures. Each main busbar enclosure shall be segregated on a per diameter basis with gas-tight barriers installed in the main bus enclosures between each diameter connecting the main buses.
iii. (2) two inductive voltage transformers with isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three motor-driven earthing switches complete with manual and motor-driven operating mechanisms.
v. (1) one lot of gas fill ports, gas density monitors/gauges, rupture discs, and gas density monitoring system transducers per gas zone.
vi. Provisions for future main bus extension at one end including isolating links.

e. Line Feeder Circuit Breaker Bay Elements

Each line feeder circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA including equipment outside of GIS such as line termination gantries, CVTs, CTs, surge arresters etc. and shall be comprised of:

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches, and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated High-Speed Grounding Switch (HSGS) and able to interrupt capacitive current from adjacent line circuit complete with manual and motor-driven operating mechanisms
vi. (3) three sets of 4000A gas-insulated bus extensions to gas-to-air bushing modules
vii. (3) three sets of 4000A gas-insulated bus extensions to gas-to-air bushing modules
viii. Three (3) nos. single phase set of gas to air bushings.

f. Future Line Feeder Circuit Breaker Bay Elements

Each future line feeder circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) One set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (3) three sets of 4000A gas-insulated bus extensions with end bushings

g. Autotransformer Circuit Breaker Bay Elements

Each autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) two three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of gas-insulated bus extensions to gas-to-air bushing modules
viii. Three (3) nos. single phase set of gas to air bushings.

h. Future Autotransformer Circuit Breaker Bay Elements

Each future autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (2) two sets of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with the separate operating mechanism for each pole.
ii. (4) four sets of three cores single-phase current transformers.
iii. (4) four sets of three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of 4000A gas-insulated bus extensions with end bushings

i. Tie Circuit (middle diameter) Breaker Bay Elements

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) two three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches, and maintenance earthing switches complete with manual and motor-driven operating mechanisms.

j. Spare Autotransformer Switching Bay Elements

i. (2) two three-phase sets of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches, and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
ii. (2) two trifurcation modules to transition from three single-phase encapsulated, independent pole, autotransformer isolating disconnect switches to single-phase gas-insulated bus extension to a gas-to-air bushing module for the spare autotransformer.
iii. (1) one single-phase gas-insulated bus extension to the gas-to-air bushing module.
iv. (1) one single-phase gas-to-air bushing.

k. The gas-insulated circuit breakers shall be equipped with a Controlled Point-on-Wave Switching Device (CPWSD) for auto transformer circuit breakers and middle breaker of each diameter which involves an auto transformer. The price for the same is deemed included in the cost for the gas-insulated circuit breaker. The use of PIR and CPWSD for line feeders and associated tiebreaker could be confirmed only after conducting Transient Switching Study by the Contractor and shall develop respective detailed specifications for PIR as per relevant IEC/IEEE standards. The Price of the line circuit breaker and its associated tie circuit breakers

equipped with CPWSD and circuit breaker equipped with PIR should be provided as per the Schedule 4.4.2: Breakdown for Day work Rates: Materials.

l. Testing & Maintenance Equipment will be required for 420kV GIS as per specification.

m. Gas-to-air bushings and support structures for outdoor connections to connect the GIS to overhead lines and gas- to- air bushing modules for auto transformers are part of the GIS scope of supply.

3.2 220KV RATMATE GIS SUBSTATION

a. The design, manufacture, testing, spare parts, training, delivery, installation, commissioning and in-service performance of high-voltage sulfur hexafluoride (SF6), gas-insulated switchgear (GIS) including indoor and outdoor gas-insulated bus (GIB) including all GIB supporting structures to overhead and/or underground line terminations or direct connections to power transformers, reactors or other equipment, rated 245kV.

b. The installation of a 220kV gas-insulated switchgear (GIS) switchyard connecting transmission lines, with provisions for connecting future transmission lines, serving bulk auto transformers and with provisions for serving future bulk auto transformers. The switchyard shall be a 220kV substation bus arrangement that will be a breaker and half configuration. The 220kV GIS switchyard shall include 220kV gas-insulated switchgear, associated Local Control Cabinets (LCC's) and all required auxiliary equipment located in a framed RCC high voltage switchgear building. The GIS shall include all 220kV interconnecting gas-insulated bus and gas-to-air bushing interfaces to the lines and autotransformers.

c. The 245 kV SF6 gas-insulated switchgear shall have the following overall design ratings:

Maximum System Voltage: 245kV

Nominal System Voltage: 220kV

Rated Frequency: 50Hz

Rated Continuous Current: 4000A

Rated Short Circuit Current: 50kA

Rated Short Circuit Duration: 1 second

The GIS shall be complete with all necessary terminal boxes, SF6 gas filling equipment, SF6 gas monitoring equipment, interconnecting power, and control wiring, earthing connections, support structures, base plates, foundation anchor bolts, necessary marshalling cabinets and all equipment and accessories specified in the technical specification.

d. Main Bus Elements

Two sets of single-phase encapsulated, metal-enclosed, gas-insulated main bus bars rated 245kV, 4000A, 50kA each enclosed in three individual bus enclosures extending the length of the switchgear to interconnect each of the diameters and associated circuit breaker bays. Each main bus bar set shall comprise of:

i. (3) three single-phase encapsulated 4000A main bus bars and enclosures. Each main busbar enclosure shall be segregated on a per diameter basis with gas-tight barriers installed in the main bus enclosures between each diameter connecting the main buses).
ii. (3) three inductive voltage transformers with isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iii. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
iv. (1) lot gas fill ports, gas density monitors/gauges, rupture discs and gas density monitoring system transducers per gas zone.
v. Provisions for future main bus extension at one end including isolating links.

e. Future Line Feeder Circuit Breaker Bay Elements

Each future line feeder circuit breaker bay shall be of single-phase encapsulated design rated 245kV, 4000A, 50kA and shall be comprised of:

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with a separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (3) three sets of 4000A gas-insulated bus extensions with bushings .

f. Autotransformer Circuit Breaker Bay Elements

Each autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 245kV, 4000A, 50kA and shall be comprised of:

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with a separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.

iii. (2) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of gas-insulated bus extensions to gas-to-air bushing modules
viii. (1) one three-phase set of gas-to-air bushings.

g. Future Autotransformer Circuit Breaker Bay Elements

Each future autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 245kV, 4000A, 50kA and shall be comprised of:

i. (2) two sets of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with the separate operating mechanism for each pole.
ii. (4) four sets of three cores single-phase current transformers.
iii. (4) four three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1)one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3)three sets of 4000A gas-insulated bus extensions with bushings

h. Future 220/132kV Transformer Circuit Breaker Bay Elements

Each future autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 245kV, 4000A, 50kA and shall be comprised of:

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with a separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) two three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.

iv. (3) three inductive voltage transformers with isolating/earthing links
v. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (2)two three-phase sets of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of 4000A gas-insulated bus extensions with bushings

i. Tie Circuit (middle diameter) Breaker Bay Elements

i. (1) one set of three single-phase encapsulated, independent pole, gas-insulated circuit breakers complete with a separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) two three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.

j. Spare Autotransformer Switching Bay Elements

i. (2) two three-phase sets of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
ii. (2) two trifurcation modules to transition from three single-phase encapsulated, independent pole, autotransformer isolating disconnect switches to single-phase gas-insulated bus extension to a gas-to-oil termination bushing module for the spare autotransformer.
iii. (1) one single-phase gas-insulated bus extension to the gas-to-air bushing module.
iv. (1) one single-phase gas-to-air bushing.

k. Testing & Maintenance Equipment will be required for 245kV GIS as per specification.
l. Gas-to-air bushings and support structures for outdoor connections to connect the GIS to overhead lines and transformers are part of the GIS scope of supply.

3.3 AUTO TRANSFORMERS

a. Design, engineering, manufacture, testing at manufacturer's facility, delivery to the site including all materials, accessories, spares, unloading, handling, proper storage at the site, erection, testing and commissioning of the 167 MVA, 400/√3/220/√3/33kV Single Phase Auto Transformers as specified below;

i. 7 (6 + 1 Spare) of 167 MVA, 400/√3/220/√3/33 kV single phase, constant ohmic impedance type Auto Transformer with series winding for HV & IV and separate winding for LV, 50Hz, YNa0d11, oil immersed, ONAN/ ONAF/ OFAF cooled, equipped with on-load tap changer (OLTC), outdoor

type, complete with all fittings and accessories including local OLTC control cabinet, cooler control cabinet and Remote Tap Changer Control panel, neutral CTs and On line Dissolved Gas , necessary arrangement for Delta formation of LV winding & Neutral Formation and Earthing Arrangement, surge protection device, Neutral Current transformer (NCT) and all fittings & accessories as specified/ required for completion of the scope of works as per technical specification.

ii. Insulating oil for first filling plus 10 % extra to account for spillage, sampling etc. for all the Transformers.
iii. Oil storage tank of suitable size.
iv. Steel rails with all accessories to fix it on the transformer foundation.
v. One (1) set of Oil filtration plant as per Annex B01-12-Oil Filtration Plant.

3.4 400KV AIS EQUIPMENT

Supply, Erection, Testing & Commissioning of 400kV AIS equipment as listed below:

i. Six (06) three-phase set of Capacitor Voltage Transformer (CVT) for 400kV.
ii. Six (06) three-phase set of Current Transformer (CT) for 400kV.
iii. Six (06) three-phase set of 400kV Surge Arrester (SA)
iv. Seven (07) Nos of Gantry Column for 400 kV Incoming Line
v. Six (06) Nos of Gantry Girder for 400 kV Incoming Line

3.5 STATION SERVICE TRANSFORMER

Supply, Erection, testing & commissioning of Two nos. 630 kVA, 33/0.4 kV LT Transformer with surge arrester along with 72.5kV circuit breakers, isolators and current transformers, for tertiary loading. These LT transformers should not be used for construction purposes.

3.6 EMERGENCY DIESEL GENERATOR SET

1 (one) Diesel Generator 230/400 V, 50 Hz, 250kVA, 24 h continuous operation.

3.7 ELECTROMECHANICAL SYSTEM

400 kV, 220kV, 66 kV and 33 kV Bus Post Insulators, clamps & connectors, Equipment terminal connectors (including terminal connectors for Auto Transformer), Conductors, Aluminum tubes, Bus bar and earthing materials, Bay marshalling box, spacers, cable supporting angles/channels, Cable trays & covers, Junction box, buried cable trenches, etc. as required. Due to space constraints, tertiary auxiliary bus & delta formation of the autotransformer is not possible by overhead Al-tube arrangement and the same shall be done by using 33kV XLPE cable and is included in the present scope of the contract.

3.8 AUTOMATION AND TELECOMMUNICATION SYSTEM

a. SAS General Information

The substation automation system (SAS) shall be based on IEC 61850 including hardware and software for local and remote-control station operations. The SAS shall integrate the associated equipment for the following bays and auxiliaries (bay as defined in Technical Specification, Substation Automation System):

- 400kV: Line Bays, Diameter Middle Breaker Bays
- 400/220 kV: Auto Transformer Bays, Diameter Middle Breaker Bays
- 220 kV: Line Bays, Diameter Middle Breaker Bays
- 33 kV: Station Service Transformer Bays
- Substation Auxiliary Systems: Lighting, Air Conditioning, AC/DC Supply, Station Service Transformer, etc.

The contractor shall supply the necessary bay monitors, installed at the Breaker Protection Panel installed in the Control Room.

The Contractor shall provide a SAS that includes provisions for all monitoring and control of all substation and auxiliary equipment, under contract. Future bays shall be displayed on the graphical displays and the database allocated with spare devices and spare point assignments.

The Contractor shall include provisions for monitoring and control from Local Control Cubicle (LCC), remotely from SAS/HMI at the Control Room and remotely from Regional Control Centre (RCC) and Load Dispatch Centre (LDC) located in Syuchatar, Kathmandu. The Contractor shall provide a complete turn-key service for the design, procurement, factory acceptance testing and installation and commission of the station equipment, at the site under contract, and at the remote end of the lines. If it is determined during the design process that the remote end of the line is under construction, then it is the responsibility of the Contractor to coordinate activities with the remote-end Contractor to ensure complete monitoring and control, protection system is provided, at no additional cost.

The Contractor shall supply a complete SAS that meets and fulfills the Employer's requirements and specifications. The Contractor shall, at every stage of the design process, provide documentation for the Engineer's review and approval. The Engineer will coordinate the interface with the Contractor in order to monitor, control and manage the SAS from the regional control centre or remotely from LDC.

All intelligent electronic devices (IED) shall include manufacturer's software for remote configuration, local configuration, and online monitoring. The IED's shall be installed, functional, and accessible from the site engineering workstation and integrated into the SAS. Access to the IEDs with the manufacturer's software shall not disturb the normal day-to-day operation of the IED. The data points accessible from the IED through the manufacturer's software shall also be accessible from a separate communication port, from the IED, in order to route data points and integrate into the SAS.

All online monitoring equipment (i.e., Optical Temperature Sensors & Measuring Unit, Online Dissolved Gas (Multi-gas) and Moisture Analyzer), including spare, shall be IEC 61850 compliant (either directly or through a Gateway). The monitoring equipment is required to be integrated with SAS through a managed Ethernet switch conforming to IEC 61850. All Ethernet switches shall be provided by the contractor. All switches shall be powered by redundant DC supply.

The SAS shall comply with IEC 61850, cybersecurity requirements IEC 62351-8, and all other related IEC substation, automation, cybersecurity standards to ensure a reliable and robust SAS is provided.

The system under the present scope shall be integrated by the Contractor into the existing SAS of Siemens 'SINAUT Spectrum" (version 4.3.2) installed at the Master Station (i.e., Nepal Electricity Authority) LDC. The integration shall include all hardware and software required at the Control Center as well as necessary database development, display generation and upgrades for proposed control and monitoring of the station and network analysis of the communication infrastructure. The above activities shall be carried out as appropriate, for all respective stations and the LDC. The manufacturer of the existing SAS system is Siemens Germany. The existing communication protocol used for SAS at LDC Kathmandu is IEC 60870-5-10x. In the present scope of work, the data points for the master station shall be obtained from the SAS, based on IEC 61850, using a Gateway port with communication protocol IEC 60870-5-10x, as per requirement being provided at the substation. The Contractor shall provide all approved data points requested by the Engineer during the design, factory acceptance test, installation, or commissioning stage of the project.

SAS Interface Panels (IFP) shall be provided with terminal blocks for data acquisition, including cabling between control and protection panels and other interface panels required by the SAS

b. LDC Telecommunication System Integration

The broad scope of FO based communication equipment shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing, training and demonstration for acceptance, commissioning and documentation for:

- SDH and termination equipment along with suitable interfaces and line cards.
- All cabling, wiring, digital distribution frame (DDF) patch facilities, and interconnection to the supplied equipment at the defined interfaces.
- System integration of all supplied subsystems at New Hetauda and Lapsiphedi. Integration with the existing communication system based on SDH/PDH of Nepal Electricity Authority including all configuration of existing NEA FO SDH network equipment
- Integration of the supplied subsystem with LDC control and monitoring system, communication equipment, VOIP PBX of RLDC/LDC, for voice.

- Network manager system, both software and hardware, including VOIP telephone instrument with one common switch, minimum 4 ports, including hardware and software.
- The existing FO SDH backbone will be extended to the new substations from New Hetauda and Lapsiphedi by means of the 400kV OPGW and corresponding SDH terminal and multiplexer to be installed in the three new substations.

The Contractor shall supply the fiber optic terminal equipment based on SDH technology with optical line termination equipment, digital multiplexer, hardware accessories, etc., along with approach optical fiber. As per requirement from junction box (JB) to optical distribution frame (ODF) box, the necessary interfacing, and its integration work, at Hetauda and LDC, for onward transmission of data and voice communication for LDC shall be included in the contract. The high-level communication scheme shall be attached to the drawings given with this specification.

c. Private Automatic Phone Exchange PABX

The necessary approach cable and hardware for termination of OPGW of Ratmate – Lapsiphedi and Ratmate - Hetauda D/C Lines at Ratmate Substation End, its interfacing with DPC for tele protection application and necessary SDH, MUX/DMUX telecommunication terminal equipment required for the communication of the said 400 kV Lines and its integrations with SAS at both end substations and SCADA system of the LDC shall be included in the present scope of contract. Bidders are requested to visit the substation site and make their own acquaintance with the scope of works as described herein.

The telecommunication system will mainly be based on Fiber Optical Phase Ground Wire (OPGW) transmission media constituting an extension of the existing Synchronous Digital Hierarchy (SDH) Backbone of NEA. This will be achieved by using the fiber optic OPGW available from the new EHV Transmission line sections built as part of the project.

The optic fiber telecommunication network will provide services mainly for the EMS SCADA data exchanges and phone communication between the various NEA substations and the main NEA Dispatch Center. The optic fiber links will also be used for transmission line differential protection and distance protection signaling.

In each of the new substations (Ratmate, New Damauli and New Butwal), a fiber optic SDH platform terminal with the necessary tributaries and multiplexers will be installed to extend the existing NEA network from the Lapsiphedi and New Hetauda substation ends and offer access to the NEA transmission backbone for those new substations services. The contract scope of works includes all interface works with the NEA fiber optic network in Lapsiphedi and New Hetauda along with all configuration within the existing NEA network for integration of the new substations SDH nodes.

The fiber optic telecommunication system shall be supervised and controlled by a centralized Telecommunication Management System (TMS) located at the NEA Main Dispatch Center or Ratmate substation (to be defined during contract performance).

A new phone exchange VoIP PBX will be located in Ratmate with local extensions in Ratmate and remote extensions in Lapsiphedi, New Hetauda, New Damauli, New Butwal and Interconnection Substation in India. The VOIP PBX will provide access to the public phone network (PSTN) at Ratmate, New Damauli and New Butwal with suitable CO (Central Office) trunks; the scope of works include the interface with the existing public network. Trunks will link with the existing NEA phone network at Lapsiphedi and New Hetauda; scope of works includes all interface works at Lapsiphedi and New Hetauda along with all configuration within the existing NEA network for integration of the new substation VOIP PBX.

3.9 CONTROL AND PROTECTION

This scope in this specification covers the materials and services for the protection and control equipment to be provided for the Ratmate Substation. The Contractor shall supply a complete protection and control scheme that fulfills all the Employer's requirements and specifications. The contractor shall provide all the equipment and design services to create a fully-functional, integrated Protection and Control scheme for all overhead transmission lines, transformers, bus bars, future line terminals, and auxiliary equipment even if it is not specifically identified in the specification. All interface equipment between systems, studies, designs, and protective relay and communications equipment programming shall be included. The protection and control equipment shall be furnished such that it interfaces seamlessly with the SAS equipment. Any auxiliary system or piece of equipment, whether specifically identified or not in this specification, needed to create a complete protection and control system shall be provided. The Contractor shall provide a complete turn-key service for the design, procurement, factory acceptance testing, installation, field testing and commissioning of the station equipment at the site under contract and the remote end of the lines.

Per the included specifications, each protection zone and/or protected piece of equipment shall be protected by dual, redundant, and independent protective relay systems, to include but not limited to tele-protection communications channels. Any failure in one of the protective relaying systems shall not adversely affect the redundant protection system. Single (non-redundant) breaker failure protection is acceptable for each circuit breaker.

The contractor is responsible for providing complete protection and control designs, studies, equipment, installation, and testing for new electrical system protection required at the remote stations to provide a complete protection system for the new transmission lines and substations. If the remote end station has existing protection and control systems, the new protection and control equipment at the local substation shall be specified to interoperate seamlessly with the existing equipment. If the existing remote equipment is not suitable for the purpose or does not meet all of the requirements of the Employer or this specification, it is the Contractor's responsibility to replace the remote end protection and control equipment with suitable protection schemes. If the remote end substation is still in the design or construction phase, it is the Contractor's responsibility to coordinate protection and control designs with the contractor responsible for the

remote station. The following lists a summary of the major equipment to be protected and its associated protection and control system at the Ratmate substation.

- ✓ 400 kV new Overhead Lines
    - Each line shall have dual primary protection schemes designated as Main I and Main II
    - The primary protection element for the Overhead Lines in both Main and Main II protection schemes shall be line current differential with communication between local and remote relays provided by fiber optic communication channels
    - The back-up protection elements in both Main and Main II protection schemes shall be provided by step-distance and overcurrent elements
    - Control and Protection panels shall not be provided for future lines
    - The Main I and Main-II relay shall be of different make & model. Same make relay shall be acceptable only if they are of different hardware & manufacturing platform
- ✓ 400/√3/220/√3/33kV new 167 MVA autotransformers
    - Each autotransformer shall have dual primary protection designated as Main I and Main II
    - The primary protection elements for the auto transformers shall be transformer differential and restricted earth fault (REF) elements
    - The back-up protection elements shall be provided by overcurrent elements
    - Control and Protection panels shall not be provided for future auto transformers
- ✓ Two (2) 400 kV bus bars
    - Each bus shall have dual primary protection designated as Main I and Main II
    - The primary protection element for the bus bars shall be low impedance bus differential
- ✓ 400 kV circuit breakers
    - Each circuit breaker shall have a single breaker failure relay
    - The primary protection element shall be provided by the 50BF element with direct transfer trip provided to breakers at remote stations via fiber optic communications

3.10 FIRE PROTECTION SYSTEM.

Fire detection and protection system for 7 nos. of 400/√3/220/√3/33 kV, 167 MVA, 1-Ph Autotransformers, 400 kV GIS building, 220 kV GIS building and control building, including Fire Fighting Pump House & water Tank, are envisaged in the present scope of Contract.

3.11 POWER AND CONTROL CABLES

Complete cabling, including mainly:

- 33 kV XLPE cables from the 33 kV Equipment up to the 33 kV bushings of the 400/220/33 kV Auto transformer
- Pot heads, termination kits or any other materials required to connect 33 kV cables from Auto transformer tertiary to the 33 kV equipment.
- Low voltage Power & Control Cable along with complete accessories to complete the scope of work.

3.12 EARTHING SYSTEM

The earth mat for GIS earthing and the yard earthing required as per specification is in the bidder scope. All the AIS/GIS equipment, Transformer, and buildings shall be earthed per IEEE 80 standards and specifications mentioned in the contract and will be connected to the main earth mat by the contractor. All earthing system design, materials supply, installation and testing required shall be in the present scope of work.

3.13 LIGHTING SYSTEM

Complete design, procurement, installation and testing of lighting and illumination for all substation buildings and outdoor switchyard are included under the present scope of work.

3.14 LIGHTNING PROTECTION SYSTEM

Complete design, procurement, and installation of lightning protection for all the substation buildings and outdoor switchyard are included under the present scope of work. A combination of Lightning Masts and shield wires can be used to provide this protection. Lightning masts can also be used to mount lighting fixtures and shall be grounded to the main grid.

3.15 AUXILIARY POWER SUPPLY

3.15.1 AUXILIARY SUPPLY 400/230 V

Supply, Installation, and testing of all 400/230 V AC distribution switchgear for the 400/220 kV switchyard and buildings as well as for outdoor and indoor lighting, fed from the station service transformer, as shown in the drawing. An emergency lighting system (220 V DC) shall be installed in the buildings.

Substation shall have Three Phase and Single Phase Industrial Grade Electrical Sockets shall be provided for charging of electric vehicles with following technical specifications:

- Three-Phase Sockets (2 Nos): 400V, 63 Amp, 5 Pole(3P+N+E), 50Hz, CE certified.
- Single Phase Sockets (3 Nos): 230V, 16Amp, 3 Pole (P+N+E), 50Hz, CE certified.

3.15.2 AUXILIARY SUPPLY 220V AND 48 V DC

a. The capacity of Battery & Battery charger shall be worked out by the bidder for complete 400kV and 220 kV substation scope including future bays as shown in the Single line diagram. For Battery sizing calculations, DC drives shall be considered for future 400kV GIS modules. However minimum battery size for 220 V batteries shall be 800 AH and for 48 V batteries shall be 400 AH.
b. All necessary auto throw over system, switches and distribution boards required to ensure uninterrupted DC supply from the battery and chargers, as shown on the drawings, shall be included in the scope.

3.16 VISUAL MONITORING SYSTEM

a. The Video Monitoring system shall be an integrated system with IP network-centric functional and management architecture aimed at providing high-speed manual/automatic operation for best performance.
b. The system should facilitate viewing of live and recorded images and control of all cameras by the authorized users.
c. The system shall use video signals from various types of indoor/outdoor CCD color cameras installed at different locations, process them for viewing on workstations/monitors in the control room and simultaneously record all the cameras after compression using H 264/MPEG 4 or better standard. Mouse/Joystick-Keyboard controllers shall be used for Pan, Tilt, Zoom, and other functions of desired cameras.
d. The System shall provide sufficient storage of all the camera recordings for a period of 15 days or more @ 25 FPS, at 4 CIF or better quality using necessary compression techniques for all cameras. It shall be ensured that data once recorded shall not be altered by any means. The recording resolution and frame rate for each camera shall be user-programmable.
e. The surveillance VMS System shall operate on 230 V, 50 Hz single-phase power supply. The system shall have a backup UPS power supply meeting the power supply needs of all the cameras in the stations including those which are installed at the gate for a period of 2 hours. The bidder shall submit the sizing calculation for the UPS considering the total load requirement of the Video Monitoring System.

3.16.1 SYSTEM REQUIREMENTS:

a. The system must provide a built-in facility of watermarking or Digital certificates to ensure tamper proof recording.
b. All cameras may be connected through a suitable LAN which shall be able to perform in a 400kV class substation environment without fail.
c. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password.
d. The facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
e. The facility of Camera recording in HD (1280X720p), D1, 4CIF, CIF, VGA, as well as in any combination i.e. any camera can be recorded in any quality.

f. System to have a facility of 100% additional camera installation beyond the originally planned capacity.
g. In order to optimize the memory, while recording, the video shall be compressed using H 264/MPEG-4 or better standard and streamed over the IP network.
h. The system shall be a triplex i.e. it should provide a facility of Viewing, Recording & Replay simultaneously.
i. The offered system shall have the facility to export the desired portion of clipping (from a specific date/time to another specific date/time) on CD or DVD. Viewing of this recording shall be possible on standard PC using standard software like windows media player etc.
j. The system shall have a provision of WAN connectivity for remote monitoring.
k. The equipment should generally conform to Electromagnetic compatibility requirements for outdoor equipment in EHV switchyards. The major EMC required for Cameras and other equipment shall be as under:
    i. Electrical Fast Transient (Level 4) – As per IEC 61000-4-4
    ii. Damped Oscillatory (1 MHz and 100 KHz) (level 3) – As per IEC 61000-4-12
    iii. AC Voltage Dips & Interruption/Variation (level 4) – As per IEC 61000-4-12
    iv. Electrostatic Discharge (Level 4) – As per IEC 61000-4-2
    v. Power Frequency Magnetic Field (level 4) – As per IEC 61000-4-8
    vi. Ripple on DC Power Supply (level 4) – As per IEC 61000-4-17

l. Type test reports to establish compliance with the above requirement shall be submitted during detailed engineering.

3.16.2 VIDEO SURVEILLANCE APPLICATION SOFTWARE

a. Digital video surveillance control software should be capable of displaying and managing the entire surveillance system. It should be capable of supporting a variety of devices such as cameras, video encoders, Servers, NAS boxes/Raid backup devices, etc.
b. The software should have an inbuilt facility to store the configuration of encoders and cameras.
c. The software should Support flexible 1/2/4/8/16/32 Windows Split-screen display mode and scroll mode on the PC monitor.
d. The software should be able to control all cameras i.e. PTZ control, Iris control, auto/manual focus, and color balance of the camera, Selection of presets, Video tour selection, etc.
e. The software should have user access authority configurable on per device or per device group basis. The system shall provide a user activity log with the user ID, timestamp, an action performed, etc.
f. The users should be on a hierarchical basis as assigned by the administrator. The higher priority person can take control of cameras, which are already being controlled by a lower priority user.
g. It should have recording modes viz. continuous, manual, or programmed modes on the date, time and camera-wise. All modes should be disabled and enabled using scheduled configuration. It should also be possible to search and replay the recorded images on the date, time and camera-wise. It should provide onscreen controls for remote operation of PTZ cameras. It should have the facility for scheduled recording. Different recording speeds (fps) and resolution for each recording mode for each camera should be possible.

h. The software for clients should also be working on a browser-based system for remote users. This will allow any authorized user to display the video of any desired camera on the monitor with full PTZ and associated controls.
i. Retrieval: The VMS application should allow retrieval of data instantaneously or any date/time interval chosen through the search functionality of the application software. In case data is older than 15 days and available, the retrieval should be possible. The system should also allow for backup of specific data on any drives like DVDs or any other device in a format that can be replayed through a standard PC based software. The log of any such activity should be maintained by the system.
j. VMS shall provide the full functionality-reporting tool, which can provide reports for user logon/logoff, camera accessibility report, and server health check reports, etc.

3.16.3 NETWORK VIDEO RECORDER

a. The Network Video recorder shall include at least Server (min 3.0 GHz, 4GB RAM, 3000GB HDD (min)), RAID 5, with suitable configuration along with Colored TFT 22" High-resolution monitor, and Internal DVD writer. Windows XP/Vista/7 Prof. or VMS compatible operating system latest version with hardware like graphic cards, licensed Anti-virus, etc.
b. Further, the digital video recorder shall conform to the following requirements:

Server Spec	Intel Quad-Core (or better) 3.0 GHz (min.), 8 MB Cache, 4 GB memory, with suitable NVIDIA graphics card,3 TB HDD, Raid 5
Recording and Display Frame Rate	Real-time 25 frames per second per channel, manual select
Recording Resolution	(PAL): 1280X720, 704(H) x 586(V) It should be possible to select lower resolutions
Compression Method	H.264/MPEG-4 or better and latest
Video Motion Detection Capable	Standard and built-in (selectable in the menu)
Monitoring Options	Split-screen 1, 2, 4, 8, 16, 32 or more cameras
Playback Options	Search, still image capture
Alarm/Event Recording Capable	To be provided with built-in external alarm input/output ports minimum(8 in, 2 out)
Network Operation Capable	To be provided by using WAN or LAN router
Remote Internet Viewing Capable	Using WAN or LAN router

HDD Storage Consumption	1GB ~ per hour/channel variable based on frame speed and resolution settings, as well as compression
Operation	Triplex operation (simultaneous recording, playback, network operation)
Number of Video Channel	32
Audio Recording Capable	32
Input Voltage	230V AC or equivalent with UPS as a backup for 30 minutes

3.16.4 VMS CAMERA

a. The color IP camera for substation shall have PAN, TILT and ZOOM facilities so that it can be focused on the required location from the remote station through a controller. Whereas wireless IP cameras with PTZ controls are required for installation at gates of the NEA premises as per the direction of Engineer-In-Charge.
b. The IP Camera at the main gate can be fixed or PTZ based and shall be used for monitoring entry and exit.
c. It should have a sufficient range for viewing all the poles of isolators and other equipment with a high degree of clarity.
d. The VMS camera shall be suitable for wall mounting, ceiling mounting, and switchyard structure mounting.
e. It shall be possible to define at 128 selectable preset locations so that the camera gets automatically focused on the selection of the location for viewing a predefined location.
f. The camera should be able to detect motion in the day & night environments having the light intensity of Color: 0.5 Lux; B&W:0.05 Lux
g. The housing of cameras meant for indoor use shall be of IP 42 or better rating whereas outdoor camera housing shall be of IP 66 or better rating. Housing shall be robust and not have the effect of electromagnetic induction in a 400KV switchyard.
h. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password
i. The facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
j. Outdoor IP Fixed Megapixel Camera Specifications (For Main Gate) shall include the following:
    i. Image Sensor 2-megapixel Progressive, 1/3" CMOS/CCD sensor, Minimum illumination 0.1 Lux
    ii. Min Luminous 0.5LUX(Color) 0.05Lux(Black)
    iii. Camera Enclosure Type IP66 Grade
    iv. Iris/Focus Auto/Manual
    v. Video Compression Dual Stream H.264 and MPEG 4 user selectable
    vi. Support Dual-stream primary/secondary stream, H.264/MPEG 4 optional

vii. Video Definition Primary stream:1600x1200,1280x960,1280x720, Secondary stream:800x600,400x288,192x144
viii. Video Parameters Brightness, hue, contrast, saturation and image quality
ix. Video Frame Rate PAL: 1-25frames/second NTSC:1-30frames/second
x. Video Compression BR 32Kbit/S - 6Mbit/S
xi. Video Output One channel composite Streaming
xii. Supported Protocols TCP, UDP, IP, HTTP, FTP, SMTP, DHCP, DNS,ARP, ICMP, POP3, NTP, IPsec, UpnP, RTP, RTCP
xiii. Operating Temperature -5 ~ +50℃
xiv. Operating Humidity 10 ~ 90%

k. Outdoor IP66 PTZ HD Camera Specifications (For Switch Yards) shall include the following:
i. Image sensor 1/3 type Solid State Progressive Scan CCD, WDR(High Definition)
ii. Security Multiple user access with password protection
iii. Effective Pixels (PAL): Main Stream : 1280x720 Sub Stream : 640x360、320x280 selectable
iv. Compression Dual Stream H.264 and MPEG 4 user-selectable
v. Signal System 50 Hz
vi. S/N (signal to noise) Ratio Better than 50 dB
vii. Electronic Shutter 1/60 ~ 1/10,000 sec. automatic or better
viii. Scanning System Progressive/interlace
ix. Low Light Sensitivity (lux) Color: 0.5 Lux; B&W:0.02 Lux
x. Lens Minimum 10x (minimum) optical in High Definition

3.16.5 PTZ-KEYBOARDS

a. The features of PTZ shall include:
1. Fully functional dynamic keyboard/joystick controllers
2. Controls all pan, tilt, zoom, iris, preset functions
3. Control up to 255 units from a single keyboard
4. Many preset options and advanced tour programming
5. Compatible with all connected cameras

Key Application	Wired keyboard control operation of PTZ functions for weatherproof dome cameras
Pan / Tilt / Zoom Protocol Languages Supported	Selectable
PTZ Data Transfer Baud Rates Supported	Selectable 1200 bps / 2400 bps / 4800 bps / 9600 bps
Additional Features	Dynamic joystick for smooth camera movements, preset location option for quick access to frequently monitored areas

3.17 CIVIL & STRUCTURAL WORKS

3.17.1 GENERAL

This specification covers the design, construction, and supply of all civil works including heating, ventilation and air conditioning of the specified new 400/220/33 kV substation at Ratmate and the 400 kV line connection at New Hetauda and Lapsiphedi.

This document is describing quality standards, required functions but is not a detailed specification. Therefore, the requirements are not limited to the descriptions hereafter; items not explicitly mentioned shall be in the same best quality range as for the entire works of the project.

The civil works must be performed in such a manner that the high standards of quality and function required are fully achieved.

Special attention must be paid by the Contractor to the aspects, which are specific to climate, seismicity, and local conditions.

The buildings and structures shall be designed with due regard to the need for easy inspection, maintenance, cleaning and repair, and must be designed and constructed to operate for long-term periods with the minimum of inspection, adjustment, and repair.

Lattice and pipe structures (galvanized): Standard lattice gantry structures (400/220/66/33kV Beams Towers and Lightning Mast), pipe/lattice support structure for equipment (pipe structures shall be used for 220 & 400 kV equipment support) and Structures for Building and AHU room, etc. shall be prepared by the contractor and shall be submitted for approval of detailed engineering.

All material shall be new and of the best quality suitable for working under the conditions, variations in temperature and load encountered in service without undue distortion or deterioration or the occurrence of undue stresses in any part, such as to affect the efficiency and reliability of the plant.

3.17.2 SCOPE OF SUPPLY AND SERVICES

3.17.2.1 GENERAL

The services to be provided within the framework of this specification comprise the planning, design and complete supply and execution in every respect including all the necessary calculations and documentation, prefabrication, delivery, erection and acceptance of all civil works required for faultless operation of the new substations.

The scope of civil works shall include construction of the GIS buildings, control buildings and site preparation and grading as shown on the single line and layout drawings.

The civil works consist of, but are not limited to the following main services:

- detailed design and engineering

- supply of all labor, materials, equipment, temporary work, tools, etc., necessary for the execution of the civil works
- site related investigations
- earthworks including also all leveling and grading work in the project area as well as the necessary soil improvements as required
- foundations
- structural and nonstructural steelwork
- building works
- containers
- roads and parking including access road
- fencing and gates
- storm water drainage and sewage systems
- Civil works for cable, routing, ducts, trenches, tunnels, crossings, etc.
- fire protection works
- water supply system
- water tank
- earthing system
- outdoor lighting system

3.17.2.2 INSTRUCTIONS RELATED TO THE SCOPE OF WORKS

The Contractor will be fully responsible for ensuring that all materials used in the work and temporary works comply with the approved standards and that all processes of workmanship are carried out with a high degree of efficiency, in accordance with an approved program and in compliance with the requirements of this specification. Solely virgin materials, subject to the Engineer's approval shall be used.

While the civil works are in progress, the Contractor shall provide suitably qualified competent Civil Engineers to be full time on the site to supervise and verify the work, quality, and progress to the approved schedule of the work.

To ensure proper quality assurance the Contractor shall submit for approval a Civil Works Quality Plan, as a part of the QA/QC procedures.

All work shall be constructed to the lines and levels shown on the drawings prepared by the Contractor and approved by the Engineer

The Contractor shall employ competent design engineers to prepare civil design. All designs shall be prepared in accordance with the best current engineering practice, the requirements of the project specifications and the appropriate Codes of Practice and Standards, as approved by the Engineer. Any deviation from the project specifications must be duly requested and justified in writing from the Engineer with formal Design Change Authorizations.

The building, structures and roads within the site and their design and detailing shall comply with the fundamental technical and operational requirements of the electrical equipment to be accommodated therein and with the requirements of this specification.

Buildings and structures shall be earthed and be provided with a lightning protection system.

Ducts, trenches and/or tunnels shall be provided with suitable permanent pumps and sump pits to enable the easy removal of water spillages and firefighting water collected in these areas.

If culvert(s), and /or tunnel(s), a trench(s) or any other underground services are crossing roads and railways, other ducts and channels, etc., these shall be constructed as bridges calculated for heavy truck loading.

Where sizes and/or dimensions are given in the Tender Package, those shall be considered as informative and for guidance only.

The Contractor shall be responsible to finalize all such sizes and dimensions during his detailed engineering to fulfill all functional and specified requirements.

3.17.2.3 PREPARATORY WORKS

Preparatory works include all necessary topographical surveys and soil investigations, as well as all other investigations and studies necessary for the design and execution of works:

- Safety and security measures;
- Investigation of all areas which have to be cleared and cleaned, for the execution of new works, filling of cavities, grubbing, etc.

3.17.2.4 ENGINEERING WORKS

Engineering works include:

- Preparation of all documents, drawings, and calculations, necessary for the execution of civil works;
- Piling calculations (if any);
- Structural calculations for buildings, structures, and foundations;
- General arrangement and reinforcement drawings for concrete works, including bar bending schedules;

- Architectural arrangement drawings and details for the substation building;
- Layout with details of outdoor facilities;
- General arrangement and manufacturing drawings for steel structures;
- Preparation and submission of drawings for statutory approvals of local authorities and of the agencies, if applicable;
- Calculations for HVAC works, drainage and sewage systems

All documents, drawings, and calculations prepared must be submitted and approved by the Engineer before the execution of the engineering work.

3.17.2.5 TEMPORARY SITE INSTALLATION WORKS

Appropriate areas shall be made available to the Contractor for their organization works and storage facilities.

Temporary site installation works include:

- Within the proposed area for site organization, the Contractor shall provide and maintain appropriate office(s) for the Employer and the Engineer;
- Temporary latrines and sanitary facilities have to be installed by the Contractor;
- The temporary water and electricity demand and connection point shall be discussed during the Contract clarifications;
- Temporary roads, parking areas, and fences shall be constructed as necessary for the execution of works;
- All kinds of necessary temporary buildings for the execution phase of the project (storage, offices, workshops, security posts, laboratories, etc.).

3.17.2.6 SITE RELATED SURVEYS

3.17.2.6.1 TOPOGRAPHIC SURVEY

A topographical survey, concerning the three (3) sites of the project shall be carried out by the Contractor.

The Contractor shall perform all the necessary surveying works in order to:

- obtain topographic survey maps;
- ensure that the position and elevation of all constructed works are correct.

The existing benchmarks (if available) shall be used as the basis for the surveying works.

3.17.2.6.2 SOIL INVESTIGATION

The extent of the investigations done by the Contractor shall be such as to permit the satisfactory determination of all necessary subsoil characteristics, to exclude any unacceptable settlement and to determine the reliable type, size, and execution of foundations. These investigations have to be completed before the work starts. Detailed instructions for the Soil Investigations are given in this specification.

3.17.2.7 SITE DEVELOPMENT WORKS

Site development works include:

- Site clearance including diversion of existing services, if any;
- Site leveling and grading;
- Roads, drain, surfacing;
- Temporary constructions works and services enabling the works of the project;
- Temporary and permanent security fences around the substations' works.

3.17.2.8 MAIN CIVIL WORKS

General layout

The limits of the substations are given in the attached general layout plans.

Based on the attached draft layouts, the Contractor shall propose detailed arrangements with the various components for the final configuration of the substations, subject to the approval of the Engineer. In doing so, adequate safety clearances, fire compartments, the favorable layout of the plant components for monitoring and maintenance, the possibility for extension and any other requirements of up to date substation construction shall be taken into account.

GIS and Control buildings

The buildings will be designed and constructed by the Contractor according to the basic design indicated in the provided general arrangement.

The proposed arrangement of the buildings can be modified by the Contractor according to the specific conditions (i.e. transport ways, an arrangement of the equipment, partition of the building, etc.), subject to the Engineer's approval.

Guard house

A guard house as shown in general arrangement plans shall be provided at the entrance of the substations.

Outdoor foundations

Transformer foundations

The main oil-filled transformers shall be supported on reinforced concrete foundations. Necessary firewall, oil/water collecting and separating pits shall be provided.

Switchgear foundations

The following foundations shall be provided:

- Foundations for outdoor switchgear equipment, supports, and gantries

Miscellaneous foundations
Foundations for lighting poles, Bay marshalling box, panels and control cubicles of equipment

3.17.2.9 CABLE DUCTS

Where necessary, reinforced concrete trenches and ducts shall be provided.

3.17.2.10 ROADS, PAVEMENTS, AND SURFACING

The proposed roads and paving are indicated in the layout plan.

The new road system must be arranged by the Contractor in such a way that non obstructed traffic is guaranteed.

The connection portion of the access roads, outside of the site areas belongs also to the scope of works of the Contractor.

The rest of the areas of the substations, where no foundations, buildings or roads and landscaping are provided, will be covered by a layer of gravel, as per Engineer's instructions.

3.17.2.11 FENCES AND GATES

All substations have to be provided with fences and adequate gates.

3.17.2.12 DRAINAGE AND SEWAGE SYSTEM

Storm water drainage system

The storm water drainage system collects only clean storm water which should be discharged into the storm water system of the zone. For the substations, complete storm water drainage systems are required. Substantially maintenance-free and operationally safe installation must be guaranteed. The surface water drainage shall include all necessary gutters, down pipes, gullies, traps, catch pits, manholes, etc.

Sanitary sewage drainage

The sanitary water from the WC, urinals, shower, wash basins and kitchen shall be discharged to a treatment plant made of reinforced concrete.

The pre-cleaned water shall be led to a soak-away pit.

3.17.2.13 LANDSCAPING

The free areas of land inside the substations, where no roads or gravel is provided, shall be landscaped, using low to medium-high growing plants and grass. The landscaping is subject to the approval of the Engineer.

3.17.2.14 SPECIFIC CIVIL WORKS IN THE SUBSTATION

The exact amount of necessary construction works in the substations will be determined by the Contractor, subject to the approval of the Engineer. The anti-weed treatment & stone spreading at the substation, site drainage i.e. internal drainage (temporary for the construction phase and permanent) and external drainage, rainwater harvesting, and others necessary civil work should be carried out as per the Chapter: Civil work of B12: Technical Specification. The major works are listed below.

The main civil works are, but not limited to, the following:

- Construction of a control building, GIS building and other structures as required by the Engineer;
- Foundations for transformers including an oil/water collector with oil separator and firewall,
- Foundations for the equipment as well as supply and erection of supporting steel structures;
- Construction of a rainwater drainage system for the complete substation area, including an adequate discharge system outside of the substation area including also the dewatering of cable channels, as well as a discharge system to the outdoor area, as requested and approved by the Engineer;
- Supply and installation of fences/walls and gates, according to the instructions of the Engineer around the complete substation area;
- Design, preparation of drawing and construction of RCC fire protection walls between the transformer units shall be in accordance with Local Advisory Committee (LAC) recommendations.

- Design, preparation of drawing and construction of the fire-fighting pump house building shall be essentially single storied reinforced cement concrete (RCC) framed Building. The building auxiliary services like internal electrification, fire protection systems shall be designed in accordance with the requirements as specified in relevant section of technical Specification.
- Supply and installation of steel structures for outdoor equipment with long-time resistant corrosion protection and transformer gantries;
- Landscaping and/ or covering by the grass of the substation area according to the instructions of the Engineer;
- The surfacing of the substation area by gravel, according to the instructions of the Engineer;
- Construction of roads as well as the construction of service roads, as instructed by the Engineer;
- Provision of cable trenches and ducts, including also the supply and installation of covering plates, where required;
- Installation of an adequate water supply system and of a domestic water drainage system (canalization)
- Installation of an adequate designed septic tank, according to the local rules.
- Installation of permanent water supply from bore well/single point of water supply system with a underground storage tank of capacity 18m3, one (1) pump with discharge capacity of 0.6 liter/s, one (1) filter unit, one (1) pressurize unit, one (1) lot of pipes, valves etc. to be supplied to the Fire Fighting pump house, Fire water tank, control room building, GIS building, guard house, etc.; Installation of internal water supply system (including water pipes, arrangement for potable water system, pumping stations etc.) and domestic water drainage system (canalization).Installation of an outdoor lighting system.

Topographic Survey

Topographic site surveys are to be made in all the substations.

Scope of Topographic Survey

The Contractor shall carry out all the necessary topographic surveying works in order to:

- Obtain (if available) maps of the construction and surrounding areas;
- Propose and install new transferred benchmarks (TBM). Their level and grid coordinates shall be related to the existing reference system;

- Conduct spot level topographic survey of the development area and adjacent prominent surface boundaries;
- Acquire all survey data in digital format for processing and detailed maps development;
- Produce CAD adaptable and editable maps, natural ground profiles and survey data files of all surveyed items;
- Prepare a survey report of resources, procedures, site and office works, data acquisition, data processing, and presentation;

The survey shall include all buildings and structures in the substation area (e.g. foundations, fences, overhead power lines, roads, tracks, finished grade, paving, buried services, etc.).

The required accuracy in Northing, Easting, etc. and elevations shall be ±10 mm, relative to the existing benchmarks.

The benchmarks shall be secured and marked in such a manner so as to ensure that they can be found at any time, that they will not be destroyed by the ongoing construction activities and that they can be constantly used for reference and check measurements.

The results of the survey shall be reported as follows:

Preliminary Site Survey Report

This shall include:

An executive summary, stating the objectives of the survey and containing a brief description of the work undertaken as well as the major conclusions;

A description of the survey work, referring to the method applied, equipment used, work organization, field operation, data processing, interpretation and presentation of the results;

A site survey plan on a scale of 1:500.

Within two (2) weeks after the receipt of the Engineer's comments, the Contractor shall submit the Final Site Survey Report.

Final Site Survey Report

This shall have incorporated all of the Engineer's comments.

For the final report, the Contractor shall also provide all the survey data in a digital format. Additionally, the Contractor shall provide the necessary software in order to gain access to the data in digital format, as well as the specifications for the computer workstation to be used.

3.17.2.15 GEOTECHNICAL INVESTIGATIONS

3.17.2.15.1 GENERAL

The extent of the subsoil investigations shall be such as to permit the satisfactory determination of the geotechnical conditions and to allow reasonable foundation proposals. Soil investigation data will be prepared by the Contractor. This document does not release the Contractor from the execution of his investigations on the proposed location of the switchgear building, various outdoor foundations and the route of cable ducts.

3.17.2.15.2 SCOPE OF WORKS FOR GEOTECHNICAL INVESTIGATIONS

The purpose of the geotechnical investigations is to accurately capture, sample and in-situ test throughout the substation area, including site reconnaissance, site geology, site previous utilization history and above ground and subsurface conditions.

The Contractor shall comply with all local laws, rules, and regulations, applicable to the works. The investigation procedure shall be governed by recognized international standards and codes, in their latest edition.

Anticipated work activities breakdown is summarized in, but not limited to, the following:

- Conduct site reconnaissance, in-situ geophysical and geotechnical exploration including open trial pits, boring, in-situ borehole, and open-pit testing, piezometer installation as per planned exploration program;
- collect disturbed and undisturbed soil samples and extract water samples from boreholes and open trial pits;
- select properly collected samples and perform geotechnical lab tests to classify soils and assess their geotechnical behavior;
- compile in-situ data collection, in-situ test results, lab test results and desk studies accounts;
- produce a comprehensive factual report of resources, procedures, acquired data, site works, and lab tests, desk study, data processing, and conclusions;
- liaise with the topographic survey for the interchange of information to be superposed on topographic survey maps or to obtain topographic survey information useful in setting out the geotechnical investigation works.

3.17.2.15.3 FIELD WORKS

BOREHOLES

Exploratory boreholes shall be sunk at the locations approved by the Engineer. The boreholes shall be 12 cm in diameter. The depth of boreholes shall not be less than 10 m unless the rock is encountered, in which case the thickness shall be proved to be greater than 1.5 m. Where weak

soils are encountered, boreholes shall be continued down to a load-bearing stratum, with a minimum thickness of 3 m proved.

The boreholes shall be drilled by locally trained drillers under the direct supervision of the Contractor, according to the established instructions and specifications. Casing shall be used where necessary so as to prevent the collapse of the borehole wall.

An appropriate boring method with the continuous recovery of soil samples shall be used. Disturbed and undisturbed samples shall be collected for the visual examination and laboratory testing.

The soil stratifications encountered in the boreholes shall be logged during drilling and the borehole logs shall include at least the following information:

- Soil stratification;
- Number, depth, and type of soil samples;
- Corrected penetration resistance;
- Groundwater level;
- Grain size distribution;
- Index and engineering properties of representative samples collected from different strata;
- SPT values;
- Drilling method, coring, casing.

Standard penetration tests (SPT)

Down to the depth of drilling, SPT shall be performed in the boreholes at 1.5m intervals, in both cohesive and non-cohesive soils.

Sampling

During SPT, at 1.5 m intervals, disturbing samples shall be collected and submitted in polyethylene bags with proper identification.

Undisturbed samples shall be collected for cohesive soils at 1.5 m intervals.

A thin-walled sample tube shall be pressed into the cohesive soils by means of hydraulic pressure produced by the drilling rig. The dimension of the tube must refer to the applied standard. The undisturbed samples shall be trimmed and scaled with non-shrinkage wax at both ends and clearly labeled.

Disturbed and undisturbed soil samples shall be sent for laboratory tests.

Groundwater level measurement

The water level in each borehole shall be recorded before commencement and after completion of drilling when the water level has settled. The depth of the borehole and the casing (if any) shall be also recorded.

Cone penetration tests (CPT)

CPT shall also be carried out as a second method of soil investigation (after borehole sinking) at the locations approved by the Engineer.

CPT shall be carried out using static penetrometers (Dutch core apparatus) for determination of the soil type, density, and consistency.

The results of the CPT´s shall be presented in the report.

Test (trial) pits (TP)

Test or trial pits down to 1.5 m shall be used as a third method of soil investigation in order to visually identify the top strata and its sequence as well as to prove the suitability of dredgers. The Contractor shall obtain at least one disturbed and one undisturbed sample of each stratum encountered.

The description of the encountered strata and of the strata sequence, accompanied by colored photographs, shall be specified in the soil investigation report.

General soil/subsoil description

A general soil/subsoil description shall be made for the investigation, comprising of:

- Soil conditions at the surface;
- Expected soil conditions below the surface (slopes, etc.);
- The inclination of the ground surface, inclination and orientation of cracks and fissures as well as their stratification, evaluation of slope stability, in case there is a potential for sliding.

This information shall be provided to the Engineer through intermediate reports, to enable them to give instructions for more intensive or additional investigations, if necessary.

The minimum number of boreholes/soundings/trial pits will be as per the below-mentioned Table.

Location	Borings	Cone Penetration Tests (CPT)	Trial Pits (TP)
400 kV Switchyard	4	4	4
220 kV Switchyard	2	2	2
Building Zones	2	2	2

Table Number of boreholes/soundings/trial pits

The final number of boreholes will be agreed between the Contractor and the Engineer.

3.17.2.15.4 LABORATORY TESTS

Natural moisture content

Tests to determine that natural moisture content (natural water content) and the in-situ wet and dry densities shall be performed on undisturbed samples.

Atterberg limit tests

Tests to determine the liquid limit and the plastic limit shall be performed on representative cohesive soil samples collected from different strata. The Liquidity Index/Consistency Index shall be determined.

Grain size distribution tests

The specific gravity and the grain size distribution of representative soil samples collected from different strata shall be determined with standard sieves and a hydrometer.

Grain size distribution curves with USCS classification of representative samples shall be specified in the soil investigation report.

Unconfined compression tests

Unconfined compression tests shall be performed with a constant strain rate on representative undisturbed specimens. Stress-strain diagrams of these shall be attached to the soil investigation report.

Consolidation tests

With a 1:1 load increment ratio and a 24-hour duration for each increment, standard consolidation tests shall be performed representative of undisturbed specimens. The dimension of the specimens must refer to the applied standard.

Chemical analyses

The groundwater and the soil shall be analyzed and classified with regard to their aggressive action on concrete. The classification shall comply with DIN 4030 or recognized standards.

The results and recommendations shall be part of the soil test report.

The chemical analyses shall determine the sulphate and chloride contents as a minimum as well as the pH value.

Electrical Resistivity Test

This test shall be conducted to determine the Electrical resistivity of soil required for designing safety-grounding systems for the entire station area. The specifications for the equipment and other accessories required for performing electrical resistivity test, the test procedure, and reporting of field observations shall conform to relevant British standard codes (B S Codes)/ equivalent International Standards. The test shall be conducted using Wagner's four electrode method as specified in relevant British standard codes (B S Codes)/ equivalent International standards.

3.17.2.15.5 RESULTS OF GEOTECHNICAL INVESTIGATIONS

The report shall be complete and shall contain, but not be limited to, the information specified below.

Description of the scope of work carried out, containing:

- work program;
- methods and systems (equipment) used;
- works carried out (field investigations and laboratory tests).

Layout location plan of soil investigations, showing:

- the area;
- the general layout plan;
- locations of boreholes, soundings, trial pits and plate tests (if any) carried out;
- Comprehensive map surrounds.

Logs, tables

The subsurface conditions, for example, the sequence of the strata, the nature, and properties of the individual strata, as well as the groundwater conditions, shall be determined and described in the borehole logs. The results of the laboratory tests and the diagrams of the test results shall be included in the report.

Borehole logs, trial pit logs, and surroundings logs shall include:

- actual ground level and reference to the local Datum;
- description and limits of various soil layers;
- samples were taken;
- SPT results;
- water levels;
- depth of borehole/pit/sounding.

Soil profiles (cross-sections)

The results of the subsoil investigations shall (in addition to the borehole logs) also be shown in the form of cross-sectional drawings with a vertical scale of 1:100 showing, e.g.:

- actual ground level and plant datum at the points of investigations;
- results of boreholes including standard penetration test (SPT) graphs;
- trial pit profiles;
- CPT diagrams;
- proposed foundation levels;
- limit lines of soil layers (soil strata);
- groundwater level;
- legend (key).

Groundwater classification

After the chemical analysis, the groundwater shall be classified according to its aggressive action on concrete. The classification shall comply with ASTM standards or equivalent codes.

Foundation Proposal

Admissible bearing pressures of different types of foundations shall be advised. Type and engineering values of proposed pile foundations - if necessary - shall be given. Explanation of

recommended soil improvement methods shall be made. Geotechnical restrictions of earth works (cut and fill, slopes, etc.) shall be advised.

Recommendations for foundations shall be derived from the in-situ investigations and from the laboratory tests.

3.17.2.15.6 REPORTING

A comprehensive investigation report shall be produced in two (2) stages. Within six (6) weeks of completion of the soil investigation fieldwork, the Contractor shall submit the draft report to the Engineer for comments and approval. The draft report shall be complete and shall contain, but not be limited to, the information specified above. A final revision shall be issued after the incorporation of comments and requirements.

All report deliverables, documentation, maps, and drawings shall be compatible with MS Office 2010 suite and CAD systems. Data to be interchanged with topographic surveyors shall be in electronic format for further electronic processing.

3.18 SPARE PARTS, TOOLS, AND OTHER EQUIPMENT

The following shall be offered:

- mandatory spare parts and tools (as per price sheets)
- recommended spare parts, equipment, tools and instruments for maintenance

Separate price sheets to be filled out and separate brochures, documents, etc. to be provided.

3.19 OTHER SERVICES AND EQUIPMENT

3.19.1 TRAINING IN FIELD

During an erection, commissioning and trial operation, the Employer's selected operating staff is to be familiarized with the functions of the system. The Contractor shall arrange appropriate training in the operation and maintenance of the equipment for the Employer's personnel at the site.

As specified in the "Instructions to Bidders", a tentative training program shall be submitted by the Bidder. The training program shall consider the availability of the "shift personnel" and structure its training program in various sessions.

The training shall be conducted in the English language.

- The traveling and living expenses of the Employer's personnel for the training program conducted in Nepal shall be borne by the Employer. The training shall be provided to Employer's personnel in the field of erection, testing, operation and maintenance at substation site as per the following:

1. Control & Protection: 5 Days.

2. Substation Automation System including the integration aspect of SCADA: 5 days.

3. For 400 kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance: 5 days.

4. For 220 kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance: 5 days

5. Operation and Maintenance of Transformers, 5 Days

6. AC & DC Auxiliaries and mechanical systems: 5 Days

- Before energizing, training sessions of at least one week ~~per substation~~ shall be performed with a focus on operation and troubleshooting. The Contractor shall provide sufficient qualified personnel on-site during trial operation in order to perform further training during operation.

The Contractor shall provide comprehensive training documents.

3.19.2 TRAINING AT MANUFACTURER'S WORKS

a) Cost for training at manufacturers' works shall be borne by the contractor. However the travel fares and insurance, lodging, boarding, and incidentals shall be borne by the Engineer/Employer. The contractor shall be responsible for managing local travel at the place of training. Arrival and departure shall be scheduled for the day before and respectively after the training(s).

The training shall be provided in the field of design, testing and maintenance at Manufacturer's works as per the following:

1. Control & Protection, Substation Automation System and Communication System: 10 Days, (3 Nos. Trainees)

2. 400 kV GIS Equipment and System (Circuit Breaker, Isolator, CT, PT & LA) and EHV GIS/AIS Substation Design: 10 Days, (3 Nos Trainees)

3. 220 kV GIS Equipment and System (Circuit Breaker, Isolator, CT, PT & LA) and EHV GIS/AIS Substation Design: 10 Days, (3 Nos Trainees)

3.20 SITE CONDITIONS - REQUIREMENTS

3.20.1 SITE EXAMINATION

Contractor shall be deemed to have conducted an examination of the Site and to have informed itself fully regarding the risks, contingencies and all other data, matters and things, local or otherwise, in relation to the Site and to any other aspects of the Work necessary to satisfactorily perform the Contract in all respects. Contractor shall confirm and represent that it has had sufficient

opportunity to visit the Site and carry out all examination, inspection, measurements and testing necessary for it in order to enter into the contract on the terms and conditions set out in the Contract Documents and that has informed and satisfied itself with respect to all aspects of the Work. Without limitation, Contractor shall confirm and represent that it has informed and satisfied itself with respect to the nature and conditions of the Site and the Existing Employer Equipment, the quantities, location and nature of the Work, the facilities, accommodations, labour, Equipment, and Materials necessary or required for performance of the Work, the means of access to the Site and the conditions under which its employees and Subcontractors will be employed and the Work will be performed.

The Contractor shall carry out for each site a geotechnical study or other investigations needed to understand the soil conditions/site better.

3.20.2 SITE HANDOVER TO CONTRACTOR

Access to the site will be permitted and construction phase can begin when the Employer has accepted from the Contractor the following documents:

- Site-Specific Safety Management Plan
- Appointment of safety officer
- Site Organization Chart
- Detailed construction program
- Work area drawings
- Environmental and Social Plan according to IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement and MCC's Environ-mental Guidelines.
- Confirmation that the Contractor has set up its main construction facilities and its equipment is ready to commence the Work at Site.

3.20.3 WATER/ POWER SUPPLY FOR CONSTRUCTION

Water Supply

The Contractor is responsible for its own water supply, including the provision of any reservoirs, pumps, piping and ancillary equipment required for such purposes.

Electric Power Supply

The Contractor is responsible for the electric power supply required during construction and could be provided by:

- Own Distribution Transformer
- Diesel Generator Set, 230/400V, 50 Hz, up to 200kVA.

- Mobile substation

The Contractor shall be also responsible for providing all extensions and distribution facilities, including breakers, transformers, and cables from the source required for construction purposes. The electrical safety of personnel and equipment shall be of prime concern.

3.20.4 ENVIRONMENTAL AND SOCIAL ISSUES

Contractor to Demonstrate Environmental and Social Responsibility - Contractor shall demonstrate in the performance of the Work that it is environmentally responsible by:

(a) complying with all applicable environmental legislation and regulations;

(b) following all Engineers work instructions and all applicable policies, practices, and procedures established by Employer;

(c) being observant for, and immediately notifying Engineer of, any environmental problems that develop on Site;

(d) while handling the SF6 gas, the contractor must ensure that the following standards are complied

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

(e) taking all necessary measures in the performance of the Work to avoid causing negative impacts to the environment, by complying with the requirements of ESHSMP Report, Environmental and Social Impacts and Mitigation Measures, during Pre-Construction and Construction and Commissioning;

(f) constantly monitoring for, and immediately notifying Engineer of, any kind of pollution, damage to vegetation, soil or watercourse that might develop on Site; and

(g) where any impact or damage occurs, Contractor shall be solely liable to undertake all reasonable and necessary measures to repair and restore the effects of such negative impacts immediately, and to the satisfaction of Engineer and Employer.

3.20.5 ACCESS

The Contractors shall avoid using private access roads belonging to individual ground owners for accessing the works. Any damage to their ground shall be repaired so that the owner shall not be dissatisfied.

The Contractor shall arrange temporary material and equipment storage at the site. If the storage area is required outside the site area the Contractor shall negotiate with the ground owners for using their lands as a storage space.

The Employer shall provide the following facilities:

a) Such right of access at the proposed area is necessary to enable the Contractor to proceed with the clearance of trees and scrubs for all the works specified in Bill of Quantities.
b) The right to construct and make use of the reasonable track to the proposed area for the transport of materials and the carrying out of erection operations, except where the route crosses orchards, gardens or other ground over which the Employer decides that such a track is not reasonably practical.

The Contractor shall, at an early stage of the Contract, examine the site and shall design on the map his proposed entry route to the plant and the type of equipment or transport intended to traverse the routes. The maps shall indicate the types of access to be constructed, if necessary, the places where it is proposed to use existing roads, community roads and existing roads not maintained by the government.

The Contractor shall arrange for his own store yard for storing materials and equipment. The Contractor shall arrange with the landowners for using their lands as store yards if required in addition to the site storage devices.

3.20.6 EXISTING ACCESS

Where the Contractor uses government maintained roads to enter the site for construction purposes then he must make sure the drains are properly protected or reinforced. The junction must be cleaned and a proper danger sign board erected on the roadside to warn the public. The drains must not be blocked.

However, when the Contractor has the approval to use existing community roads that are not maintained by the government, he shall get the consent from the landowners concerned and shall undertake to maintain the road during the works to such a standard that its use by the customary traffic is not impeded in any way. He shall then restore the road to a condition equal to that existing before the start of execution. The Employer will assist the Contractor in negotiating with the persons or organization normally responsible for maintaining the road.

The Contractor shall avoid using access roads undertaken by other departments unless directed by the Engineer. Consent must be sought before entering these access roads.

3.20.7 CULVERTS

Temporary culverts, which are compulsory to be included in the access road rate, shall be provided at low points of the new access. The culvert shall be of different sizes and of reinforced concrete

tubes sufficient to prevent retention of floodwaters upstream of the access. The reinforced concrete tubes can be used again.

The Engineer shall approve the types of culverts proposed by the Contractor. All culverts shall be deemed to be included in the new access road rates.

3.20.8 SITE FACILITIES PROVIDED BY THE CONTRACTOR

3.20.8.1 SITE FACILITIES FOR CONTRACTOR'S STAFF

Site Accommodation

The Contractor shall make his own arrangements with regard to accommodation for his expatriate and locally recruited staff during the construction period. All dwellings and buildings, existing or erected, shall comply with local regulations with regard to construction, water supply, sanitation, and other requirements.

Temporary construction camps shall be provided with proper sanitation and other necessary facilities. All accommodation shall be removed by the Contractor when no longer required. After the removal of accommodation, the ground shall be left in a clean and tidy condition.

Site offices

The Contractor shall provide for his own staff such buildings as may be necessary for office accommodation for site staff during the construction period. The cost of these shall be deemed to be included in the Contract Price.

Site transport

The Contractor shall provide at his own expense all necessary transport for his personnel and materials.

3.20.8.2 SITE FACILITIES FOR THE EMPLOYER/ENGINEER

Additionally to his own infrastructure facilities, the Contractor shall establish Infrastructure facilities for the Employer and the Engineer, as described herein, in the vicinity of the construction sites.

Site accommodation

The Contractor shall provide site accommodation fully furnished residential family accommodation for Employers and the Engineer's Personnel (minimum 2BHK i.e. 2 Bedroom, 1 Living Room Hall, and 1 Kitchen per accommodation) . The site accommodation for the Engineer/Employer Personnel shall be of a standard at least equivalent to that provided for the Contractor's most senior expatriate management staff on Site and in any case, should meet the

minimum requirements as with local regulations with regard to construction, water supply, sanitation, and other requirements. The site accommodation will have at least following facility

- Kitchen
- Clean Toilet and shower facility with running water
- Air-conditioning
- Safe drinking water
- Bed and resting area
- Living room furniture
- Reliable electric power
- Internet and phone line
- Graded parking
- Good ventilation and heating

The arrangement for food should also be made on a chargeable basis to the Employer or the Engineer as the case may be.

Site accommodation shall be provided in the vicinity of the substation. The exact type and location of the site accommodation will be proposed by the Contractor and shall be subject to Engineer/Employer approval.

The above infrastructure shall be provided from inception to the handing over of the substation.

Site offices

The Contractor shall supply and maintain Site offices for the Employer´s and the Engineer's Personnel.

At least one (1) office with suitable cubicles etc. for around 6 staff of Engineer and one (1) meeting room shall be provided in the substation.

These offices shall be separate from - but adjacent to - the Contractor's own offices and other facilities and shall meet the Employer's Requirements. The offices shall be air-conditioned and suitably furnished with desks, chairs, benches and lockable filing cabinets. The offices shall be installed with full office facilities, including lighting and electricity, telephone lines, water supply, sewerage, and drainage. The facility will be equipped with

- 6 desks and chairs
- Ten filing cabinets
- Two common photocopiers/printers
- Clean Toilet facilities
- Sufficient number of fire extinguishers of suitable size and type
- Safe bottled drinking water
- Graded parking area close to the office
- Internet & Phone line with rentals paid by the Contractor

The above infrastructure shall be provided from inception to the handing over of the substation.

Site transportation

The Contractor shall provide, maintain and keep available at all times, transport for the exclusive use of the Engineer/Employer Personnel.

For the Engineer/Employer Personnel three (3) SUV type vehicles including one driver per vehicle. The details of vehicles are presented in Annex_B01_5_Vehicle_Spec.

Furthermore, the minimum following standards shall be provided:

- Power Steering
- Anti-Locking Braking System
- Driver and Passenger Airbag
- Power Windows
- Air Conditioning (non CFC)
- Central locking with alarm
- Headrests and Seat belts for each passenger place
- Tubeless tyres Toolkit and Jack Owner's manual

Two (2) double cabin 4 WD vehicles (Pick Type) including one driver per vehicle shall be provided. The details of vehicles are presented in Annex_B01_5_Vehicle_Spec.

The cost shall be deemed to include the cost of vehicles, comprehensive insurance (≥ 2 Million USD per incident, however, to be in compliance also with local regulations) and licenses, fuel, lubricants, repairs, wheels, maintenance, cleaning and all other costs and charges incurred in running and upkeep of the vehicles. Furthermore, the vehicles shall be provided with a driver.

The Contractor shall cover the fuel costs for 2500km/month for each vehicle.

The vehicles shall be provided to cover the whole construction period including the defects notification period. If the vehicles are not available on the commencement date, the Contractor shall cover the cost for the transportation of the Engineer's Personnel until the above-mentioned vehicles will be made available.

The specification of the SUV and Pick Up types of vehicle are provided in the Annex B01-5 - Vehicle Specifications.

3.20.9 LOCAL TRANSPORT AND OTHER EQUIPMENT

Shipment by sea freight shall be made to the port to be defined by the Contractor (Town, Country).

Airfreight shall be made to: to be defined by the Contractor (Name of International Airport of Town or Name of International Airport of Town), whatever more advantageous to the project.

Shipments are to be made on a laydown area according to Incoterms and explained in the commercial conditions.

The Contractor shall ensure that adequate handling equipment is available to unload the heaviest piece of equipment.

Prior to shipment, the Contractor shall furnish by airmail or telefax the shipping documents (Bill of Lading, original shall accompany the merchandise until delivered at site) to the Engineer. Details will be fixed during the Kick-Off Meeting. It will be the Contractor who is solely responsible for custom clearance while MCA-Nepal will provide documents to the Contractor for duty free import.

When actual transport has been completed, the Engineer/Employer shall be so notified.

All cases and boxes shall be clearly and boldly marked and shall be addressed to:

Name of the Employer, Country of the Employer

Project Title

Project Subtitle

Lot Title

The site at Town or Region

c/o (Contractor's name)

In order to facilitate custom examination, all packages and transport documents shall regardless of other markings be clearly and indelibly marked.

The Contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangements with the appropriate authorities for the transportation of the equipment. The dimension of the equipment shall be such that when packed for transportation, it will comply with the requirements of loading and clearance restrictions for the selected route. It shall be the responsibility of the contractor to coordinate the arrangement for transportation of the Transformers for all the stages from the manufacturer's work to the site.

The conditions of roads, the capacity of bridges, culverts, etc. in the route shall also be assessed by the Contractor. The scope of any necessary modification/ extension/ improvement to existing road, bridges, culverts etc. shall be included in the scope of the Contractor.

3.20.10 INSPECTION AND TEST PLAN (ITP), FACTORY ACCEPTANCE TESTS (FAT), COMMISSIONING TESTS

3.20.10.1 INSPECTION AND TEST PLAN (ITP)

The Contractor shall establish an Inspection and Test Plan (ITP) to describe and control what inspection and tests will be conducted, how, when and what quality records will be generated for the Scope of Work, including procurement, component fabrication, system integration, delivery, installation, and commissioning.

The Contractor shall submit the ITP to the Engineer for review and acceptance. As a minimum, the ITP shall include all types, routine and conformance tests specified in the Contract, as well as inspection and tests necessary for special process control, such as for welding.

All test reports generated and submitted to the Engineer shall be certified by the Contractor's personnel, responsible for quality assurance. The ITP Employer/Engineer Witness Points shall be established jointly between the Contractor and Engineer.

The Contractor shall notify Engineer prior to each established "Employer/Engineer Witness Point". The Contractor shall carry out inspection and tests at its own expense, in accordance with the accepted ITP, to verify the conformity of each part of the Work. At the discretion of the Engineer, the Contractor shall repeat the inspection and testing at the Contractor's expense.

3.20.10.2 INSPECTION AND AUDIT BY EMPLOYER

Any inspection and audits carried out by the Engineer, separately or in conjunction with the Contractor, shall in no way relieve the Contractor's responsibility for the quality of the Work. Employer/Engineer reserves the right to witness all tests and perform an inspection of material at the place of manufacture, including sub-suppliers. Engineers shall at all times have access to all places of manufacture where equipment or materials are being made or prepared for use under the Contract and shall have full facilities for unrestricted inspection of such materials and equipment. Engineers may employ independent inspection and testing agencies.

3.20.10.3 FACTORY ACCEPTANCE TEST

Cost for factory acceptance tests (FAT) including travel fares and insurance, lodging, boarding, and incidentals shall be borne by the Engineer/Employer. The contractor shall be responsible for managing local travel at the place of testing. Arrival and respectively departure shall be scheduled for the day before and respectively after the test(s).

The following FAT is foreseen:

- GIS 400 kV and 220 kV
- Outdoor 220 kV and 72.5 kV Circuit breaker.

- 400 kV and 220 kV surge arrester
- Current and Voltage Transformers
- Auto Transformer 400/220/33 kV
- SAS/SCADA/Communication equipment
- Control and Protection Equipment

3.21 LIMIT SCOPE OF SUPPLY AND INTERFACES

The interfaces are as following:

1) The 400 kV line shall be terminated on the substation gantry tower by the line contractor with a provision of a termination pad for the jumper. The substation contractor will be responsible to connect to the termination pad and bring the jumper to the AIS equipment in case of Ratmate S/S. The Contractor shall also be responsible for the interconnection between existing AIS equipment at New Hetauda S/S and Lapsiphedi S/S. There is no AIS scope of works for Substation Contractor at New Hetauda S/S and Lapsiphedi S/S. All AIS equipment will be supplied and installed by another Contractor. The gantries and beams for Ratmate Substation shall be supplied and installed by Substation Contractor whereas gantries and beams for New Hetauda S/S and Lapsiphedi S/S shall be provided by the other Contractor. Proper interface and coordination with the other contractor regarding Communication/SAS/SCADA aspects at Ratmate S/S, New Hetauda S/S and Lapsiphedi S/S for Ratmate-New Damauli Line, Ratmate-New Hetauda line and Ratmate-Lapsiphedi line for will be the responsibility of Contractor. Furthermore the task of coordination will be performed by the Engineer but the Contractor is sole responsible for technical compatibility of interface.

The following supplies/works are not part of the Substation Contractor:

1) Boundary wall for the entire property. Note the fence for the substation proper is in the scope of Contractor.
2) Permanent Residential Quarters for Owner's (NEA's)' personnel.

3.22 SPECIFIC REQUIREMENTS

- The Bidders are advised to visit the Substation site and acquaint themselves with the topography, infrastructure, etc.
- The Frequency range for the earthquake spectra shall be as per IEC-62271-300.
- The Empty gas Cylinders may be taken back by the contractors after filling the gas in GIS compartments. However, in view of the future maintenance requirement, the contractor shall provide the Gas storage capacity equivalent to the Gas used in the largest Gas tight GIS Module. Further, the spare Gas shall be supplied in Gas storage cylinders. While handling the SF6 gas, the contractor must ensure that the following standards are complied
    - IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)

- IEC 60736:2018

3.23 OTHER INFORMATION

- The Contractor shall also be responsible for the overall coordination with internal/external agencies; and other pertinent contractors, project management, training of Employer's manpower, loading, unloading, handling, moving to the final destination for successful erection, testing and commissioning of the substation.
- Any works, which are not expressly specified/included in the Employer's Requirements but are required for safe and reliable operation/successful commissioning of the plant, shall be deemed to be included in the scope of works and the Contractor shall carry out such works (e.g. terminal connection) at no extra cost to the Employer.
- The drawings attached to the bid document are only for reference, which shall be further engineered by the bidder. The enclosed drawings give the basic scheme, layout of the substation, substation buildings, associated services, etc. In case of any discrepancy between the drawings and text of the specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from the Employer as per Instructions to Bidders and Bid Data Sheet.

- In case of any discrepancy between Project Specific Requirement, General Technical Requirement and other technical specifications on the scope of works, the final decision will be made by the Engineer/Employer. However, the Bidder is advised to get these clarified from the Employer as per Instructions to Bidders and Bid Data Sheet.

- In case of any discrepancy between General Technical Requirement and Individual Chapter for various equipment, the requirement of individual equipment chapter shall prevail.

3.24 PRE-COMMISSIONING, COMMISSIONING, TRIAL-RUN & COMPLETION

As soon as the Facilities covered by these specifications are physically completed in all respects, the Pre-commissioning, Commissioning, Trial run, and Completion of the Facilities, as mentioned below, shall be attained

a. Pre-commissioning: As per relevant Sections in the specifications
b. Commissioning: Charging of the Facilities at rated voltage. Further, wherever appearing in these specifications, the words – 'commissioning checks', 'installation checks', 'site tests', 'performance guarantee tests for fire protection system', are to be considered as 'pre-commissioning checks'.
c. Trial run: Contractor will not be authorized to operate the live facilities. Only NEA operators will be switching equipment to energize the new facilities or de-energize them. Operation of the Facilities or any part thereof immediately after the Commissioning for a period of 1(One) month with no more than 48(Forty-Eight) hours cumulative interruption over 1(One) month. In case of interruption due to problem /failure in the respective equipment, the contractor shall rectify the problem and after rectification, if the cumulated interruption time has reached 48 (Forty-Eight Hour) then the one month trial test shall resume from the beginning.

d. Completion: After successful completion of Pre-Commissioning Tests , Trial run and operational acceptance of equipment the warranty on equipment will start, the warranty period for the equipment has been summarized below:

i. 400 & 220kV GIS: 3 years after the date of operational acceptance.

ii. Auto-Transformer: 3 years after the date of operational acceptance.

iii. Transformer Condition Monitor: Equipment warranty of 3 years.

iv. Control & Relay Panel: 3 years after the date of operational acceptance.

v. SAS: 3 years after the date of operational acceptance.

vi. Tele-Communication: 3 years after the date of operational acceptance.

vii. Air-Conditioning: All compressors should have 3 years warranty after the date of commissioning.

viii. The below listed works done and equipment will have warranty period starting after the date of operational acceptance for the period of DNP which has been defined in the relevant section of the Bid Document. The works done and equipment are as follows :

- Outdoor Switchgear including Circuit Breaker, Isolator and Earthing Switches, Instrument Transformer, and Surge Arrester
- LV Switchgear
- Fire Protection System
- Control and Power Cable
- Battery and Battery Charger
- Telephone System
- Diesel Generator
- Air-Conditioning system excluding compressors

ix. The equipment to be supplied under the contract but not stated above, the warranty shall remain valid for twelve (12) months after successful completion of Pre-Commissioning Tests, Trial run and operational acceptance of equipment. The warranty period for equipment that were repaired or replaced during the warranty period shall be twelve (12) months from the date on which such Goods were repaired or replaced.

PROJECT SPECIFIC REQUIREMENTS – Lot 2

B1.1

PROJECT SPECIFIC REQUIREMENT (PSR)

I. TABLE OF CONTENTS

1 PROJECT DESCRIPTION AND SCOPE

1.1 GENERAL

a. As part of strengthening the 400 kV grid for Nepal Millennium Challenge Account Nepal (MCA-Nepal) is establishing 400 kV GIS Substation and adding two 220 kV AIS bays at New Butwal of Nepal.

b. The following transmission lines are associated with this substation:

   1. New Butwal – Indian Border 400 kV D/C Lines: 18 km in this scope (along with OPGW).

   2. New Butwal - New Damauli 400 kV D/C Lines: 90 km (along with OPGW)

c. The New Butwal substation shall be established as a 400kV Gas Insulated Substation (GIS) in a breaker and half bus configuration. It shall also include three (3) 400/220 kV Three-phase Autotransformers and all related control and protection systems. The 220kV Air Insulated Substation (AIS) is being built by others as a two main bus and a transfer bus configuration. As part of this scope, three bays shall be added to the 220 kV AIS for the three Autotransformers also provided under this scope.

1.2 PHYSICAL AND OTHER PARAMETERS

1.2.1 ENVIRONMENTAL CONDITIONS

The following summarized environmental data shall be considered for planning of site works and form the design data for the working conditions of the equipment.

Altitude

Altitude above sea level
New Butwal: 120 m

Temperature

Maximum annual ambient temperature	40 °C
Minimum annual ambient temperature	-30 °C
Annual average temperature	23 °C

Humidity

Average relative humidity	70 %

Rain Conditions

Annual rainfall	1500 mm

Rainy Season from June to September

Thunderstorms & Lightning

Isokeraunic level	45 days/year

Solar Radiation

Average daily irradiation	780 W/m²

Seismic Conditions

Seismic Acceleration	
(PGA: *peak ground acceleration*)	0.50 g

Wind Velocity

Wind velocity 47 m/s

Pollution

Low to medium pollution:	as per IEC 60815

Location

New Butwal:	Lat. - 27°34'28.38"N, Long. - 83°41'19.73"E

1.2.2 VOLTAGE LEVELS

1.2.2.1 HIGH AND MEDIUM VOLTAGE ELECTRICAL PARAMETERS

System electrical parameters for Voltages ≤ 245 kV

High Voltages

Network System Voltage	
Nominal system voltage	220 kV
Equipment Rating	
Highest system voltage (rms)	245 kV
Short time power-frequency withstand voltage (rms)	460 kV
Lightning (or Full wave) impulse voltage withstand level (peak)	1050 kVp
Rated Short-time withstand current	50 kA
Number of phases	3
Frequency	50 Hz

Medium Voltages

Network System Voltage	
Nominal system voltage	33 kV
Equipment Rating	
Highest system voltage (rms)	36 kV
Short time power-frequency withstand voltage (rms)	75 kV
Lightning impulse withstand voltage (peak)	170 kVp
Rated Short-time withstand current	25 kA
Number of phases	3
Frequency	50 Hz

System electrical parameters for Voltages > 245 kV

Network System Voltage	
Nominal system voltage	400 kV
Equipment Rating	

Highest system voltage (rms)	420 kV
Short time power-frequency withstand voltage (rms)	630 kV
Lightning impulse withstand voltage (peak)	1425 kVp
Switching impulse voltage withstand level (peak)	1050 kVp
Rated Short-time withstand current	50 kA
Number of phases	3
Frequency	50 Hz

1.2.2.2 LOW VOLTAGE AC AND DC EQUIPMENT AND INSTALLATIONS

General

All chambers and cubicles shall be designed in accordance with IEC 61439 and separated by-partition or by a metal cover.

AC low voltage equipment

The following basic technical values shall be kept as indicated:

Nominal system voltage:	*230 / 400 V*
Maximum voltage variation:	*± 10%*
System configuration:	*Main system:* *3-phase (4-wires), solidly earthed* *Subsystems:* *4 Wires (3-phases + N)*
Test voltage (1 min.) for new installation:	*2.5 kV*
Minimum insulation resistance for new installation:	
· phase-to-phase:	*400 kOhm*
· phase-to-earth	*230 kOhm*

DC low voltage equipment

The DC low voltage installation shall feed the control and protection circuits as well as the telecommunication equipment.

The basic technical design features are as follows (if not otherwise mentioned in the technical specification):

For the control system:

Nominal system voltage:	*220 V DC*
Test voltage (1 min.) for new installation:	*1.5 kV*
Minimum insulation resistance for new installation:	*110 kOhm*

For communication system:

Nominal system voltage:	*48 V DC*
Test voltage (1 min.) for new installation:	*1 kV*
Minimum insulation resistance for new installation:	*48 kOhm*

Control and protection system

The basic technical values shall be as follows:

Trip/close voltage:	*220 V D.C.*
Rated secondary voltage of VTs:	*110/√3 V*
Rated secondary current (max.)	*1 A*
Frequency:	*50 Hz*

1.3 SCOPE OF SUPPLY AND SERVICES

The scope of works for each new substation or specified works expansion of the existing would be:

- Design
- Supply of new electromechanical equipment
- Shipment
- Civil works
- Installation and
- Testing and Commissioning.

The project will be executed on a turnkey basis. The General and Particular Technical Requirements cover the design calculation, manufacturing, assembly, parameterization, settings and acceptance tests in the Contractor's workshop as well as the supply, customs clearance, delivery, unloading, erection, adjusting, painting, identification, testing, commissioning, and

acceptance of new equipment to be installed in the new substations, complete in every respect and suitable for satisfactory operation to fulfill the purpose of the Works.

This section covers the main items of plant to be provided and works to be carried out under this Contract, but the Bidder is required to ascertain for himself whether any additional plant or works are necessary to leave the substations complete and in working order on completion of the contract in accordance with the Technical Requirements in order to fulfill the purpose of the Works.

To complete each item of plant and equipment detailed in this Schedule the contractor shall provide all necessary cabling, cable boxes, terminal boards, protective relays, panels for control equipment, supporting steelwork, panel wiring, fuse links, interlocking gear, motors, auxiliary contacts, holding down bolts, screen guards, labels, auxiliary and control cables, and all necessary miscellaneous items whether specified in detail or not.

Only type tested equipment shall be used. Type test reports of similar equipment - in terms of mechanical and electrical size/measures, mechanical and electrical technical data, similar model type, only in accordance with "Part 2, Section V, B02_GTR, 220913_B02_ GTR, Page 15, 10. Type Testing, Inspection, Testing & inspection Certificate, 10.3", shall be accepted. Type Test Reports shall be subject to the Engineer's approval. If no type test certificates are available, the relevant type tests shall be performed at the Contractor's expenses.

2 SCOPE

The scope of work shall include construction of the entire GIS buildings, control buildings, station services, site preparation and grading as shown on the single line and layout drawings. The Bidders are requested to quote the price as per the price schedule attached in Section IV of bid documents.

2.1 SCOPE OF WORK

2.1.1 NEW BUTWAL SUBSTATION

The Scope of work includes the following:

a) 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from India Border, along with outdoor CT's, CVT's and LA's. Suspension insulators, connectors, and conductors required to connect the incoming lines to GIB's, and PLCC system along with necessary coupling equipment , line traps and cables need to be installed in each of 400kV D/C Lines going towards Indo-Nepal border to extend to Gorakhpur Substation in UP of India are also included in the scope.

b) 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from New Damauli, along with outdoor CT's, CVT's and LA's. Suspension insulators, connectors, and conductors required to connect the incoming lines to GIB's are also included in the scope.

c) 400 kV GIS Auto Transformer bay with required GIB, 4 nos. bay for connecting four (4), 3-Ph, 400/220/33 kV, 315 MVA, Autotransformers.

d) Three Autotransformers each of 3- Ph, 400/220/33 kV, 315 MVA.

e) 220 kV AIS, 3 nos. bays for connecting three (3), 3-Ph, 400/220/33 kV, 315 MVA, Auto Autotransformers.

f) 400 kV GIS bays with required GIB, 6 nos. for 400 kV D/C Quad Moose ACSR future lines including GIB termination along with supporting structure but without outdoor AIS equipment.

g) The scope of supply also includes substation service transformers 630 kVA, 33/.4 kV, 2 nos. LT Transformers along with associated 33 kV Bays.

Summary of Works includes the following:

S.N.	400 kV Line Bay (Nos)	400 kV TFR Bay (Nos.)	220 kV TFR Bay (Nos.)	TFR Bank	Station TFR (Nos.)
1	10	4	3	3*315 MVA	2

The configuration of the Scope will be seven 400kV diameters and three 220kV AIS ICT Bays.

The bidders are requested to quote their price considering that the future bays shall not include the feeder Control, Relay & Protection panels but shall include diameter protection, Local Control

Panels and, Substation Automation System. The protection of the associated stubs and of the tie breaker shall also be included

3 DETAILED SCOPE OF WORK

This section describes the detailed scope of works.

3.1 400KV NEW BUTWAL GIS SUBSTATION

a. The design, manufacture, testing, spare parts, training, delivery, installation, commissioning and in-service performance of high-voltage sulfur hexafluoride (SF6), gas-insulated switchgear (GIS) including indoor and outdoor gas-insulated bus (GIB) including all GIB supporting structures to overhead and/or underground line terminations or direct connections to Autotransformers or other equipment, rated 420kV.

b. The installation of a 400kV gas-insulated switchgear (GIS) switchyard connecting existing transmission lines, with provisions for connecting future transmission lines, serving bulk power transformers and with provisions for serving future bulk power transformers. The switchyard shall be a 400kV substation bus arrangement that will be a breaker and half configuration. The 400kV GIS switchyard shall include 400kV gas-insulated switchgear, associated Local Control Cubicles (LCC's) and all required auxiliary equipment located in an RCC high voltage switchgear building. The GIS shall include all 400kV interconnecting gas-insulated bus and gas-to-air bushing interfaces to the lines and Autotransformers. PLCC system along with necessary coupling equipment, line traps and cables need to be installed in each of 400kV D/C Lines going towards Indo-Nepal border to extend to Gorakhpur Substation in UP of India is also included in the scope of work.

c. The 420 kV SF_6 gas-insulated switchgear shall have the following overall design ratings:

Maximum System Voltage:	420kV
Nominal System Voltage:	400kV
Rated Frequency:	50Hz
Rated Continuous Current:	4000A
Rated Short Circuit Current:	50kA
Rated Short Circuit Duration:	1 second

The GIS shall be complete with all necessary terminal boxes, SF_6 gas filling equipment, SF_6 gas monitoring equipment, interconnecting power, and control wiring, earthing connections, support structures, base plates, foundation anchor bolts, necessary marshaling cabinets and all equipment and accessories specified in the technical specification.

The SF6 gas handling must strictly follow the following compliance standards:-

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

d. Main Bus Elements

Two sets of single-phase encapsulated, metal-enclosed, gas-insulated main bus bars rated 420kV, 4000A, 50kA each enclosed in three individual bus enclosures extending the length of the switchgear to interconnect each of the diameters and associated circuit breaker bays. Each main bus bar set shall comprise of:

i. (3) three single-phase encapsulated 4000A main bus bars and enclosures. Each main busbar enclosure shall be segregated on a per diameter basis with gastight barriers installed in the main bus enclosures between each diameter connecting the main buses).
ii. (2) two inductive voltage transformers with isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iii. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
iv. (1) one lot of gas fill ports, gas density monitors/gauges, rupture discs, and gas density monitoring system transducers per gas zone.
v. Provisions for future main bus extension including isolating links.

e. Line Feeder Circuit Breaker Bay Elements

Each line feeder circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms (3) sets of 4000A gas-insulated bus extensions to gas-to-air bushing modules
vi. (3) three sets of 4000A gas-insulated bus extensions to gas-to-air bushing modules
vii. Three (3) nos. single phase set of gas to air bushings.

f. Future Line Feeder Circuit Breaker Bay Elements

Each future line feeder circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (3) three sets of 4000A gas-insulated bus extensions with end cap modules.

g. Autotransformer Circuit Breaker Bay Elements

Each autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of gas-insulated bus extensions to gas-to-air bushing modules
viii. Three (3) nos. single phase set of gas to air bushings.

h. Future Autotransformer Circuit Breaker Bay Elements

Each future autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of 4000A gas-insulated bus extensions with end cap modules

i. Tie (Middle Diameter) Circuit Breaker Bay Elements

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) two three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.

j. The gas-insulated circuit breakers shall be equipped with a Controlled Point-on-Wave Switching Device (CPWSD) for auto transformer circuit breakers and middle breaker of each diameter which involves auto transformer. The price for the same is deemed included in the cost for the gas-insulated circuit breaker. The use of PIR and CPWSD for line feeders and associated tie breaker could be confirmed only after conducting Transient Switching Study by the Contractor and shall develop respective detailed specifications for PIR as per relevant IEC/IEEE standards. The Price of the line circuit breaker and its associated tie circuit breakers equipped with CPWSD and circuit breaker equipped with PIR should be provided as per the Schedule 4.4.2: Breakdown for Day work Rates: Materials.

k. Testing & Maintenance Equipment will be required for 420kV GIS as per specification.

l. Gas-to-air bushings and support structures for outdoor connections to connect the GIS to overhead lines, transformers and bus reactors are part of GIS scope of supply.

3.2 AUTO-TRANSFORMER

a. Design, engineering, manufacture, testing at manufacturer's facility, delivery to the site including all materials, accessories, spares, unloading, handling, proper storage at the

site, erection, testing and commissioning of the 315 MVA, 400/√3/220/√3/33 3-Phase Auto Transformers as specified below;

i. 2 Nos of 315MVA, 400/√3/220/√3/33 kV 3-phase, constant ohmic impedance type Auto Transformer with series winding for HV & IV and separate winding for LV, 50Hz, YNa0d11, oil immersed, ONAN/ ONAF/ OFAF cooled, equipped with on-load tap changer (OLTC), outdoor type, complete with all fittings and accessories including local OLTC control cabinet, cooler control cabinet and Remote Tap Changer Control panel, neutral CTs and On line Dissolved Gas , necessary arrangement for Delta formation of LV winding & Neutral Formation and Earthing Arrangement, surge protection device, Neutral Current transformer (NCT) and all fittings & accessories as specified/ required for completion of the scope of works as per technical specification.

ii. Insulating oil for first filling plus 10 % extra to account for spillage, sampling etc. for all the Transformers.

iii. Oil storage tank of suitable size.

iv. Steel rails with all accessories to fix it on the transformer foundation.

v. One (1) set of Oil filtration plant as per Annex B01-12-Oil Filtration Plant.

3.3 400KV AIS EQUIPMENT

Supply, Erection, Testing & Commissioning of 400kV AIS equipment as listed below:

i. Four (04) three-phase set of Capacitor Voltage Transformer (CVT) for 400kV.
ii. Four (04) three-phase set of Current Transformer (CT) for 400kV.
iii. Four (04) three-phase set of 400kV Surge Arrester (SA)
iv. Six (06) Nos of Gantry Column for 400 kV Incoming Line
v. Four (04) Nos of Gantry Girder for 400 kV Incoming Line

3.4 220KV AIS EQUIPMENT

Supply, Erection, Testing & Commissioning of 220kV AIS equipment as listed below:

i. Three (03) three-phase set of Current Transformer (CT) for 220kV.
ii. Three (03) three-phase set of 220kV Surge Arrester (SA)
iii. Three (03) three phase set of 220kV Circuit Breaker(CB)
iv. Nine (09) 220 kV, Tandem Isolator without Earthing Switch, Three Phase Set
v. Three (03) 220 kV, Isolator with One Earthing Switch, Three Phase set
vi. Three (03) 220 kV, Isolator with Two Earthing Switch, Three Phase Set
vii. Five (05) Nos of Gantry Column for 220 kV Incoming Line
viii. Three (03) Nos of Gantry Girder for 220kV Incoming Line

3.5 STATION SERVICE TRANSFORMER

Supply, Erection, testing & commissioning of Two nos. 630 kVA, 33/0.4 kV LT Transformer with surge arrester along with 72.5kV circuit breakers, isolators and current transformers, for tertiary loading. These LT transformers should not be used for construction purposes.

3.6 EMERGENCY DIESEL GENERATOR SET

1 (one) Diesel Generator 230/400 V, 50 Hz, 250kVA, 24 h continuous operation.

3.7 ELECTROMECHANICAL SYSTEM

400 kV, 220kV, 66kV and 33 kV Bus Post Insulators, clamps & connectors, Equipment terminal connectors (including terminal connectors for Auto Transformer), Conductors, Aluminum tubes, Bus bar and earthing materials, Bay marshaling box, spacers, cable supporting angles/channels, Cable trays & covers, Junction box, buried cable trenches, etc. as required. Due to space constraints, tertiary auxiliary bus & delta formation of the autotransformer is not possible by overhead Al-tube arrangement and the same shall be done by using 33kV XLPE cable and included in the present scope of the contract.

3.8 AUTOMATION AND TELECOMMUNICATION SYSTEM

a. SAS General Information

The substation automation system (SAS) shall be based on IEC 61850 including hardware and software for local and remote-control station operations. The SAS shall integrate the associated equipment for the following bays and auxiliaries (bay as defined in Technical Specification, Substation Automation System):

- 400kV: Line Bays, Diameter Middle Breaker Bays,
- 400/220 kV: Auto Transformer Bays, Diameter Middle Breaker Bays (400 kV)
- 33 kV: Station Service Transformer Bays
- Substation Auxiliary Systems: Lighting, Air Conditioning, AC/DC Supply, Station Service Transformer, etc.

The contractor shall supply the necessary bay monitors, installed at the Breaker Protection Panel installed in the Control Room.

The Gorakhpur Substation to be connected with 400kV New Butwal – Gorakhpur transmission line may adopt Digital Protection Coupler. The Digital Protection Coupler matching with the Gorakhpur S/S and associated power & control cables, fibre cables and accessories for New Butwal S/S is under the present scope of work and shall be used for tele protection application. Each DPC shall be interfaced with SDH/MUX telecommunication terminal located in the control room required for the communication with present SAS and SCADA system of NEA.

The Contractor shall provide a SAS that includes provisions for all monitoring and control of all substation and auxiliary equipment, under contract. Future bays shall be displayed on the graphical displays and the database allocated with spare devices and spare point assignments.

The Contractor shall include provisions for monitoring and control from the Local Control Cubicle (LCC), remotely from SAS/HMI at the Control Room and remotely from Regional Control Centre (RCC) and Load Dispatch Centre (LDC) located in Syuchatar, Kathmandu. The Contractor shall provide a complete turn-key service for the design, procurement, factory acceptance testing and installation and commission of the station equipment, at the site under contract, and at the remote end of the lines. If it is determined during the design process, that the remote end of the line is under construction, then it is the responsibility of the Contractor to coordinate activities with the remote-end Contractor to ensure complete monitoring and control, protection system is provided, at no additional cost.

The Contractor shall supply a complete SAS that meets and fulfills the Employer's requirements and specifications. The Contractor shall, at every stage of the design process, provide documentation for the Engineer's review and approval. The Engineer will coordinate the interfaces with the Contractor in order to monitor, control and manage the SAS from the regional control centre or remotely from LDC

All intelligent electronic devices (IEDs) shall include manufacturer's software for remote configuration, local configuration, and online monitoring. The IEDs shall be installed, functional, and accessible from the site engineering workstation and integrated into the SAS. Access to the IEDs with the manufacturer's software shall not disturb the normal day-to-day operation of the IED. The data points accessible from the IED through the manufacturer's software shall also be accessible from a separate communication port, from the IED, in order to route data points and integrate into the SAS.

All online monitoring equipment (i.e., Optical Temperature Sensors & Measuring Unit, Online Dissolved Gas (Multi-gas) and Moisture Analyzer), including spare, shall be IEC 61850 compliant (either directly or through a Gateway). The monitoring equipment is required to be integrated with SAS through a managed Ethernet switch conforming to IEC 61850. All Ethernet switches shall be provided by the contractor. All switches shall be powered by redundant DC supply.

The SAS shall comply with IEC 61850, cybersecurity requirements IEC 62351-8, and all other related IEC substation, automation, cybersecurity standards to ensure a reliable and robust SAS is provided.

The system under the present scope shall be integrated by the Contractor into the existing SAS of Siemens 'SINAUT Spectrum" (version 4.3.2) installed at the Master Station (i.e., Nepal Electricity Authority) LDC. The integration shall include all hardware and software required at the Control Center as well as necessary database development, display generation and upgrades for proposed control and monitoring of the station and network analysis of the communication infrastructure. The above activities shall be carried out as appropriate, for all respective stations and the LDC. The manufacturer of the existing SAS system is Siemens Germany. The existing communication protocol used for SAS at LDC Kathmandu is IEC

60870-5-10x. In the present scope of work, the data points for the master station shall be obtained from the SAS, based on IEC 61850, using a Gateway port with communication protocol IEC 60870-5-10x, as per requirement being provided at the substation. The Contractor shall provide all approved data points requested by the Engineer during the design, factory acceptance test, installation, or commissioning stage of the project.

SAS Interface Panels (IFP) shall be provided with terminal blocks for data acquisition, including cabling between control and protection panels and other interface panels required by the SAS.

b. LDC Telecommunication System Integration

The broad scope of FO based communication equipment shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing, training and demonstration for acceptance, commissioning and documentation for:

- SDH and termination equipment along with suitable interfaces and line cards.
- All cabling, wiring, digital distribution frame (DDF) patch facilities, and interconnection to the supplied equipment at the defined interfaces.
- Integration with the existing communication system based on SDH/PDH of Nepal Electricity Authority including all configuration of existing NEA FO SDH network equipment
- Integration of supplied subsystem with LDC control and monitoring system, communication equipment, VOIP PBX of RLDC/LDC, for voice.
- Network manager system, both software and hardware, including VOIP telephone instrument with one common switch, minimum 4 ports, including hardware and software.

The Contractor shall supply the fiber optic terminal equipment based on SDH technology with optical line termination equipment, digital multiplexer, hardware accessories, etc., along with approach optical fiber. As per requirement from junction box (JB) to optical distribution frame (ODF) box, the necessary interfacing, and its integration work, at Hetauda and LDC, for onward transmission of data and voice communication for LDC shall be included in the contract. The high-level communication scheme shall be attached to the drawings given with this specification.

The PLCC Equipment and Line traps as specified shall be installed at the New Butwal S/S end of the New Butwal – Indo Nepal Border transmission line. The Contractor shall be responsible for coordinating the exact technical specifications of the equipment to be supplied by him with the specifications of already finalized/procured/installed carrier equipment at the Gorakhpur substation. Contractor shall also be responsible for collecting all the necessary information/data from the respective substations/concerned utilities for the installation of the equipment

c. Private Automatic Phone Exchange PABX

The necessary approach cable and hardware for termination of OPGW of New Butwal - New Damauli D/C Lines and New Butwal – Gorakhpur D/C Lines at New Butwal Substation End, its interfacing with DPC for tele protection application and necessary SDH, MUX/DMUX telecommunication terminal equipment required for the communication of the said 400 kV Lines and its integrations with SAS at both end substations and SCADA system of the LDC shall be included in the present scope of contract. Bidders are requested to visit the substation site and make themselves acquainted with the scope of works as described herein.

3.9 CONTROL AND PROTECTION

This scope in this specification covers the materials and services for the protection and control equipment to be provided for the New Butwal Substation. The Contractor shall supply a complete protection and control scheme that fulfills all the Employer's requirements and specifications. The contractor shall provide all the equipment and design services to create a fully-functional, integrated Protection and Control scheme for all overhead transmission lines, transformers, bus bars, future line terminals, and auxiliary equipment even if it is not specifically identified in the specification. All interface equipment between systems, studies, designs, and protective relay and communications equipment programming shall be included. The protection and control equipment shall be furnished such that it interfaces seamlessly with the SAS equipment. Any auxiliary system or piece of equipment, whether specifically identified or not in this specification, needed to create a complete protection and control system shall be provided. The Contractor shall provide a complete turn-key service for the design, procurement, factory acceptance testing, installation, field testing and commissioning of the station equipment at the site under contract and the remote end of the lines.

Per the included specifications, each protection zone and/or protected piece of equipment shall be protected by dual, redundant, and independent protective relay systems, to include but not limited to tele-protection communications channels. Any failure in one of the protective relaying systems shall not adversely affect the redundant protection system. Single (non-redundant) breaker failure protection is acceptable for each circuit breaker.

The contractor is responsible for providing complete protection and control designs, studies, equipment, installation, and testing for new electrical system protection required at the remote stations to provide a complete protection system for the new transmission lines and substations. If the remote end station has existing protection and control systems, the new protection and control equipment at the local substation shall be specified to interoperate seamlessly with the existing equipment. If the existing remote equipment is not suitable for the purpose or does not meet all of the requirements of the Employer or this specification, it is the Contractor's responsibility to

replace the remote end protection and control equipment with suitable protection schemes. If the remote end substation is still in the design or construction phase, it is the Contractor's responsibility to coordinate protection and control designs with the contractor responsible for the remote station. The following lists a summary of the major equipment to be protected and its associated protection and control system at the New Butwal substation.

- ✓ 400 kV new Overhead Lines
    - Each line shall have dual primary protection schemes designated as Main I and Main II
    - The primary protection element for the Overhead Lines in both Main and Main II protection schemes shall be line current differential with communication between local and remote relays provided by fiber optic communication channels
    - The back-up protection elements in both Main and Main II protection schemes shall be provided by step-distance and overcurrent elements
    - Control and Protection panels shall not be provided for future lines
    - The Main I and Main II relay shall be of different make and model. The same make relay shall be acceptable only if they are of different hardware and manufacturing platforms.
- ✓ 400kV, 400/220/33 kV new 315 MVA autotransformers
    - Each autotransformer shall have dual primary protection designated as Main I and Main II
    - The primary protection elements for the auto transformers shall be transformer differential and restricted earth fault (REF) elements
    - The back-up protection elements shall be provided by overcurrent elements
    - Control and Protection panels shall not be provided for future transformers
- ✓ Two (2) 400 kV bus bars
    - Each bus shall have dual primary protection designated as Main I and Main II
    - The primary protection element for the bus bars shall be low impedance bus differential
- ✓ 400 kV circuit breakers
    - Each circuit breaker shall have a single breaker failure relay
    - The primary protection element shall be provided by the 50BF element with direct transfer trip provided to breakers at remote stations via fiber-optic communications.
- ✓ 220 kV, 400/220/33 kV new 315 MVA autotransformers
    - Each autotransformer shall have dual primary protection designated as Main I and Main II

- The primary protection elements for the auto transformers shall be transformer differential and restricted earth fault (REF) elements
- The back-up protection elements shall be provided by overcurrent elements
- The protection shall be compatible with existing bus differential protection and SAS for 220 kV yard.

3.10 FIRE PROTECTION SYSTEM.

Fire detection and protection system for 3 nos. of 400/220/33 kV, 315 MVA, 3-Ph Autotransformers, 400 kV GIS building, and control building, including Fire Fighting Pump House & water Tank, are envisaged in the present scope of Contract.

3.11 POWER AND CONTROL CABLES

Complete cabling, including mainly:

- 33 kV XLPE cables from the 33 kV Equipment up to the 33 kV bushings of the 400/220/33 kV Autotransformer
- Pot heads, termination kits or any other materials required to connect 33 kV cables from Autotransformer tertiary to the 33 kV equipment.
- Low voltage Power & Control Cable along with complete accessories to complete the scope of works.

3.12 EARTHING SYSTEM

The earth mat for GIS earthing and the yard earthing required as per specification is in the bidder scope. All the AIS/GIS equipment, Transformer, and buildings shall be earthed per IEEE80 standards and specifications mentioned in the contract and will be connected to the main earth mat by the contractor. All earthing materials supply, installation, and testing required shall be in the present scope of work. The earth mat for the 400kV side as per specification is in the bidder scope. The earth mat already exists in the 220 kV switchyard area. The connection with the existing earth mat shall be in the present scope of work.

3.13 LIGHTING SYSTEM

Complete design, procurement, installation and testing of lighting and illumination for all substation buildings and outdoor switchyard are included under the present scope of work.

3.14 LIGHTNING PROTECTION SYSTEM

Complete design, procurement, and installation of lightning protection for all the substation buildings and outdoor switchyard are included under the present scope of work. A combination of

Lightning Masts and shield wires can be used to provide this protection. Lightning masts can also be used to mount lighting fixtures and shall be grounded to the main grid.

3.15 AUXILIARY POWER SUPPLY

3.15.1 AUXILIARY SUPPLY 400/230 V

Supply, Installation, and testing of all 400/230 V AC distribution switchgear for the 400/220 kV switchyard and buildings as well as for outdoor and indoor lighting, fed from the station service transformer, as shown in the drawing. An emergency lighting system (220 V DC) shall be installed in the buildings.

Substation shall have Three Phase and Single Phase Industrial Grade Electrical Sockets shall be provided for charging of electric vehicles with following technical specifications:

- Three-Phase Sockets (2 Nos): 400V, 63 Amp, 5 Pole(3P+N+E), 50Hz, CE certified.
- Single Phase Sockets (3 Nos): 230V, 16Amp, 3 Pole (P+N+E), 50Hz, CE certified.

3.15.2 AUXILIARY SUPPLY 220V AND 48 V DC

a. The capacity of Battery & Battery charger shall be worked out by the bidder for complete 400kV and 220 kV substation scope including future bays as shown in the Single line diagram. For Battery sizing calculations, DC drives shall be considered for future 400kV GIS modules. However minimum battery size for 220 V batteries shall be 800 AH and for 48 V batteries shall be 400 AH.
b. All necessary auto throw over system, switches and distribution boards required to ensure uninterrupted DC supply from the battery and chargers, as shown on the drawings, shall be included in the scope.

3.16 VISUAL MONITORING SYSTEM

a. The Video Monitoring system shall be an integrated system with IP network-centric functional and management architecture aimed at providing high-speed manual/automatic operation for best performance.

b. The system should facilitate viewing of live and recorded images and control of all cameras by the authorized users.

c. The system shall use video signals from various types of indoor/outdoor CCD colour cameras installed at different locations, process them for viewing on workstations/monitors in the control room and simultaneously record all the cameras after compression using H 264/MPEG 4 or better standard. Mouse/Joystick-Keyboard controllers shall be used for Pan, Tilt, Zoom, and other functions of desired cameras.

d. The System shall provide sufficient storage of all the camera recordings for a period of 15 days or more @ 25 FPS, at 4 CIF or better quality using necessary compression techniques

for all cameras. It shall be ensured that data once recorded shall not be altered by any means. The recording resolution and frame rate for each camera shall be user-programmable.

e. The surveillance VMS System shall operate on 230 V, 50 Hz single-phase power supply. The system shall have backup UPS power supply meeting the power supply needs of all the cameras in the stations including those which are installed at the gate for a period of 2 hours. The bidder shall submit the sizing calculation for the UPS considering the total load requirement of the Video Monitoring System.

3.16.1 SYSTEM REQUIREMENTS:

a. The system must provide a built-in facility of watermarking or Digital certificates to ensure tamper proof recording.
b. All cameras may be connected through a suitable LAN which shall be able to perform in a 400kV class substation environment without fail.
c. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password.
d. The facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
e. The facility of Camera recording in HD (1280X720p), D1, 4CIF, CIF, VGA, as well as in any combination i.e. any camera can be recorded in any quality.
f. System to have a facility of 100% additional camera installation beyond the originally planned capacity.
g. In order to optimize the memory, while recording, the video shall be compressed using H 264/MPEG-4 or better standard and streamed over the IP network.
h. The system shall be a triplex i.e. it should provide a facility of Viewing, Recording & Replay simultaneously.
i. The offered system shall have the facility to export the desired portion of clipping (from a specific date/time to another specific date/time) on CD or DVD. Viewing of this recording shall be possible on standard PC using standard software like windows media player etc.
j. The system shall have a provision of WAN connectivity for remote monitoring.
k. The equipment should generally conform to Electromagnetic compatibility requirements for outdoor equipment in EHV switchyards. The major EMC required for Cameras and other equipment shall be as under:

    i. Electrical Fast Transient (Level 4) – As per IEC 61000-4-4
    ii. Damped Oscillatory (1 MHz and 100 KHz) (level 3) – As per IEC 61000-4-12
    iii. AC Voltage Dips & Interruption/Variation (level 4) – As per IEC 61000-4-12
    iv. Electrostatic Discharge (Level 4) – As per IEC 61000-4-2
    v. Power Frequency Magnetic Field (level 4) – As per IEC 61000-4-8
    vi. Ripple on DC Power Supply (level 4) – As per IEC 61000-4-17

l. Type test reports to establish compliance with the above requirement shall be submitted during detailed engineering.

3.16.2 VIDEO SURVEILLANCE APPLICATION SOFTWARE

a. Digital video surveillance control software should be capable of displaying and managing the entire surveillance system. It should be capable of supporting a variety of devices such as cameras, video encoders, Servers, NAS boxes/Raid backup devices, etc.
b. The software should have an inbuilt facility to store the configuration of encoders and cameras.
c. The software should Support flexible 1/2/4/8/16/32 Windows Split-screen display mode and scroll mode on the PC monitor.
d. The software should be able to control all cameras i.e. PTZ control, Iris control, auto / manual focus, and color balance of the camera, Selection of presets, Video tour selection, etc.
e. The software should have user access authority configurable on per device or per device group basis. The system shall provide a user activity log with the user ID, timestamp, an action performed, etc.
f. The users should be on a hierarchical basis as assigned by the administrator. The higher priority person can take control of cameras, which are already being controlled by a lower priority user.
g. It should have recording modes viz. continuous, manual, or programmed modes on the date, time and camera-wise. All modes should be disabled and enabled using scheduled configuration. It should also be possible to search and replay the recorded images on the date, time and camera-wise. It should provide onscreen controls for remote operation of PTZ cameras. It should have the facility for scheduled recording. Different recording speeds (fps) and resolution for each recording mode for each camera should be possible.
h. The software for clients should also be working on a browser-based system for remote users. This will allow any authorized user to display the video of any desired camera on the monitor with full PTZ and associated controls.
i. Retrieval: The VMS application should allow retrieval of data instantaneously or any date/time interval chosen through the search functionality of the application software. In case data is older than 15 days and available, the retrieval should be possible. The system should also allow for backup of specific data on any drives like DVDs or any other device in a format that can be replayed through a standard PC based software. The log of any such activity should be maintained by the system.
j. VMS shall provide the full functionality reporting tool which can provide reports for user login/logoff, camera accessibility report, server health check reports, etc.

3.16.3 NETWORK VIDEO RECORDER

a. The Network Video recorder shall include at least Server (min 3.0 GHz, 4GB RAM, 3000GB HDD (min)), RAID 5, with suitable configuration along with Colored TFT 22" High-resolution monitor, and Internal DVD writer. Windows XP/Vista/7 Prof. or VMS compatible operating system latest version with hardware like graphic cards, licensed Anti-virus, etc.
b. Further, the digital video recorder shall conform to the following requirements:

Server Spec	Intel Quad-Core (or better) 3.0 GHz (min.), 8 MB Cache, 4 GB memory, with suitable NVIDIA graphics card,3 TB HDD, Raid 5

Recording and Display Frame Rate	Real-time 25 frames per second per channel, manual select
Recording Resolution	(PAL): 1280X720, 704(H) x 586(V) It should be possible to select lower resolutions
Compression Method	H.264/MPEG-4 or better and latest
Video Motion Detection Capable	Standard and built-in (selectable in the menu)
Monitoring Options	Split-screen 1, 2, 4, 8, 16, 32 or more cameras
Playback Options	Search, still image capture
Alarm/Event Recording Capable	To be provided with built-in external alarm input/output ports minimum(8 in, 2 out)
Network Operation Capable	To be provided by using WAN or LAN router
Remote Internet Viewing Capable	Using WAN or LAN router
HDD Storage Consumption	1GB ~ per hour/channel variable based on frame speed and resolution settings, as well as compression
Operation	Triplex operation (simultaneous recording, playback, network operation)
Number of Video Channel	32
Audio Recording Capable	32
Input Voltage	230V AC or equivalent with UPS as a backup for 30 minutes

3.16.4 VMS CAMERA

a. The color IP camera for substation shall have PAN, TILT and ZOOM facilities so that it can be focused on the required location from the remote station through a controller. Whereas wireless IP cameras with PTZ controls are required for installation at gates of the NEA premises as per the direction of Engineer-In-Charge.
b. The IP Camera at the main gate can be fixed or PTZ based and shall be used for monitoring entry and exit.
c. It should have a sufficient range for viewing all the poles of isolators and other equipment with a high degree of clarity.
d. The VMS camera shall be suitable for wall mounting, ceiling mounting, and switchyard structure mounting.
e. It shall be possible to define at 128 selectable preset locations so that the camera gets automatically focused on the selection of the location for viewing a predefined location.
f. The camera should be able to detect motion in the day & night environments having the light intensity of Color: 0.5 Lux; B&W:0.05 Lux
g. The housing of cameras meant for indoor use shall be of IP 42 or better rating whereas outdoor camera housing shall be of IP 66 or better rating. Housing shall be robust and not have the effect of electromagnetic induction in a 400KV switchyard.

h. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password
i. The facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
j. Outdoor IP Fixed Megapixel Camera Specifications (For Main Gate) shall include the following:
   i. Image Sensor 2-megapixel Progressive, 1/3" CMOS/CCD sensor, Minimum illumination 0.1 Lux
   ii. Min Luminous 0.5LUX(Color) 0.05Lux(Black)
   iii. Camera Enclosure Type IP66 Grade
   iv. Iris/Focus Auto/Manual
   v. Video Compression Dual Stream H.264 and MPEG 4 user selectable
   vi. Support Dual-stream primary/secondary stream, H.264/MPEG 4 optional
   vii. Video Definition Primary stream:1600x1200,1280x960,1280x720, Secondary stream:800x600,400x288,192x144
   viii. Video Parameters Brightness, hue, contrast, saturation and image quality
   ix. Video Frame Rate PAL: 1-25frames/second NTSC:1-30frames/second
   x. Video Compression BR 32Kbit/S - 6Mbit/S
   xi. Video Output One channel composite Streaming
   xii. Supported Protocols TCP, UDP, IP, HTTP, FTP, SMTP, DHCP, DNS,ARP, ICMP, POP3, NTP, IPsec, UpnP, RTP, RTCP
   xiii. Operating Temperature -5 ~ +50℃
   xiv. Operating Humidity 10 ~ 90%

k. Outdoor IP66 PTZ HD Camera Specifications (For Switch Yards) shall include the following:
   i. Image sensor 1/3 type Solid State Progressive Scan CCD, WDR(High Definition)
   ii. Security Multiple user access with password protection
   iii. Effective Pixels (PAL): Main Stream : 1280x720 Sub Stream : 640x360、320x280 selectable
   iv. Compression Dual Stream H.264 and MPEG 4 user-selectable
   v. Signal System 50 Hz
   vi. S/N (signal to noise) Ratio Better than 50 dB
   vii. Electronic Shutter 1/60 ~ 1/10,000 sec. automatic or better
   viii. Scanning System Progressive/interlace
   ix. Low Light Sensitivity (lux) Color: 0.5 Lux; B&W:0.02 Lux
   x. Lens Minimum 10x (minimum) optical in High Definition

3.16.5 PTZ-KEYBOARDS

a. The features of PTZ shall include:
   1. Fully functional dynamic keyboard/joystick controllers
   2. Controls all pan, tilt, zoom, iris, preset functions
   3. Control up to 255 units from a single keyboard
   4. Many preset options and advanced tour programming

5. Compatible with all connected cameras

Key Application	Wired keyboard control operation of PTZ functions for weatherproof dome cameras
Pan / Tilt / Zoom Protocol Languages Supported	Selectable
PTZ Data Transfer Baud Rates Supported	Selectable 1200 bps / 2400 bps / 4800 bps / 9600 bps
Additional Features	Dynamic joystick for smooth camera movements, preset location option for quick access to frequently monitored areas

3.17 CIVIL & STRUCTURAL WORKS

3.17.1 GENERAL

This specification covers the design, construction, and supply of all civil works including heating, ventilation and air conditioning of the specified new 400/220/33 kV substation at New Butwal.

This document is describing quality standards, required functions but is not a detailed specification. Therefore, the requirements are not limited to the descriptions hereafter; items not explicitly mentioned shall be in the same best quality range as for the entire works of the project.

The civil works must be performed in such a manner that the high standards of quality and function required are fully achieved.

Special attention must be paid by the Contractor to the aspects which are specific to climate, seismicity, and local conditions.

The buildings and structures shall be designed with due regard to the need for easy inspection, maintenance, cleaning and repair, and must be designed and constructed to operate for long-term periods with the minimum of inspection, adjustment, and repair.

Lattice and pipe structures (galvanized): Standard lattice gantry structures (400/220/66/33kV Beams Towers and Lightning Mast), pipe/lattice support structure for equipment (pipe structures shall be used for 220 & 400 kV equipment support) and Structures for Building and AHU room, Fire walls between Auto-Transformer Units etc. shall be prepared by the contractor and shall be submitted for approval of detailed engineering.

All material shall be new and of the best quality suitable for working under the conditions, variations in temperature and load encountered in service without undue distortion or deterioration or the occurrence of undue stresses in any part, such as to affect the efficiency and reliability of the plant.

3.17.2 SCOPE OF SUPPLY AND SERVICES

3.17.2.1 GENERAL

The services to be provided within the framework of this specification comprise the planning, design and complete supply and execution in every respect including all the necessary calculations and documentation, prefabrication, delivery, erection and acceptance of all civil works required for faultless operation of the new substations.

The civil works consist basically of, but are not limited to the following main services:

- detailed design and engineering
- supply of all labor, materials, equipment, temporary work, tools, etc., necessary for the execution of the civil works
- site related investigations
- earth works including also all leveling and grading work in the project area as well as the necessary soil improvements as required
- foundations
- structural and nonstructural steelwork
- building works
- containers
- roads and parking including access road
- fencing and gates
- storm water drainage and sewage systems
- Civil works for cable, routing, ducts, trenches, tunnels, crossings, etc.
- fire protection works
- water supply system
- water tank
- earthing system
- outdoor lighting system

3.17.2.2 INSTRUCTIONS RELATED TO THE SCOPE OF WORKS

The Contractor will be fully responsible for ensuring that all materials used in the work and temporary works comply with the approved standards and that all processes of workmanship are

carried out with a high degree of efficiency, in accordance with an approved program and in compliance with the requirements of this specification. Solely virgin materials, subject to the Engineer's approval shall be used.

While the civil works are in progress the Contractor shall provide suitably qualified competent Civil Engineers to be full time on the site to supervise and verify the work, quality, and progress to the approved schedule of the work.

To ensure proper quality assurance the Contractor shall submit for approval a Civil Works Quality Plan, as a part of the QA/QC procedures.

All work shall be constructed to the lines and levels shown on the drawings prepared by the Contractor and approved by the Engineer

The Contractor shall employ competent design engineers to prepare civil design. All designs shall be prepared in accordance with the best current engineering practice, the requirements of the project specifications and the appropriate Codes of Practice and Standards, as approved by the Engineer. Any deviation from the project specifications must be duly requested and justified in writing from the Engineer with formal Design Change Authorizations.

The building, structures and roads within the site and their design and detailing shall comply with the fundamental technical and operational requirements of the electrical equipment to be accommodated therein and with the requirements of this specification.

Buildings and structures shall be earthed and be provided with a lightning protection system.

Ducts, trenches and/or tunnels shall be provided with suitable permanent pumps and sump pits to enable the easy removal of water spillages and firefighting water collected in these areas.

If culvert(s), and /or tunnel(s), a trench(s) or any other underground services are crossing roads and railways, other ducts and channels, etc., these shall be constructed as bridges calculated for heavy truck loading.

Where sizes and/or dimensions are given in the Tender Package, those shall be considered as informative and for guidance only.

The Contractor shall be responsible to finalize all such sizes and dimensions during his detailed engineering to fulfill all functional and specified requirements.

3.17.2.3 PREPARATORY WORKS

Preparatory works include all necessary topographical surveys and soil investigations, as well as all other investigations and studies necessary for the design and execution of works:

- Safety and security measures;
- Investigation of all areas which have to be cleared and cleaned, for the execution of new works, filling of cavities, grubbing, etc.

3.17.2.4 ENGINEERING WORKS

Engineering works include:

- Preparation of all documents, drawings, and calculations, necessary for the execution of civil works;
- Piling calculations (if any);
- Structural calculations for buildings, structures, and foundations;
- General arrangement and reinforcement drawings for concrete works, including bar bending schedules;
- Architectural arrangement drawings and details for the substation building;
- Layout with details of outdoor facilities;
- General arrangement and manufacturing drawings for steel structures;
- Preparation and submission of drawings for statutory approvals of local authorities and of the agencies, if applicable;
- Calculations for VAC works, drainage and sewage systems

All documents, drawings, and calculations prepared must be submitted and approved by the Engineer before the execution of the engineering work.

3.17.2.5 TEMPORARY SITE INSTALLATION WORKS

Appropriate areas shall be made available to the Contractor for their organization works and storage facilities.

Temporary site installation works include:

- Within the proposed area for site organization, the Contractor shall provide and maintain appropriate office(s) for the Employer and the Engineer;
- Temporary latrines and sanitary facilities have to be installed by the Contractor;
- The temporary water and electricity demand and connection point shall be discussed during the Contract clarifications;
- Temporary roads, parking areas, and fences shall be constructed as necessary for the execution of works;
- All kinds of necessary temporary buildings for the execution phase of the project (storage, offices, workshops, security posts, laboratories, etc.).

3.17.2.6 SITE RELATED SURVEYS

3.17.2.6.1 TOPOGRAPHIC SURVEY

A topographical survey, concerning the three (3) sites of the project shall be carried out by the Contractor.

The Contractor shall perform all the necessary surveying works in order to:

- obtain topographic survey maps;
- ensure that the position and elevation of all constructed works are correct.

The existing benchmarks (if available) shall be used as the basis for the surveying works.

3.17.2.6.2 SOIL INVESTIGATION

The extent of the investigations done by the Contractor shall be such as to permit the satisfactory determination of all necessary subsoil characteristics, to exclude any unacceptable settlement and to determine the reliable type, size, and execution of foundations. These investigations have to be completed before the works start. Detailed instructions for the Soil Investigations are given in this specification.

3.17.2.7 SITE DEVELOPMENT WORKS

Site development works include:

- Site clearance including diversion of existing services, if any;
- Site leveling and grading;
- Roads, drains, surfacing;
- Temporary constructions works and services enabling the works of the project;
- Temporary and permanent security fences around the substations' works.

3.17.2.8 MAIN CIVIL WORKS

General layout

The limits of the substations are given in the attached general layout plans.

Based on the attached draft layouts, the Contractor shall propose detailed arrangements with the various components for the final configuration of the substations, subject to the approval of the Engineer. In doing so, adequate safety clearances, fire compartments, the favorable layout of the plant components for monitoring and maintenance, the possibility for extension and any other requirements of up to date substation construction shall be taken into account.

GIS and Control buildings

The buildings will be designed and constructed by the Contractor according to the basic design indicated in the provided general arrangement.

The proposed arrangement of the buildings can be modified by the Contractor according to the specific conditions (i.e. transport ways, an arrangement of the equipment, a partition of the building, etc.), subject to the Engineer's approval.

Guard house

A guard house as shown in general arrangement plans shall be provided at the entrance of the substations.

Outdoor foundations

Transformer foundations

The main oil-filled transformers shall be supported on reinforced concrete foundations. Necessary firewall, oil/water collecting and separating pits shall be provided.

Switchgear foundations

The following foundations shall be provided:

- Foundations for outdoor switchgear equipment, supports, and gantries

Miscellaneous foundations
Foundations for lighting poles, Bay marshaling box, panels and control cubicles of equipment

3.17.2.9 CABLE DUCTS

Where necessary, reinforced concrete trenches and ducts shall be provided.

3.17.2.10 ROADS, PAVEMENTS AND SURFACING

The proposed roads and paving are indicated in the layout plan.

The new road system must be arranged by the Contractor in such a way that non obstructed traffic is guaranteed.

The connection portion of the access roads, outside of the site areas belongs also to the scope of works of the Contractor.

The rest of the areas of the substations, where no foundations, buildings or roads and landscaping are provided, will be covered by a layer of gravel, as per Engineer's instructions.

3.17.2.11 FENCES AND GATES

All substations have to be provided with fences and adequate gates.

3.17.2.12 DRAINAGE AND SEWAGE SYSTEM

Storm Water Drainage System

The storm water drainage system collects only clean storm water which should be discharged into the storm water system of the zone. For the substations, complete storm water drainage systems are required. Substantially maintenance-free and operationally safe installation must be guaranteed. The surface water drainage shall include all necessary gutters, down pipes, gullies, traps, catch pits, manholes, etc.

Sanitary Sewage Drainage

The sanitary water from the WC, urinals, shower, wash basins and kitchen shall be discharged to a treatment plant made of reinforced concrete.

The pre-cleaned water shall be led to a soak-away pit.

3.17.2.13 LANDSCAPING

The free areas of land inside the substations, where no roads or gravel is provided, shall be landscaped, using low to medium-high growing plants and grass. The landscaping is subject to the approval of the Engineer.

3.17.2.14 SPECIFIC CIVIL WORKS IN THE SUBSTATION

The exact amount of necessary construction works in the substations will be determined by the Contractor, subject to the approval of the Engineer. The anti-weed treatment & stone spreading at the substation, site drainage i.e. internal drainage (temporary for the construction phase and permanent) and external drainage, rainwater harvesting, and others necessary civil work should be carried out as per the Chapter: Civil work of B12: Technical Specification. The major works are listed below.

The main civil works are, but not limited to, the following:

- Construction of a control building, GIS building and other structures as required by the Engineer;
- Foundations for transformers including an oil/water collector with oil separator and firewall,
- Foundations for the equipment as well as supply and erection of supporting steel structures.

- Construction of all internal and external drainage and substation flood protection works, as well as river protection works have to be carried out in conformity to the flood risk assessment following the hydrological study.
- Construction of fire walls between Auto-Transformer units.
- Construction of a rainwater drainage system for the complete substation area, including an adequate discharge system outside of the substation area including also the dewatering of cable channels, as well as a discharge system to the outdoor area, as requested and approved by the Engineer;
- Supply and installation of fences/walls and gates, according to the instructions of the Engineer around the complete substation area;
- Supply and installation of steel structures for outdoor equipment with long-time resistant corrosion protection and transformer gantries;
- Landscaping and/ or covering by the grass of the substation area according to the instructions of the Engineer;
- The surfacing of the substation area by gravel, according to the instructions of the Engineer;
- Construction of roads as well as the construction of service roads, as instructed by the Engineer;
- Provision of cable trenches and ducts, including also the supply and installation of covering plates, where required;
- Installation of permanent water supply from bore well/single point of water supply system with a underground storage tank of capacity 18m3, one (1) pump with discharge capacity of 0.6 liter/s, one (1) filter unit, one (1) pressurize unit, one (1) lot of pipes, valves etc. to be supplied to the Fire Fighting pump house, Fire water tank, control room building, GIS building, guard house, etc.; Installation of internal water supply system (including water pipes, arrangement for potable water system, pumping stations etc.) and domestic water drainage system (canalization).Installation of an outdoor lighting system.
- Installation of an adequate designed septic tank, according to the local rules.
- Installation of an outdoor lighting system

TOPOGRAPHIC SURVEY

Topographic site surveys are to be made in all the substations.

Scope of Topographic Survey

The Contractor shall carry out all the necessary topographic surveying works in order to:

- Obtain (if available) maps of the construction and surrounding areas;
- Propose and install new transferred benchmarks (TBM). Their level and grid coordinates shall be related to the existing reference system;
- Conduct spot level topographic survey of the development area and adjacent prominent surface boundaries;
- Acquire all survey data in digital format for processing and detailed maps development;
- Produce CAD adaptable and editable maps, natural ground profiles and survey data files of all surveyed items;
- Prepare a survey report of resources, procedures, site and office works, data acquisition, data processing, and presentation;

The survey shall include all buildings and structures in the substation area (e.g. foundations, fences, overhead power lines, roads, tracks, finished grade, paving, buried services, etc.).

The required accuracy in Northing, Easting, etc. and elevations shall be ±10 mm, relative to the existing benchmarks.

The benchmarks shall be secured and marked in such a manner so as to ensure that they can be found at any time, that they will not be destroyed by the ongoing construction activities and that they can be constantly used for reference and check measurements.

The results of the survey shall be reported as follows:

Preliminary Site Survey Report

This shall include:

An executive summary, stating the objectives of the survey and containing a brief description of the work undertaken as well as the major conclusions;

A description of the survey work, referring to the method applied, equipment used, work organization, field operation, data processing, interpretation and presentation of the results;

A site survey plan on a scale of 1:500.

Within two (2) weeks after the receipt of the Engineer's comments, the Contractor shall submit the Final Site Survey Report.

Final Site Survey Report

This shall have incorporated all of the Engineer's comments.

For the final report, the Contractor shall also provide all the survey data in a digital format. Additionally, the Contractor shall provide the necessary software in order to gain access to the data in digital format, as well as the specifications for the computer workstation to be used.

3.17.2.15 GEOTECHNICAL INVESTIGATIONS

3.17.2.15.1 GENERAL

The extent of the subsoil investigations shall be such as to permit the satisfactory determination of the geotechnical conditions and to allow reasonable foundation proposals. Soil investigation data will be prepared by the Contractor. This document does not release the Contractor from the execution of his investigations on the proposed location of the switchgear building, various outdoor foundations and the route of cable ducts.

3.17.2.15.2 SCOPE OF WORKS FOR GEOTECHNICAL INVESTIGATIONS

The purpose of the geotechnical investigations is to accurately capture, sample and in-situ test throughout the substation area, including site reconnaissance, site geology, site previous utilization history and above ground and subsurface conditions.

The Contractor shall comply with all local laws, rules, and regulations, applicable to the works. The investigation procedure shall be governed by recognized international standards and codes, in their latest edition.

Anticipated work activities breakdown is summarized in, but not limited to, the following:

- Conduct site reconnaissance, in-situ geophysical and geotechnical exploration including open trial pits, boring, in-situ borehole, and open-pit testing, piezometer installation as per planned exploration program;
- collect disturbed and undisturbed soil samples and extract water samples from boreholes and open trial pits;
- select properly collected samples and perform geotechnical lab tests to classify soils and assess their geotechnical behavior;
- compile in-situ data collection, in-situ test results, lab test results and desk studies accounts;
- produce a comprehensive factual report of resources, procedures, acquired data, site works, and lab tests, desk study, data processing, and conclusions;

- liaise with the topographic survey for an interchange of information to be superposed on topographic survey maps or to obtain topographic survey information useful in setting out the geotechnical investigation works.

3.17.2.15.3 FIELD WORKS

BOREHOLES

Exploratory boreholes shall be sunk at the locations approved by the Engineer. The boreholes shall be 12 cm in diameter. The depth of boreholes shall not be less than 10 m unless the rock is encountered, in which case the thickness shall be proved to be greater than 1.5 m. Where weak soils are encountered, boreholes shall be continued down to a load-bearing stratum, with a minimum thickness of 3 m proved.

The boreholes shall be drilled by locally trained drillers under the direct supervision of the Contractor, according to the established instructions and specifications. Casing shall be used where necessary so as to prevent the collapse of the borehole wall.

An appropriate boring method with the continuous recovery of soil samples shall be used. Disturbed and undisturbed samples shall be collected for the visual examination and laboratory testing.

The soil stratifications encountered in the boreholes shall be logged during drilling and the borehole logs shall include at least the following information:

- Soil stratification;
- Number, depth, and type of soil samples;
- Corrected penetration resistance;
- Groundwater level;
- Grain size distribution;
- Index and engineering properties of representative samples collected from different strata;
- SPT values;
- Drilling method, coring, casing.

Standard penetration tests (SPT)

Down to the depth of drilling, SPT shall be performed in the boreholes at 1.5m intervals, in both cohesive and non-cohesive soils.

Sampling

During SPT, at 1.5 m intervals, disturbing samples shall be collected and submitted in polyethylene bags with proper identification.

Undisturbed samples shall be collected for cohesive soils at 1.5 m intervals.

A thin-walled sample tube shall be pressed into the cohesive soils by means of hydraulic pressure produced by the drilling rig. The dimension of the tube must refer to the applied standard. The undisturbed samples shall be trimmed and scaled with non-shrinkage wax at both ends and clearly labeled.

Disturbed and undisturbed soil samples shall be sent for laboratory tests.

Groundwater level measurement

The water level in each borehole shall be recorded before commencement and after completion of drilling when the water level has settled. The depth of the borehole and the casing (if any) shall be also recorded.

Cone penetration tests (CPT)

CPT shall also be carried out as a second method of soil investigation (after borehole sinking) at the locations approved by the Engineer.

CPT shall be carried out using static penetrometers (Dutch core apparatus) for determination of the soil type, density, and consistency.

The results of the CPT´s shall be presented in the report.

Test (trial) pits (TP)

Test or trial pits down to 1.5 m shall be used as a third method of soil investigation in order to visually identify the top strata and its sequence as well as to prove the suitability of dredgers. The Contractor shall obtain at least one disturbed and one undisturbed sample of each stratum encountered.

The description of the encountered strata and of the strata sequence, accompanied by colored photographs, shall be specified in the soil investigation report.

General soil/subsoil description

A general soil/subsoil description shall be made for the investigation, comprising of:

- Soil conditions at the surface;

- Expected soil conditions below the surface (slopes, etc.);
- The inclination of the ground surface, inclination and orientation of cracks and fissures as well as their stratification, evaluation of slope stability, in case there is a potential for sliding.

This information shall be provided to the Engineer through intermediate reports, to enable them to give instructions for more intensive or additional investigations, if necessary.

The minimum number of boreholes/soundings/trial pits will be as per the below-mentioned Table 1.

Location	Borings	Cone Penetration Tests (CPT)	Trial Pits (TP)
400 kV Switchyard	4	4	4
220 kV Switchyard	2	2	2
Building Zones	2	2	2

Table 1 Number of boreholes/soundings/trial pits

The final number of boreholes will be agreed between the Contractor and the Engineer.

3.17.2.15.4 LABORATORY TESTS

Natural moisture content

Tests to determine that natural moisture content (natural water content) and the in-situ wet and dry densities shall be performed on undisturbed samples.

Atterberg limit tests

Tests to determine the liquid limit and the plastic limit shall be performed on representative cohesive soil samples collected from different strata. The Liquidity Index/Consistency Index shall be determined.

Grain size distribution tests

The specific gravity and the grain size distribution of representative soil samples collected from different strata shall be determined with standard sieves and a hydrometer.

Grain size distribution curves with USCS classification of representative samples shall be specified in the soil investigation report.

Unconfined compression tests

Unconfined compression tests shall be performed with a constant strain rate on representative undisturbed specimens. Stress-strain diagrams of these shall be attached to the soil investigation report.

Consolidation tests

With a 1:1 load increment ratio and a 24-hour duration for each increment, standard consolidation tests shall be performed representative undisturbed specimens. The dimension of the specimens must refer to the applied standard.

Chemical analyses

The groundwater and the soil shall be analyzed and classified with regard to their aggressive action on concrete. The classification shall comply with DIN 4030 or recognized standards.

The results and recommendations shall be part of the soil test report.

The chemical analyses shall determine the sulphate and chloride contents as a minimum as well as the pH value.

Electrical Resistivity Test

This test shall be conducted to determine the Electrical resistivity of soil required for designing safety-grounding systems for the entire station area. The specifications for the equipment and other accessories required for performing electrical resistivity test, the test procedure, and reporting of field observations shall conform to relevant British standard codes (B S Codes)/ equivalent International Standards. The test shall be conducted using Wagner's four electrode method as specified in relevant British standard codes (B S Codes)/ equivalent International standards.

3.17.2.15.5 RESULTS OF GEOTECHNICAL INVESTIGATIONS

The report shall be complete and shall contain, but not be limited to, the information specified below.

Description of the scope of work carried out, containing:

- work program;
- methods and systems (equipment) used;
- works carried out (field investigations and laboratory tests).

Layout location plan of soil investigations, showing:

- the area;

- the general layout plan;
- locations of boreholes, soundings, trial pits and plate tests (if any) carried out;
- Comprehensive map surrounds.

Logs, tables

The subsurface conditions, for example, the sequence of the strata, the nature, and properties of the individual strata, as well as the groundwater conditions, shall be determined and described in the borehole logs. The results of the laboratory tests and the diagrams of the test results shall be included in the report.

Borehole logs, trial pit logs, and surroundings logs shall include:

- actual ground level and reference to the local Datum;
- description and limits of various soil layers;
- samples were taken;
- SPT results;
- water levels;
- depth of borehole/pit/sounding.

Soil profiles (cross-sections)

The results of the subsoil investigations shall (in addition to the borehole logs) also be shown in the form of cross-sectional drawings with a vertical scale of 1:100 showing, e.g.:

- actual ground level and plant datum at the points of investigations;
- results of boreholes including standard penetration test (SPT) graphs;
- trial pit profiles;
- CPT diagrams;
- proposed foundation levels;
- limit lines of soil layers (soil strata);
- groundwater level;
- legend (key).

Groundwater classification

After the chemical analysis, the groundwater shall be classified according to its aggressive action on concrete. The classification shall comply with ASTM standards or equivalent codes.

Foundation Proposal

Admissible bearing pressures of different types of foundations shall be advised. Type and engineering values of proposed pile foundations - if necessary - shall be given. Explanation of recommended soil improvement methods shall be made. Geotechnical restrictions of earthworks (cut and fill, slopes, etc.) shall be advised.

Recommendations for foundations shall be derived from the in-situ investigations and from the laboratory tests.

3.17.2.15.6 REPORTING

A comprehensive investigation report shall be produced in two (2) stages. Within six (6) weeks of completion of the soil investigation fieldwork, the Contractor shall submit the draft report to the Engineer for comments and approval. The draft report shall be complete and shall contain, but not be limited to, the information specified above. A final revision shall be issued after the incorporation of comments and requirements.

All report deliverables, documentation, maps, and drawings shall be compatible with MS Office 2010 suite and CAD systems. Data to be interchanged with topographic surveyors shall be in electronic format for further electronic processing.

3.18 SPARE PARTS, TOOLS, AND OTHER EQUIPMENT

The following shall be offered:

- mandatory spare parts and tools (as per price sheets)
- recommended spare parts, equipment, tools and instruments for maintenance

Separate price sheet to be filled out and separate brochures, documents, etc. to be provided.

3.19 OTHER SERVICES AND EQUIPMENT

3.19.1 TRAINING IN FIELD

During an erection, commissioning and trial operation, the Employer's selected operating staff is to be familiarized with the functions of the system. The Contractor shall arrange appropriate training in the operation and maintenance of the equipment for the Employer's personnel at the site.

As specified in the "Instructions to Bidders", a tentative training program shall be submitted by the Bidder. The training program shall consider the availability of the "shift personnel" and structure its training program in various sessions.

The training shall be conducted in the English language.

- The traveling and living expenses of the Employer's personnel for the training program conducted in Nepal shall be borne by the Employer. The training shall be provided to Employer's personnel in the field of erection, testing, operation and maintenance at substation site as per the following:

  1. Control & Protection: 5 Days.

  2. Substation Automation System including the integration aspect of SCADA: 5 days.

  3. For 400kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance: 5 days.

  4. Operation and Maintenance of Transformers, 5 Days.

  5. AC & DC Auxiliaries and mechanical systems: 5 Days

- Before energizing, training sessions of at least one week per substation shall be performed with a focus on operation and troubleshooting. The Contractor shall provide sufficient qualified personnel on-site during trial operation in order to perform further training during operation.

The Contractor shall provide comprehensive training documents.

3.19.2 TRAINING AT MANUFACTURER'S WORKS

a) Cost for training at manufacturers' works shall be borne by the contractor. However the travel fares and insurance, lodging, boarding, and incidentals shall be borne by the Engineer/Employer. The contractor shall be responsible for managing local travel at the place of training. Arrival and respectively departure shall be scheduled for the day before and respectively after the training(s).

   The training shall be provided in the field of design, testing and maintenance at Manufacturer's works as per the following:

   1. Control & Protection, Substation Automation System and Communication System: 10 Days, (3Nos. Trainees)

   2. 400 kV GIS Equipment and System (Circuit Breaker, Isolator, CT, CVT & LA) and EHV GIS/AIS Substation Design: 10 Days, (3 Nos Trainees).

3.20 SITE CONDITIONS - REQUIREMENTS

3.20.1 SITE EXAMINATION

Contractor shall be deemed to have conducted an examination of the Site and to have informed itself fully regarding the risks, contingencies and all other data, matters and things, local or

otherwise, in relation to the Site and to any other aspects of the Work necessary to satisfactorily perform the Contract in all respects. Contractor shall confirm and represent that it has had sufficient opportunity to visit the Site and carry out all examination, inspection, measurements, and testing necessary for it in order to enter into the contract on the terms and conditions set out in the Contract Documents and that has informed and satisfied itself with respect to all aspects of the Work. Without limitation, Contractor shall confirm and represent that it has informed and satisfied itself with respect to the nature and conditions of the Site and the Existing Employer Equipment, the quantities, location and nature of the Work, the facilities, accommodations, labor, Equipment, and Materials necessary or required for performance of the Work, the means of access to the Site and the conditions under which its employees and Subcontractors will be employed and the Work will be performed.

The Contractor shall carry out for each site a geotechnical study or other investigations needed to understand the soil conditions/site better.

3.20.2 SITE HANDOVER TO CONTRACTOR

Access to the site will be permitted and construction phase can begin when the Employer has accepted from the Contractor the following documents:

- Site-Specific Safety Management Plan
- Appointment of safety officer
- Site Organization Chart
- Detailed construction program
- Work area drawings
- Environmental and Social Plan according to IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement and MCC's Environ-mental Guidelines.
- Confirmation that the Contractor has set up its main construction facilities and its equipment is ready to commence the Work at Site.

3.20.3 WATER/ POWER SUPPLY FOR CONSTRUCTION

Water Supply

The Contractor is responsible for its own water supply, including the provision of any reservoirs, pumps, piping and ancillary equipment required for such purposes.

Electric Power Supply

The Contractor is responsible for the electric power supply required during construction and could be provided by:

- Own Distribution Transformer
- Diesel Generator Set, 230/400V, 50 Hz, up to 200kVA.
- Mobile substation

The Contractor shall be also responsible for providing all extensions and distribution facilities, including breakers, transformers, and cables from the source required for construction purposes. The electrical safety of personnel and equipment shall be of prime concern.

3.20.4 ENVIRONMENTAL AND SOCIAL ISSUES

Contractor to Demonstrate Environmental and Social Responsibility - Contractor shall demonstrate in the performance of the Work that it is environmentally responsible by:

(a) complying with all applicable environmental legislation and regulations;

(b) following all Engineers work instructions and all applicable policies, practices, and procedures established by the Employer;

(c) being observant for, and immediately notifying Engineer of, any environmental problems that develop on Site;

(d) while handling the SF6 gas, the contractor must ensure that the following standards are complied

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

(e) taking all necessary measures in the performance of the Work to avoid causing negative impacts to the environment, by complying with the requirements of ESHSMP Report, Environmental and Social Impacts and Mitigation Measures, during Pre-Construction and Construction and Commissioning;

(f) constantly monitoring for, and immediately notifying Engineer of, any kind of pollution, damage to vegetation, soil or watercourse that might develop on Site; and

(g) where any impact or damage occurs, Contractor shall be solely liable to undertake all reasonable and necessary measures to repair and restore the effects of such negative impacts immediately, and to the satisfaction of Engineer and Employer.

3.20.5 ACCESS

The Contractors shall avoid using private access roads belonging to individual ground owners for accessing the works. Any damage to their ground shall be repaired so that the owner shall not be dissatisfied.

The Contractor shall arrange temporary material and equipment storage at the site. If the storage area is required outside the site area the Contractor shall negotiate with the ground owners for using their lands as a storage space.

The Employer shall provide the following facilities:

a) Such right of access at the proposed area is necessary to enable the Contractor to proceed with the clearance of trees and scrubs for all the works specified in Bill of Quantities.
b) The right to construct and make use of the reasonable track to the proposed area for the transport of materials and the carrying out of erection operations, except where the route crosses orchards, gardens or other ground over which the Employer decides that such a track is not reasonably practical.

The Contractor shall, at an early stage of the Contract, examine the site and shall design on the map his proposed entry route to the plant and the type of equipment or transport intended to traverse the routes. The maps shall indicate the types of access to be constructed, if necessary, the places where it is proposed to use existing roads, community roads and existing roads not maintained by the government.

The Contractor shall arrange for his own store yard for storing materials and equipment. The Contractor shall arrange with the landowners for using their lands as store yards if required in addition to the site storage devices.

3.20.6 EXISTING ACCESS

Where the Contractor uses government maintained roads to enter the site for construction purposes then he must make sure the drains are properly protected or reinforced. The junction must be cleaned and a proper danger sign board erected on the roadside to warn the public. The drains must not be blocked.

However, when the Contractor has the approval to use existing community roads that are not maintained by the government, he shall get the consent from the landowners concerned and shall undertake to maintain the road during the works to such a standard that its use by the customary traffic is not impeded in any way. He shall then restore the road to a condition equal to that existing before the start of execution. The Employer will assist the Contractor in negotiating with the persons or organization normally responsible for maintaining the road.

The Contractor shall avoid using access roads undertaken by other departments unless directed by the Engineer. Consent must be sought before entering these access roads.

3.20.7 CULVERTS

Temporary culverts, which are compulsory to be included in the access road rate, shall be provided at low points of the new access. The culvert shall be of different sizes and of reinforced concrete

tubes sufficient to prevent retention of floodwaters upstream of the access. The reinforced concrete tubes can be used again.

The Engineer shall approve the types of culverts proposed by the Contractor. All culverts shall be deemed to be included in the new access road rates.

3.20.8 SITE FACILITIES PROVIDED BY THE CONTRACTOR

3.20.8.1 SITE FACILITIES FOR CONTRACTOR'S STAFF

Site Accommodation

The Contractor shall make his own arrangements with regard to accommodation for his expatriate and locally recruited staff during the construction period. All dwellings and buildings, existing or erected, shall comply with local regulations with regard to construction, water supply, sanitation, and other requirements.

Temporary construction camps shall be provided with proper sanitation and other necessary facilities. All accommodation shall be removed by the Contractor when no longer required. After the removal of accommodation, the ground shall be left in a clean and tidy condition.

Site offices

The Contractor shall provide for his own staff such buildings as may be necessary for office accommodation for site staff during the construction period. The cost of these shall be deemed to be included in the Contract Price.

Site transport

The Contractor shall provide at his own expense all necessary transport for his personnel and materials.

3.20.8.2 SITE FACILITIES FOR THE EMPLOYER/ENGINEER

Additionally to his own infrastructure facilities, the Contractor shall establish Infrastructure facilities for the Employer and the Engineer, as described herein, in the vicinity of the construction sites.

Site accommodation

The Contractor shall provide site accommodation fully furnished residential family accommodation for 6 Employers and the Engineer's Personnel (minimum 2BHK i.e. 2 Bedroom, 1 Living Room Hall, and 1 Kitchen per accommodation. The Site accommodation for the Engineer/Employer Personnel shall be of a standard at least equivalent to that provided for the Contractor's most senior expatriate management staff on Site and in any case, should meet the

minimum requirements as with local regulations with regard to construction, water supply, sanitation, and other requirements. The site accommodation will have at least following facility

- Kitchen
- Clean Toilet and shower facility with running water
- Air-conditioning
- Safe drinking water
- Bed and resting area
- Reliable electric power
- Internet and phone line
- Graded parking
- Good ventilation and heating

The arrangement for food should also be made on a chargeable basis to the Employer or the Engineer as the case may be.

Site accommodation shall be provided in the vicinity of the substation. The exact type and location of the site accommodation will be proposed by the Contractor and shall be subject to Engineer/Employer approval.

The above infrastructure shall be provided from inception to the handing over of the substation.

Site offices

The Contractor shall supply and maintain Site offices for the Employer´s and the Engineer's Personnel.

At least one (1) office with suitable cubicles etc. for around 6 staff of Engineer and one (1) meeting room shall be provided in the substation.

These offices shall be separate from - but adjacent to - the Contractor's own offices and other facilities and shall meet the Employer's Requirements. The offices shall be air-conditioned and suitably furnished with desks, chairs, benches and lockable filing cabinets. The offices shall be installed with full office facilities, including lighting and electricity, telephone lines, water supply, sewerage, and drainage. The facility will be equipped with

- Six desks and chairs
- Ten filing cabinets
- Two common photocopiers/printers
- Clean Toilet facilities
- Sufficient number of fire extinguishers of suitable size and type
- Safe bottled drinking water
- Graded parking area close to the office
- Internet & Phone line with rentals paid by the Contractor

The above infrastructure shall be provided from inception to the handing over of the substation.

Site transportation

The Contractor shall provide, maintain and keep available at all times, transport for the exclusive use of the Engineer/Employer Personnel.

For the Engineer/Employer Personnel three (3) SUV type vehicles including one driver per vehicle. The details of vehicles are presented in Annex_B01_5_Vehicle_Spec.

Furthermore, the minimum following standards shall be provided:

- Power Steering
- Anti-Locking Braking System
- Driver and Passenger Airbag
- Power Windows
- Air Conditioning (non CFC)
- Central locking with alarm
- Headrests and Seat belts for each passenger place
- Tubeless tyres Toolkit and Jack Owner's manual

Two (2) double cabin 4 WD vehicles (Pick Type) including one driver per vehicle shall be provided. The details of vehicles are presented in Annex_B01_5_Vehicle_Spec.

The cost shall be deemed to include the cost of vehicles, comprehensive insurance (≥ 2 Mio. USD per incident, however, to be in compliance also with local regulations) and licenses, fuel, lubricants, repairs, wheels, maintenance, cleaning and all other costs and charges incurred in running and upkeep of the vehicles. Furthermore, the vehicles shall be provided with a driver.

The Contractor shall cover the fuel costs for 2500km/month for each vehicle.

The vehicles shall be provided to cover the whole construction period including the defects notification period and not less than 42 months beginning with the contract award/commencement date. If the vehicles are not available on the commencement date, the Contractor shall cover the cost for the transportation of the Engineer's Personnel until the above-mentioned vehicles will be made available.

At the end of the project, the vehicles shall be handed over to the Employer.

3.20.9 LOCAL TRANSPORT AND OTHER EQUIPMENT

Shipment by sea freight shall be made to the port to be defined by the Contractor (Town, Country).

Airfreight shall be made to: to be defined by the Contractor (Name of International Airport of Town or Name of International Airport of Town), whatever more advantageous to the project.

Shipments are to be made on a "DDP" basis according to Incoterms and explained in the commercial conditions.

The Contractor shall ensure that adequate handling equipment is available to unload the heaviest piece of equipment.

Prior to shipment, the Contractor shall furnish by airmail or telefax the shipping documents (bill of lading, original shall accompany the merchandise until delivered at site) to the Engineer. Details will be fixed during the Kick-Off Meeting. It will be the Contractor who is solely responsible for custom clearance while MCA-Nepal will provide documents to the Contractor for duty free import.

When actual transport has been completed, the Engineer/Employer shall be so notified.

All cases and boxes shall be clearly and boldly marked and shall be addressed to:

Name of the Employer, Country of the Employer

Project Title

Project Subtitle

Lot Title

The site at Town or Region

c/o (Contractor's name)

In order to facilitate custom examination, all packages and transport documents shall regardless of other markings be clearly and indelibly marked.

The Contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangements with the appropriate authorities for the transportation of the equipment. The dimension of the equipment shall be such that when packed for transportation, it will comply with the requirements of loading and clearance restrictions for the selected route. It shall be the responsibility of the contractor to coordinate the arrangement for transportation of the Transformers for all the stages from the manufacturer's work to the site.

The conditions of roads, the capacity of bridges, culverts, etc. in the route shall also be assessed by the Contractor. The scope of any necessary modification/ extension/ improvement to existing road, bridges, culverts etc. shall be included in the scope of the Contractor

3.20.10 INSPECTION AND TEST PLAN (ITP), FACTORY ACCEPTANCE TESTS (FAT), COMMISSIONING TESTS

3.20.10.1 INSPECTION AND TEST PLAN (ITP)

The Contractor shall establish an Inspection and Testing Plan (ITP) to describe and control what inspection and tests will be conducted, how, when and what quality records will be generated for the Scope of Work, including procurement, component fabrication, system integration, delivery, installation, and commissioning.

The Contractor shall submit the ITP to the Engineer for review and acceptance. As a minimum, the ITP shall include all types, routine and conformance tests specified in the Contract, as well as inspection and tests necessary for special process control, such as for welding.

All test reports generated and submitted to the Engineer shall be certified by the Contractor's personnel, responsible for quality assurance. The ITP customer (Employer) Witness Points shall be established jointly between the Contractor and Engineer.

The Contractor shall notify Engineer prior to each established "Customer Witness Point". The Contractor shall carry out inspection and tests at its own expense, in accordance with the accepted ITP, to verify the conformity of each part of the Work. At the discretion of the Engineer, the Contractor shall repeat the inspection and testing at the Contractor's expense.

3.20.10.2 INSPECTION AND AUDIT BY EMPLOYER

Any inspection and audits carried out by the Engineer, separately or in conjunction with the Contractor, shall in no way relieve the Contractor's responsibility for the quality of the Work. The Engineer reserves the right to witness all tests and perform an inspection of material at the place of manufacture, including sub-suppliers. Engineers shall at all times have access to all places of manufacture where equipment or materials are being made or prepared for use under the Contract and shall have full facilities for unrestricted inspection of such materials and equipment. Engineers may employ independent inspection and testing agencies.

3.20.10.3 FACTORY ACCEPTANCE TEST

Cost for factory acceptance tests (FAT) including travel fares and insurance, lodging, boarding, and incidentals shall be borne by the Engineer/Employer. The contractor shall be responsible for managing local travel at the place of testing. Arrival and respectively departure shall be scheduled for the day before and respectively after the test(s).

The following FAT is foreseen:

- GIS 400 kV and 220 kV
- Outdoor 220 kV and 72.5 kV Circuit breaker.

- 400 kV and 220 kV surge arrester
- Current and Voltage Transformers
- Auto Transformer 400/220/33 kV
- SAS/SCADA/Communication equipment
- Control and Protection Equipment

3.21 LIMIT SCOPE OF SUPPLY AND INTERFACES

The interfaces are as following:

1) The 400 kV line shall be terminated on the substation gantry tower by the line contractor with a provision of a termination pad for the jumper. The substation contractor will be responsible to connect to the termination pad and bring the jumper to the AIS equipment in case of New Butwal S/S. The gantries and beams for New Butwal Substation shall be supplied and installed by Substation Contractor and is the part of this Contract. Proper interface and coordination with the other contractor regarding Communication/SAS/SCADA aspects at New Damauli S/S and Gorakhpur (India) S/S for New Damauli- New Butwal line and New Butwal-Gorakhpur (India) line will be the responsibility of Contractor involved in the present contract. Furthermore the task of coordination will be performed by the Engineer but the Contractor is sole responsible for technical compatibility of interface

2) The contractor shall ensure that the 220 kV equipment on the two Autotransformer bays included under this scope shall be similar to the existing 220 kV equipment. The design shall be compatible with the existing station. All necessary earthing, lightning and lighting supply, installation and commissioning for these bays shall be included in the scope. Control and Relay panels provided under the scope for the two Autotransformer bays shall be compatible with the existing scheme. Any automation or auxiliary component required to connect the two Auto bays with the existing system shall be included in the scope.

The following supplies/works are not part of the Lot Substations:

1) Boundary Wall for the entire property. Note: the fence for the station is in the scope of the project
2) Permanent Residential Quarters for employers personnel.
3) Protection and Substation Automation for future lines, transformers, and corresponding tie breakers.
4) The access road to the substation is not in scope as it has already been constructed as part of the 220 kV station installations. However, any road connection from the 220kV to the 400kV roads shall be considered as internal paving and shall be included in the scope.

3.22 SPECIFIC REQUIREMENTS

The Bidders are advised to visit Substation sites and acquaint themselves with the topography, infrastructure, etc.

The Frequency range for the earthquake spectra shall be as per IEC-62271-300.

The Empty gas Cylinders may be taken back by the contractors after filling the gas in GIS compartments. However, in view of the future maintenance requirement, the contractor shall provide the Gas storage capacity equivalent to the Gas used in the largest Gas tight GIS Module.

Further, the spare Gas shall be supplied in Gas storage cylinders. While handling the SF6 gas, the contractor must ensure that the following standards are complied

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

3.23 OTHER INFORMATION

- The Contractor shall also be responsible for the overall coordination with internal/external agencies; Supplier of Employer's supplied equipment, project management, training of Employer's manpower, loading, unloading, handling, moving to the final destination for successful erection, testing and commissioning of the substation.
- Any works, which are not expressly specified/included in the Employer's Requirements but are required for safe and reliable operation/successful commissioning of the plant, shall be deemed to be included in the scope of works and the Contractor shall carry out such works (e.g. terminal connection) at no extra cost to the Employer.
- The drawings attached to the bid document are only for reference, which shall be further engineered by the bidder. The enclosed drawings give the basic scheme, layout of the substation, substation buildings, associated services, etc. In case of any discrepancy between the drawings and text of the specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from the Employer.
- In case of any discrepancy between Project Specific Requirement, General Technical Requirement and other technical specifications on the scope of works, the final decision will be made by the Engineer/Employer. The Bidder is advised to get clarification from the Employer.
- In case of any discrepancy between General Technical Requirement and Individual Chapter for various equipment, the requirement of individual equipment chapter shall prevail.

3.24 PRE-COMMISSIONING, COMMISSIONING, TRIAL-RUN & COMPLETION

As soon as the Facilities covered by these specifications are physically completed in all respects, the Pre-commissioning, Commissioning, Trial run, and Completion of the Facilities, as mentioned below, shall be attained

a. Pre-commissioning: As per relevant Sections in the specifications
b. Commissioning: Charging of the Facilities at rated voltage. Further, wherever appearing in these specifications, the words – 'commissioning checks', 'installation checks', 'site tests', 'performance guarantee tests for fire protection system', is to be considered as 'pre-commissioning checks'.
c. Trial-run Contractor will not be authorized to operate the live facilities. Only NEA operators will be switching equipment to energize the new facilities or de-energize them. Operation of

the Facilities or any part thereof immediately after the Commissioning for a period of 1(One) month with no more than 48(Forty-Eight) hours cumulative interruption over 1(One) month. In case of interruption due to problem/failure in the respective equipment, the contractor shall rectify the problem and after rectification if the cumulated interruption time has reached 48 (Forty-Eight Hour) then the one month trial test shall resume from the beginning.

d. Completion: After successful completion of Pre-Commissioning Tests, Trial run and operational acceptance of equipment the warranty on equipment will start. The warranty period for the equipment has been summarized below:

i. 400kV GIS: 3 years after the date of operational acceptance.

ii. Auto-Transformer: 3 years after the date of operational acceptance.

iii. Transformer Condition Monitor: Equipment warranty of 3 years.

iv. Control & Relay Panel: 3 years after the date of operational acceptance.

v. SAS: 3 years after the date of operational acceptance.

vi. Tele-Communication: 3 years after the date of operational acceptance.

vii. Air-Condition: All compressors should have 3 years warranty after the date of commissioning.

viii. The below listed works done and equipment will have warranty period starting after the date of operational acceptance for the period of DNP which has been defined in the relevant section of the Bid Document. The works done and equipment are as follows :

- Outdoor Switchgear including Circuit Breaker, Isolator and Earthing Switches, Instrument Transformer, Surge Arrester etc.
- LV Switchgear
- Fire Protection System
- Control and Power Cable
- Battery and Battery Charger
- Diesel Generator
- Telephone System
- Air-Conditioning system excluding compressors

ix. The equipment to be supplied under the contract but not stated above, the warranty shall remain valid for twelve (12) months after successful completion of Pre-Commissioning Tests, Trial run and operational acceptance of equipment. The warranty period for equipment that were repaired or replaced during the warranty period shall be twelve (12) months from the date on which such Goods were repaired or replaced.

PROJECT SPECIFIC REQUIREMENTS – Lot 3

B1.1

PROJECT SPECIFIC REQUIREMENT (PSR)

I. TABLE OF CONTENTS

1 PROJECT DESCRIPTION AND SCOPE

1.1 GENERAL

a. As part of strengthening the 400 kV grid for Nepal, Millennium Challenge Account Nepal (MCA-Nepal) is establishing a 400 kV GIS Substation at New Damauli of Nepal.

b. The following transmission lines are associated with substation:

   1. New Damauli – Ratmate 400 kV D/C Lines: 89 km (along with OPGW)
   2. New Damauli – New Butwal 400 kV D/C Lines:90 km (along with OPGW)

c. The New Damauli substation shall be established as a 400kV Gas Insulated Substation (GIS) in One and Half Breaker bus configuration. It shall also include seven (7) 1-Ph, 400/√3/220/√3/33 kV, 167 MVA, Autotransformers, and all related control and protection systems.

1.2 PHYSICAL AND OTHER PARAMETERS

1.2.1 ENVIRONMENTAL CONDITIONS

The following summarized environmental data shall be considered for planning of site works and form the design data for the working conditions of the equipment.

Altitude

Altitude above sea level New Damauli:	334 m

Temperature

Maximum annual ambient temperature	40 °C
Minimum annual ambient temperature	-30 °C
Annual average temperature	23 °C

Humidity

Average relative humidity	70 %

Rain Conditions

Annual rainfall	1500 mm

Rainy Season from June to September

Thunderstorms & Lightning

Isokeraunic level	45 days/year

Solar Radiation

Average daily irradiation	780 W/m²

Seismic Conditions

Seismic Acceleration
(PGA: *peak ground acceleration*) 0.50 g

Wind Velocity

Wind velocity 47 m/s

Pollution
Low to medium pollution: as per IEC 60815
Location
New Damauli: Lat. - 27°58'5.86"N, Long. - 84°17'36.58"E

1.2.2 VOLTAGE LEVELS

1.2.2.1 HIGH AND MEDIUM VOLTAGE ELECTRICAL PARAMETERS

System electrical parameters for Voltages ≤ 245 kV

High Voltages

Network System Voltage	
Nominal system voltage	220 kV
Equipment Rating	
Highest system voltage (rms)	245 kV
Short time power-frequency withstand voltage (rms)	460 kV
Lightning (or Full wave) impulse voltage withstand level (peak)	1050 kVp
Rated Short-time withstand current	50 kA
Number of phases	3
Frequency	50 Hz

Medium Voltages

Network System Voltage	
Nominal system voltage	33 kV
Equipment Rating	
Highest system voltage (rms)	36 kV
Short time power-frequency withstand voltage (rms)	75 kV
Lightning impulse withstand voltage (peak)	170 kVp
Rated Short-time withstand current	25 kA

Number of phases	3
Frequency	50 Hz

System electrical parameters for Voltages > 245 kV

Network System Voltage	
Nominal system voltage	400 kV
Equipment Rating	
Highest system voltage (rms)	420 kV
Short time power-frequency withstand voltage (rms)	630 kV
Lightning impulse withstand voltage (peak)	1425 kVp
Switching impulse withstand voltage (peak)	1050 kVp
Rated Short-time withstand current	50 kA
Number of phases	3
Frequency	50 Hz

1.2.2.2 LOW VOLTAGE AC AND DC EQUIPMENT AND INSTALLATIONS

General

All chambers and cubicles shall be designed in accordance with IEC 61439 and separated by-partition or by a metal cover.

AC low voltage equipment

The following basic technical values shall be kept as indicated:

Nominal system voltage:	*230 / 400 V*
Maximum voltage variation:	*± 10%*
System configuration:	*Main system:* *3-phase (4-wires), solidly earthed* *Subsystems:* *4 Wires (3-phases + N)*
Test voltage (1 min.) for new installation:	*2.5 kV*
Minimum insulation resistance for new installation:	
· phase-to-phase:	*400 kOhm*
· phase-to-earth	*230 kOhm*

DC low voltage equipment

The DC low voltage installation shall feed the control and protection circuits as well as the telecommunication equipment.

The basic technical design features are as follows (if not otherwise mentioned in the technical specification):

For the control system:

Nominal system voltage:	*220 V DC*
Test voltage (1 min.) for new installation:	*1.5 kV*
Minimum insulation resistance for new installation:	*110 kOhm*

For communication system:

Nominal system voltage:	*48 V DC*
Test voltage (1 min.) for new installation:	*1 kV*
Minimum insulation resistance for new installation:	*48 kOhm*

Control and protection system

The basic technical values shall be as follows:

Trip/close voltage:	*220 V D.C.*
Rated secondary voltage of VTs:	*110/√3 V*
Rated secondary current (max.)	*1 A*
Frequency:	*50 Hz*

1.3 SCOPE OF SUPPLY AND SERVICES

1.3.1 GENERAL

The scope of works for each new substation or expansion of the existing would be:

- Design
- Supply of new electromechanical equipment
- Shipment
- Civil works
- Installation and
- Testing and Commissioning.

The project will be executed on a turnkey basis. The General and Particular Technical Requirements cover the design calculation, manufacturing, assembly, parameterization, settings and acceptance tests in the Contractor's workshop as well as the supply, customs clearance, delivery, unloading, erection, adjusting, painting, identification, testing, commissioning, and acceptance of new equipment to be installed in the new substations, complete in every respect and suitable for satisfactory operation to fulfill the purpose of the Works.

This section covers the main items of plant to be provided and works to be carried out under this Contract, but the Bidder is required to ascertain for himself whether any additional plant or works are necessary to leave the substations complete and in working order on completion of the contract in accordance with the Technical Requirements in order to fulfill the purpose of the Works.

To complete each item of plant and equipment detailed in this Schedule the contractor shall provide all necessary cabling, cable boxes, terminal boards, protective relays, panels for control equipment, supporting steelwork, panel wiring, fuse links, interlocking gear, motors, auxiliary contacts, holding down bolts, screen guards, labels, auxiliary and control cables, and all necessary miscellaneous items whether specified in detail or not.

Only type tested equipment shall be used. Type test reports of similar equipment - in terms of mechanical and electrical size/measures, mechanical and electrical technical data, similar model type, only in accordance with "Part 2, Section V, B02_GTR, 220913_B02_ GTR, Page 15, 10. Type Testing, Inspection, Testing & inspection Certificate, 10.3", shall be accepted. Type Test Reports shall be subject to the Engineer's approval. If no type test certificates are available, the relevant type tests shall be performed at the Contractor's expenses.

2 SCOPE

The scope of work shall include construction of the entire GIS buildings, control buildings, station services, site preparation and grading as shown on the single line and layout drawings. The Bidders are requested to quote the price as per the price schedule attached in Section IV of bid documents.

2.1 SCOPE OF WORK

2.1.1 NEW DAMAULI SUBSTATION

The Scope of Work includes the following:

a. 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from Ratmate, along with outdoor CT's, CVT's and LA's, suspension insulators, connectors and conductor required to connect the incoming lines to GIB's are also included in the scope.
b. 400 kV GIS bays with required GIB, 2 nos. to terminate one 400 kV D/C Quad Moose ACSR lines from New Butwal, along with outdoor CT's, CVT's and LA's, suspension insulators, connectors and conductor required to connect the incoming lines to GIB's are also included in the scope.
c. 400 kV GIS Autotransformer Bay with required GIB, 2 Nos, to connect Two Autotransformer Banks each of 3x1ϕ, 400/√3/220/√3/33 kV, 167 MVA with 1ϕ as Spare included in the scope of Works.
d. Two Autotransformer Banks each of 3x1ϕ, 400/√3/220/√3/33 kV, 167 MVA with 1ϕ as Spare
e. 400 kV GIS bays with required GIB, 4 nos. for 400 kV D/C Quad Moose ACSR future lines including GIB termination along with supporting structure but without outdoor AIS equipment.
f. 400 kV GIS two circuit breakers diameter, Autotransformer Bay with required GIB, 1 No., to connect future One Autotransformer Bank of 3x1ϕ, 400/√3/220/√3/33 kV, 167 MVA including GIB termination along with supporting structure.
g. The scope of supply also includes substation service transformers 630 kVA, 33/.4 kV, 2 nos. LT Transformers along with associated 33 kV Bays.

Summary of Works includes the following:

S.N.	400 kV Line Bay (Nos)	400 kV TFR Bay (Nos.)	TFR Bank	Station TFR (Nos.)
1	8	3	2 *3 (1- ϕ) +1 (each of 167 MVA)	2

The configuration of the Scope will be six 400kV diameters.

The bidders are requested to quote their price considering that the future bays shall not include the feeder Control, Relay & Protection panels but shall include diameter protection, Local Control Panels and, Substation Automation System. The protection of the associated stubs and of the tie breaker shall also be included

3 DETAILED SCOPE OF WORK

This section describes the detailed scope of works.

3.1 NEW DAMAULI SUBSTATION

3.1.1 400KV NEW DAMAULI GIS SUBSTATION

a. The design, manufacture, testing, spare parts, training, delivery, installation, commissioning and in-service performance of high-voltage sulfur hexafluoride (SF_6), gas-insulated switchgear (GIS) including indoor and outdoor gas-insulated bus (GIB) including all GIB supporting structures to overhead and/or underground line terminations or direct connections to autotransformers or other equipment, rated 420kV.

b. The installation of a 400kV gas-insulated switchgear (GIS) switchyard connecting existing transmission lines, with provisions for connecting future transmission lines, serving bulk power transformers and with provisions for serving future bulk power transformers/autotransformers. The switchyard shall be a 400kV substation bus arrangement that will be a breaker and half configuration. The 400kV GIS switchyard shall include 400kV gas-insulated switchgear, associated Local Control Cabinets (LCC's) and all required auxiliary equipment located in a framed RCC high voltage switchgear building. The GIS shall include all 400kV interconnecting gas-insulated bus and gas-to-air bushing interfaces to the lines and autotransformers.

c. The 420 kV SF_6 gas-insulated switchgear shall have the following overall design ratings:

Maximum System Voltage:	420kV
Nominal System Voltage:	400kV
Rated Frequency:	50Hz
Rated Continuous Current:	4000A
Rated Short Circuit Current:	50kA
Rated Short Circuit Duration:	1 second

The GIS shall be complete with all necessary terminal boxes, SF_6 gas filling equipment, SF_6 gas monitoring equipment, interconnecting power, and control wiring, earthing connections, support structures, base plates, foundation anchor bolts, necessary marshaling cabinets and all equipment and accessories specified in the technical specification.

The SF6 gas handling must strictly follow the following compliance standards:-

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

d. Main Bus Elements

Two sets of single-phase encapsulated, metal-enclosed, gas-insulated main bus bars rated 420kV, 4000A, 50kA each enclosed in three individual bus enclosures extending the length

of the switchgear to interconnect each of the diameters and associated circuit breaker bays. Each main bus bar set shall comprise of:

i. (3) three single-phase encapsulated 4000A main bus bars and enclosures. Each main busbar enclosure shall be segregated on a per diameter basis with gastight barriers installed in the main bus enclosures between each diameter connecting the main buses).
ii. (2) two inductive voltage transformers with isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iii. (3) three motor-operated earthing switches complete with manual and motor-driven operating mechanisms.
iv. (1) lot gas fill ports, gas density monitors/gauges, rupture discs and gas density monitoring system transducers per gas zone.
v. Provisions for future main bus extension including isolating links.

e. Line Feeder Circuit Breaker Bay Elements

Each line feeder circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms
vi. (3) three sets of 4000A gas-insulated bus extensions to gas-to-air bushing modules
vii. (3) three sets of 4000A gas-insulated bus extensions to gas-to-air bushing modules
viii. Three (3) nos. single phase set of gas to air bushings.

f. Future Line Feeder Circuit Breaker Bay Elements

Each future line feeder circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. 1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (3) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links

v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (3) three sets of 4000A gas-insulated bus extensions with end cap modules.

g. Autotransformer Circuit Breaker Bay Elements

Each autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (1) one set of the three-pole group operated high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of gas-insulated bus extensions to gas-to-air bushing modules
viii. Three (3) nos. single phase set of gas to air bushings.

h. Future Autotransformer Circuit Breaker Bay Elements

Each future autotransformer circuit breaker bay shall be of single-phase encapsulated design rated 420kV, 4000A, 50kA and shall be comprised of:

i. (2) two single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (4) four sets of three cores single-phase current transformers.
iii. (4) four three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
iv. (3) three inductive voltage transformers with isolating links
v. (3) three high-speed earthing switches complete with manual and motor-driven operating mechanisms.
vi. (1) one three-phase set of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
vii. (3) three sets of 4000A gas-insulated bus extensions with end cap modules

i. Tie Circuit (Middle Diameter) Breaker Bay Elements

i. (1) one single-phase encapsulated, independent pole, gas-insulated circuit breaker complete with the separate operating mechanism for each pole.
ii. (2) two sets of three cores single-phase current transformers.
iii. (2) three-phase sets of single-phase encapsulated, independent pole, circuit breaker isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.

j. Spare Autotransformer Switching Bay Elements

i. (2) two three-phase sets of single-phase encapsulated, independent pole, autotransformer isolating disconnect switches and maintenance earthing switches complete with manual and motor-driven operating mechanisms.
ii. (2) two trifurcation modules to transition from three single-phase encapsulated, independent pole, autotransformer isolating disconnect switches to single-phase gas-insulated bus extension to a gas-to-air bushing module for the spare autotransformer.
iii. (1) one single-phase gas-insulated bus extension to the gas-to-air bushing module.
iv. (1) one single-phase gas-to-air bushing.

k. The gas-insulated circuit breakers shall be equipped with a Controlled Point-on-Wave Switching Device (CPWSD) for auto transformer circuit breakers and middle breaker of each diameter which involves auto transformer. The price for the same is deemed included in the cost for the gas-insulated circuit breaker. The use of PIR and CPWSD for line feeders and associated tiebreaker could be confirmed only after conducting Transient Switching Study by the Contractor and shall develop respective detailed specifications for PIR as per relevant IEC/IEEE standards. The Price of the line circuit breaker and its associated tie circuit breakers equipped with CPWSD and circuit breaker equipped with PIR should be provided as per the Schedule 4.4.2: Breakdown for Day work Rates: Materials.

l. Testing & Maintenance Equipment will be required for 420kV GIS as per specification.

m. Gas-to-air bushings and support structures for outdoor connections to connect the GIS to overhead lines, transformers and bus reactors are part of the GIS scope of supply.

3.1.2 220 KV NEW DAMAULI SUBSTATION

a. The 220 kV GIS substation is generally NOT included in the scope of this project. Supply, installation, testing, and commissioning of all equipment including control and protection panels and automation systems shall be others responsibility. However, extension of Earthing and Site Development Works in the 400kV side of the switchyard up to and excluding the 220kV side shall be included in the present scope of work.

b. The supply, installation, termination, testing and commissioning of the outdoor termination at Auto Transformer end and the termination at 220 kV GIS end of the 220

kV Cables shall be included as part of this project. Contractor shall be responsible for coordinating this with the supplier/designer of 220 kV GIS.

c. The coordination with a party involved in the construction of a 220 kV GIS substation shall be included in the scope.

3.2 AUTO TRANSFORMERS

a. Design, engineering, manufacture, testing at manufacturer's facility, delivery to the site including all materials, accessories, spares, unloading, handling, proper storage at the site, erection, testing and commissioning of the 167 MVA, 400/√3/220/√3/33 Single Phase Auto Transformers as specified below;

i. 7 (6 + 1 Spare) of 167 MVA, 400/√3/220/√3/33 kV single phase, constant ohmic impedance type Auto Transformer with series winding for HV & IV and separate winding for LV, 50Hz, YNa0d11, oil immersed, ONAN/ ONAF/ OFAF cooled, equipped with on-load tap changer (OLTC), outdoor type, complete with all fittings and accessories including local OLTC control cabinet, cooler control cabinet and Remote Tap Changer Control panel, neutral CTs and On line Dissolved Gas , necessary arrangement for Delta formation of LV winding & Neutral Formation and Earthing Arrangement, surge protection device, Neutral Current transformer (NCT) and all fittings & accessories as specified/ required for completion of the scope of works as per technical specification.

ii. Insulating oil for first filling plus 10 % extra to account for spillage, sampling etc. for all the Transformers.

iii. Oil storage tank of suitable size.

iv. Steel rails with all accessories to fix it on transformer foundation.

v. One (1) set of Oil filtration plant as per Annex B01-12-Oil Filtration Plant.

3.3 400KV AIS EQUIPMENT

Supply, Erection, Testing & Commissioning of 400kV AIS equipment as listed below:

i. Four (04) three-phase set of Capacitor Voltage Transformer (CVT) for 400kV.
ii. Four (04) three-phase set of Current Transformer (CT) for 400kV.
iii. Four (04) three-phase set of 400kV Surge Arrester (SA)
iv. Five (05) Nos of Gantry Column for 400 kV Incoming Line
v. Four (04) Nos of Gantry Girder for 400 kV Incoming Line

3.4 STATION SERVICE TRANSFORMER

Supply, Erection, testing & commissioning of Two nos. 630 kVA, 33/0.4 kV LT Transformer with surge arrester along with 72.5kV circuit breakers, isolators and current transformers, for tertiary loading. These LT transformers should not be used for construction purposes.

3.5 EMERGENCY DIESEL GENERATOR SET

1 (one) Diesel Generator 230/400 V, 50 Hz, 250kVA, 24 h continuous operation.

3.6 ELECTROMECHANICAL SYSTEM

400 kV, 66kV and 33 kV Bus Post Insulators, clamps & connectors, Equipment terminal connectors (including terminal connectors for Auto Transformer), Conductors, Aluminum tubes, Bus bar and earthing materials, Bay marshaling box, spacers, cable supporting angles/channels, Cable trays & covers, Junction box, buried cable trenches, etc. as required. Due to space constraints, tertiary auxiliary bus & delta formation of the autotransformer is not possible by overhead Al-tube arrangement and the same shall be done by using 33kV XLPE cable is included in the present scope of the contract.

3.7 AUTOMATION AND TELECOMMUNICATION SYSTEM

a. SAS General Information

The substation automation system (SAS) shall be based on IEC 61850 including hardware and software for local and remote-control station operations. The SAS shall integrate the associated equipment for the following bays and auxiliaries (bay as defined in Technical Specification, Substation Automation System):

- 400kV: Line Bays, Middle Diameter Bays
- 400/220 kV: Auto Transformer Bays, Diameter Middle Breaker Bays (400 kV only)
- 33 kV: Transformer Bays
- Substation Auxiliary Systems: Lighting, Air Conditioning, AC/DC Supply, Station Service Transformer, etc.

The contractor shall supply the necessary bay monitors, installed at the Breaker Protection Panel installed in the Control Room.

The Contractor shall provide a SAS that includes provisions for all monitoring and control of all substation and auxiliary equipment, under contract. Future bays shall be displayed on the graphical displays and the database allocated with spare devices and spare point assignments.

The Contractor shall include provisions for monitoring and control from the Local Control Cubicle (LCC), remotely from SAS/HMI at the Control Room and remotely from Regional Control Centre (RCC) and Load Dispatch Centre (LDC) located in Syuchatar, Kathmandu. The Contractor shall provide a complete turn-key service for the design, procurement, factory acceptance testing and installation and commission of the station equipment, at the site under contract, and at the remote end of the lines. If it is determined during the design process that the remote end of the line is under construction, then it is the responsibility of the Contractor to coordinate activities with the remote-end Contractor to ensure complete monitoring and control, protection system is provided, at no additional cost.

The Contractor shall supply a complete SAS that meets and fulfills the Employer's requirements and specifications. The Contractor shall, at every stage of the design process, provide documentation for the Engineer's review and approval. The Engineer will coordinate the interface with the Contractor in order to monitor, control and manage the SAS from the regional control centre or remotely from LDC.

All intelligent electronic devices (IEDs) shall include manufacturer's software for remote configuration, local configuration, and online monitoring. The IEDs shall be installed, functional, and accessible from the site engineering workstation and integrated into the

SAS. Access to the IEDs with the manufacturer's software shall not disturb the normal day-to-day operation of the IED. The data points accessible from the IED through the manufacturer's software shall also be accessible from a separate communication port, from the IED, in order to route data points and integrate into the SAS.

All online monitoring equipment (i.e., Optical Temperature Sensors & Measuring Unit, Online Dissolved Gas (Multi-gas) and Moisture Analyzer), including spare, shall be IEC 61850 compliant (either directly or through a Gateway). The monitoring equipment is required to be integrated with SAS through a managed Ethernet switch conforming to IEC 61850. All Ethernet switches shall be provided by the contractor. All switches shall be powered by redundant DC supply.

The SAS shall comply with IEC 61850, cybersecurity requirements IEC 62351-8, and all other related IEC substation, automation, cybersecurity standards to ensure a reliable and robust SAS is provided.

The system under the present scope shall be integrated by the Contractor into the existing SAS of Siemens 'SINAUT Spectrum" (version 4.3.2) installed at the Master Station (i.e., Nepal Electricity Authority) LDC. The integration shall include all hardware and software required at the Control Center as well as necessary database development, display generation and upgrades for proposed control and monitoring of the station and network analysis of the communication infrastructure. The above activities shall be carried out as appropriate, for all respective stations and the LDC. The manufacturer of the existing SAS system is Siemens Germany. The existing communication protocol used for SAS at LDC Kathmandu is IEC 60870-5-10x. In the present scope of work, the data points for the master station shall be obtained from the SAS, based on IEC 61850, using a Gateway port with communication protocol IEC 60870-5-10x, as per requirement being provided at the substation. The Contractor shall provide all approved data points requested by the Engineer during the design, factory acceptance test, installation, or commissioning stage of the project.

SAS Interface Panels (IFP) shall be provided with terminal blocks for data acquisition, including cabling between control and protection panels and other interface panels required by the SAS.

b. LDC Telecommunication System Integration

The broad scope of FO based communication equipment shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing, training and demonstration for acceptance, commissioning and documentation for:

- SDH and termination equipment along with suitable interfaces and line cards.
- All cabling, wiring, digital distribution frame (DDF) patch facilities, and interconnection to the supplied equipment at the defined interfaces.
- Integration with the existing communication system based on SDH/PDH of Nepal Electricity Authority including all configuration of existing NEA FO SDH network equipment

- Integration of supplied subsystem with LDC control and monitoring system, communication equipment, VOIP PBX of RLDC/LDC, for voice.
- Network manager system, both software and hardware, including VOIP telephone instrument with one common switch, minimum 4 ports, including hardware and software.

The Contractor shall supply the fiber optic terminal equipment based on SDH technology with optical line termination equipment, digital multiplexer, hardware accessories, etc., along with approach optical fiber. As per requirement from junction box (JB) to optical distribution frame (ODF) box, the necessary interfacing, and its integration work, at Hetauda and LDC, for onward transmission of data and voice communication for LDC shall be included in the contract. The high-level communication scheme shall be attached to the drawings given with this specification.

c. Private Automatic Phone Exchange PABX

The necessary approach cable and hardware for termination of OPGW of Ratmate – New Damauli D/C and New Damauli – New Butwal D/C Lines at New Damauli Substation End, its interfacing with DPC for tele protection application and necessary SDH, MUX/DMUX telecommunication terminal equipment required for the communication of the said 400 kV Lines and its integrations with SAS at both end substations and SCADA system of the LDC shall be included in the present scope of contract. Bidders are requested to visit the substation site and make themselves acquainted with the scope of works as described herein.

3.8 CONTROL AND PROTECTION

This scope in this specification covers the materials and services for the protection and control equipment to be provided for the New Damauli Substation. The Contractor shall supply a complete protection and control scheme that fulfills all the Employer's requirements and specifications. The contractor shall provide all the equipment and design services to create a fully-functional, integrated Protection and Control scheme for all overhead transmission lines, transformers, bus bars, future line terminals, and auxiliary equipment even if it is not specifically identified in the specification. All interface equipment between systems, studies, designs, and protective relay and communications equipment programming shall be included. The protection and control equipment shall be furnished such that it interfaces seamlessly with the SAS equipment. Any auxiliary system or piece of equipment, whether specifically identified or not in this specification, needed to create a complete protection and control system shall be provided. The Contractor shall provide a complete turn-key service for the design, procurement, factory acceptance testing, installation and commissioning of the station equipment at the site under contract and the remote end of the lines.

Per the included specifications, each protection zone and/or protected piece of equipment shall be protected by dual, redundant, and independent protective relay systems, to include but not limited to tele-protection communications channels. Any failure in one of the protective relaying systems shall not adversely affect the redundant protection system. Single (non-redundant) breaker failure protection is acceptable for each circuit breaker.

The contractor is responsible for providing complete protection and control designs, studies, equipment, installation, and testing for new electrical system protection required at the remote

stations to provide a complete protection system for the new transmission lines and substations. If the remote end station has existing protection and control systems, the new protection and control equipment at the local substation shall be specified to interoperate seamlessly with the existing equipment. If the existing remote equipment is not suitable for the purpose or does not meet all of the requirements of the Employer or this specification, it is the Contractor's responsibility to replace the remote end protection and control equipment with suitable protection schemes. If the remote end substation is still in the design or construction phase, it is the Contractor's responsibility to coordinate protection and control designs with the contractor responsible for the remote station. The following lists a summary of the major equipment to be protected and its associated protection and control system at the New Damauli substation.

- 400 kV new Overhead Lines
    - Each line shall have dual primary protection schemes designated as Main I and Main II
    - The primary protection element for the Overhead Lines in both Main and Main II protection schemes shall be line current differential with communication between local and remote relays provided by fiber optic communication channels
    - The back-up protection elements in both Main and Main II protection schemes shall be provided by step-distance and overcurrent elements
    - Control and Protection panels shall not be provided for future lines
    - The Main I and Main II relay shall be of different make and model. The same make relay shall be acceptable only if they are different hardware and manufacturing platform.
- 400kV, 400/220/33 kV new 167 MVA autotransformers
    - Each autotransformer shall have dual primary protection designated as Main I and Main II
    - The primary protection elements for the autotransformers shall be transformer differential and restricted earth fault (REF) elements
    - The back-up protection elements shall be provided by overcurrent elements
    - Control and Protection panels shall not be provided for future transformers
- Two (2) 400 kV bus bars
    - Each bus shall have dual primary protection designated as Main I and Main II
    - The primary protection element for the bus bars shall be low impedance bus differential
- 400 kV circuit breakers
    - Each circuit breaker shall have a single breaker failure relay

- The primary protection element shall be provided by the 50BF element with direct transfer trip provided to breakers at remote stations via fiber-optic communications.

3.9 FIRE PROTECTION SYSTEM.

Fire detection and protection system for 7 nos. of 400/√3/220/√3/33 kV, 167 MVA, 1-Ph Autotransformers, 400 kV GIS building, and control building, including Fire Fighting Pump House & Water Tank are envisaged in the present scope of Contract.

3.10 POWER AND CONTROL CABLES

Complete cabling, including mainly:

- 33 kV XLPE cables from the 33 kV Equipment up to the 33 kV bushings of the 400/220/33 kV Autotransformer
- Pot heads, termination kits or any other materials required to connect 33 kV cables from Autotransformer tertiary to the 33 kV equipment.
- Low voltage Power & Control Cable along with complete accessories to complete the scope of works.
- 220 kV HV cables from Auto Transformer to the 220 kV GIS including the outdoor terminations at the Auto Transformer end and the termination at the GIS end.

3.11 EARTHING SYSTEM

The earth mat for GIS earthing and the yard earthing required as per specification is in the bidder scope. All the AIS/GIS equipment, Transformers, and buildings shall be earthed per IEEE80 standards and specifications mentioned in the contract and will be connected to the main earth mat by the contractor. All earthing materials supply, installation, and testing required shall be in the present scope of work. The earthing of the overall 400 kV and 220 kV side of the substation area shall be in the present scope of the work.

3.12 LIGHTING SYSTEM

Complete design, procurement, installation and testing of lighting and illumination for all substation buildings and outdoor switchyard are included under the present scope of work.

3.13 LIGHTNING PROTECTION SYSTEM

Complete design, procurement, and installation of lightning protection for all the substation buildings and outdoor switchyard are included under the present scope of work. A combination of Lightning Masts and shield wires can be used to provide this protection. Lightning masts can also be used to mount lighting fixtures and shall be grounded to the main grid.

3.14 AUXILIARY POWER SUPPLY

3.14.1 AUXILIARY SUPPLY 400/230 V

Supply, Installation, and testing of all 400/230 V AC distribution switchgear for the 400/220 kV switchyard and buildings as well as for outdoor and indoor lighting, fed from the station service transformer, as shown in the drawing. An emergency lighting system (220 V DC) shall be installed in the buildings.

Substation shall have Three Phase and Single Phase Industrial Grade Electrical Sockets shall be provided for charging of electric vehicles with following technical specifications:

- Three-Phase Sockets (2 Nos): 400V, 63 Amp, 5 Pole (3P+N+E), 50Hz, and CE certified.
- Single Phase Sockets (3 Nos): 230V, 16Amp, 3 Pole (P+N+E), 50Hz, CE certified.

3.14.2 AUXILIARY SUPPLY 220V AND 48 V DC

a. The capacity of Battery & Battery charger shall be worked out by the bidder for complete 400kV and 220 kV substation scope including future bays as shown in the Single line diagram. For Battery sizing calculations, DC drives shall be considered for future 400kV GIS modules. However minimum battery size for 220V batteries shall be 800 AH and for 48V batteries shall be 400 AH.

b. All necessary auto throw over system, switches and distribution boards required to ensure uninterrupted DC supply from the battery and chargers, as shown on the drawings, shall be included in the scope.

3.15 VISUAL MONITORING SYSTEM

a. The Video Monitoring system shall be an integrated system with IP network-centric functional and management architecture aimed at providing high-speed manual/automatic operation for best performance.
b. The system should facilitate viewing of live and recorded images and control of all cameras by the authorized users.
c. The system shall use video signals from various types of indoor/outdoor CCD colour cameras installed at different locations, process them for viewing on workstations/monitors in the control room and simultaneously record all the cameras after compression using H 264/MPEG 4 or better standard. Mouse/Joystick-Keyboard controllers shall be used for Pan, Tilt, Zoom, and other functions of desired cameras.
d. The System shall provide sufficient storage of all the camera recordings for a period of 15 days or more @ 25 FPS, at 4 CIF or better quality using necessary compression techniques for all cameras. It shall be ensured that data once recorded shall not be altered by any means. The recording resolution and frame rate for each camera shall be user-programmable.
e. The surveillance VMS System shall operate on 230 V, 50 Hz single-phase power supply. The system shall have backup UPS power supply meeting the power supply needs of all the cameras in the stations including those which are installed at the gate for a period of 2 hours. The bidder shall submit the sizing calculation for the UPS considering the total load requirement of the Video Monitoring System.

3.15.1 SYSTEM REQUIREMENTS:

a. The system must provide a built-in facility of watermarking or Digital certificates to ensure tamper proof recording.
b. All cameras may be connected through a suitable LAN which shall be able to perform in a 400kV class substation environment without fail.
c. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password.
d. The facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
e. The facility of Camera recording in HD (1280X720p), D1, 4CIF, CIF, VGA, as well as in any combination i.e. any camera can be recorded in any quality.
f. System to have a facility of 100% additional camera installation beyond the originally planned capacity.
g. In order to optimize the memory, while recording, the video shall be compressed using H 264/MPEG-4 or better standard and streamed over the IP network.
h. The system shall be a triplex i.e. it should provide the facility of Viewing, Recording & Replay simultaneously.
i. The offered system shall have the facility to export the desired portion of clipping (from a specific date/time to another specific date/time) on CD or DVD. Viewing of this recording shall be possible on standard PC using standard software like windows media player etc.
j. The system shall have the provision of WAN connectivity for remote monitoring.
k. The equipment should generally conform to Electromagnetic compatibility requirements for outdoor equipment in EHV switchyards. The major EMC required for Cameras and other equipment shall be as under:
    i. Electrical Fast Transient (Level 4) – As per IEC 61000-4-4
    ii. Damped Oscillatory (1 MHz and 100 KHz) (level 3) – As per IEC 61000-4-12
    iii. AC Voltage Dips & Interruption/Variation (level 4) – As per IEC 61000-4-12
    iv. Electrostatic Discharge (Level 4) – As per IEC 61000-4-2
    v. Power Frequency Magnetic Field (level 4) – As per IEC 61000-4-8
    vi. Ripple on DC Power Supply (level 4) – As per IEC 61000-4-17

l. Type test reports to establish compliance with the above requirement shall be submitted during detailed engineering.

3.15.2 VIDEO SURVEILLANCE APPLICATION SOFTWARE

a. Digital video surveillance control software should be capable of displaying and managing the entire surveillance system. It should be capable of supporting a variety of devices such as cameras, video encoders, Servers, NAS boxes/Raid backup devices etc.
b. The software should have an inbuilt facility to store the configuration of encoders and cameras.
c. The software should Support flexible 1/2/4/8/16/32 Windows Split-screen display mode and scroll mode on the PC monitor.
d. The software should be able to control all cameras i.e. PTZ control, Iris control, auto / manual focus, and color balance of the camera, Selection of presets, Video tour selection etc.

e. The software should have user access authority configurable on per device or per device group basis. The system shall provide a user activity log with the user ID, timestamp, an action performed, etc.
f. The users should be on a hierarchical basis as assigned by the administrator. The higher priority person can take control of cameras, which are already being controlled by a lower priority user.
g. It should have recording modes viz. continuous, manual, or programmed modes on the date, time and camera-wise. All modes should be disabled and enabled using scheduled configuration. It should also be possible to search and replay the recorded images on the date, time and camera-wise. It should provide onscreen controls for remote operation of PTZ cameras. It should have the facility for scheduled recording. Different recording speeds (fps) and resolution for each recording mode for each camera should be possible.
h. The software for clients should also be working on a browser-based system for remote users. This will allow any authorized user to display the video of any desired camera on the monitor with full PTZ and associated controls.
i. Retrieval: The VMS application should allow retrieval of data instantaneously or any date/time interval chosen through the search functionality of the application software. In case data is older than 15 days and available, the retrieval should be possible. The system should also allow for backup of specific data on any drives like DVDs or any other device in a format that can be replayed through a standard PC based software. The log of any such activity should be maintained by the system.
j. VMS shall provide the full functionality reporting tool which can provide reports for user login/logoff, camera accessibility report, server health check reports, etc.

3.15.3 NETWORK VIDEO RECORDER

a. The Network Video recorder shall include at least Server (min 3.0 GHz, 4GB RAM, 3000GB HDD (min)), RAID 5, with suitable configuration along with Colored TFT 22" High-resolution monitor, and Internal DVD writer. Windows XP/Vista/7 Prof. or VMS compatible operating system latest version with hardware like graphic cards, licensed Anti-virus, etc.
b. Further, the digital video recorder shall conform to the following requirements:

Server Spec	Intel Quad-Core (or better) 3.0 GHz (min.), 8 MB Cache, 4 GB memory, with suitable NVIDIA graphics card,3 TB HDD, Raid 5
Recording and Display Frame Rate	Real-time 25 frames per second per channel, manual select
Recording Resolution	(PAL): 1280X720, 704(H) x 586(V) It should be possible to select lower resolutions
Compression Method	H.264/MPEG-4 or better and latest
Video Motion Detection Capable	Standard and built-in (selectable in the menu)
Monitoring Options	Split-screen 1, 2, 4, 8, 16, 32 or more cameras
Playback Options	Search, still image capture
Alarm/Event Recording Capable	To be provided with built-in external alarm input/output ports minimum(8 in, 2 out)
Network Operation Capable	To be provided by using WAN or LAN router

Remote Internet Viewing Capable	Using WAN or LAN router
HDD Storage Consumption	1GB ~ per hour/channel variable based on frame speed and resolution settings, as well as compression
Operation	Triplex operation (simultaneous recording, playback, network operation)
Number of Video Channel	32
Audio Recording Capable	32
Input Voltage	230V AC or equivalent with UPS as a backup for 30 minutes

3.15.4 VMS CAMERA

a. The color IP camera for substation shall have PAN, TILT and ZOOM facilities so that it can be focused on the required location from the remote station through a controller. Whereas wireless IP cameras with PTZ controls are required for installation at gates of the NEA premises as per the direction of Engineer-In-Charge.
b. The IP Camera at the main gate can be fixed or PTZ based and shall be used for monitoring entry and exit.
c. It should have a sufficient range for viewing all the poles of isolators and other equipment with a high degree of clarity.
d. The VMS camera shall be suitable for wall mounting, ceiling mounting, and switchyard structure mounting.
e. It shall be possible to define at 128 selectable preset locations so that the camera gets automatically focused on the selection of the location for viewing a predefined location.
f. The camera should be able to detect motion in the day & night environments having the light intensity of Color: 0.5 Lux; B&W:0.05 Lux
g. The housing of cameras meant for indoor use shall be of IP 42 or better rating whereas outdoor camera housing shall be of IP 66 or better rating. Housing shall be robust and not have the effect of electromagnetic induction in a 400KV switchyard.
h. All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password
i. The facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
j. Outdoor IP Fixed Megapixel Camera Specifications (For Main Gate) shall include the following:
    i. Image Sensor 2-megapixel Progressive, 1/3" CMOS/CCD sensor, Minimum illumination 0.1 Lux
    ii. Min Luminous 0.5LUX(Color) 0.05Lux(Black)
    iii. Camera Enclosure Type IP66 Grade
    iv. Iris/Focus Auto/Manual
    v. Video Compression Dual Stream H.264 and MPEG 4 user-selectable
    vi. Support Dual-stream primary/secondary stream, H.264/MPEG 4 optional
    vii. Video Definition Primary stream:1600x1200,1280x960,1280x720, Secondary stream:800x600,400x288,192x144
    viii. Video Parameters Brightness, hue, contrast, saturation and image quality
    ix. Video Frame Rate PAL: 1-25frames/second NTSC:1-30frames/second

x. Video Compression BR 32Kbit/S - 6Mbit/S
xi. Video Output One channel composite Streaming
xii. Supported Protocols TCP, UDP, IP, HTTP, FTP, SMTP, DHCP, DNS,ARP, ICMP, POP3, NTP, IPsec, UpnP, RTP, RTCP
xiii. Operating Temperature -5 ~ +50℃
xiv. Operating Humidity 10 ~ 90%

k. Outdoor IP66 PTZ HD Camera Specifications (For Switch Yards) shall include the following:
i. Image sensor 1/3 type Solid State Progressive Scan CCD, WDR(High Definition)
ii. Security Multiple user access with password protection
iii. Effective Pixels (PAL): Main Stream : 1280x720 Sub Stream : 640x360、320x280 selectable
iv. Compression Dual Stream H.264 and MPEG 4 user-selectable
v. Signal System 50 Hz
vi. S/N (signal to noise) Ratio Better than 50 dB
vii. Electronic Shutter 1/60 ~ 1/10,000 sec. automatic or better
viii. Scanning System Progressive/interlace
ix. Low Light Sensitivity (lux) Color: 0.5 Lux; B&W:0.02 Lux
x. Lens Minimum 10x (minimum) optical in High Definition

3.15.5 PTZ-KEYBOARDS

a. The features of PTZ shall include:
1. Fully functional dynamic keyboard/joystick controllers
2. Controls all pan, tilt, zoom, iris, preset functions
3. Control up to 255 units from a single keyboard
4. Many preset options and advanced tour programming
5. Compatible with all connected cameras

Key Application	Wired keyboard control operation of PTZ functions for weatherproof dome cameras
Pan / Tilt / Zoom Protocol Languages Supported	Selectable
PTZ Data Transfer Baud Rates Supported	Selectable 1200 bps / 2400 bps / 4800 bps / 9600 bps
Additional Features	Dynamic joystick for smooth camera movements, preset location option for quick access to frequently monitored areas

3.16 CIVIL & STRUCTURAL WORKS

3.16.1 GENERAL

This specification covers the design, construction, and supply of all civil works including heating, ventilation and air conditioning of the specified new 400/220/33kV substation at New Damauli.

This document is describing quality standards, required functions but is not a detailed specification. Therefore, the requirements are not limited to the descriptions hereafter; items not explicitly mentioned shall be in the same best quality range as for the entire works of the project.

The civil works must be performed in such a manner that the high standards of quality and function required are fully achieved.

Special attention must be paid by the Contractor to the aspects, which are specific to climate, seismicity, and local conditions.

The buildings and structures shall be designed with due regard to the need for easy inspection, maintenance, cleaning and repair, and must be designed and constructed to operate for long-term periods with the minimum of inspection, adjustment, and repair.

Lattice and pipe structures (galvanized): Standard lattice gantry structures (400/220/66/33kV Beams Towers and Lightning Mast), pipe/lattice support structure for equipment (pipe structures shall be used for 220 & 400 kV equipment support) and Structures for Building and AHU room, Fire walls between Auto-Transformer Units etc. shall be prepared by the contractor and shall be submitted for approval of detailed engineering.

All material shall be new and of the best quality suitable for working under the conditions, variations in temperature and load encountered in service without undue distortion or deterioration or the occurrence of undue stresses in any part, such as to affect the efficiency and reliability of the plant.

3.16.2 SCOPE OF SUPPLY AND SERVICES

3.16.2.1 GENERAL

The services to be provided within the framework of this specification comprise the planning, design and complete supply and execution in every respect including all the necessary calculations and documentation, prefabrication, delivery, erection and acceptance of all civil works required for faultless operation of the new substations.

The civil works consist of, but are not limited to the following main services:

- detailed design and engineering
- supply of all labor, materials, equipment, temporary work, tools, etc., necessary for the execution of the civil works
- site related investigations

- earthworks including also all leveling and grading work in the project area as well as the necessary soil improvements as required
- foundations
- structural and nonstructural steelwork
- building works
- containers
- roads and parking including access road
- fencing and gates
- storm water drainage and sewage systems
- Civil works for cable, routing, ducts, trenches, tunnels, crossings, etc.
- fire protection works
- water supply system
- water tank
- earthing system
- outdoor lighting system

3.16.2.2 INSTRUCTIONS RELATED TO THE SCOPE OF WORKS

The Contractor will be fully responsible for ensuring that all materials used in the work and temporary works comply with the approved standards and that all processes of workmanship are carried out with a high degree of efficiency, in accordance with an approved program and in compliance with the requirements of this specification. Solely virgin materials, subject to the Engineer's approval shall be used.

While the civil works are in progress, the Contractor shall provide suitably qualified competent Civil Engineers to be full time on the site to supervise and verify the work, quality, and progress to the approved schedule of the work.

To ensure proper quality assurance the Contractor shall submit for approval a Civil Works Quality Plan, as a part of the QA/QC procedures.

All work shall be constructed to the lines and levels shown on the drawings prepared by the Contractor and approved by the Engineer

The Contractor shall employ competent design engineers to prepare civil design. All designs shall be prepared in accordance with the best current engineering practice, the requirements of the project specifications and the appropriate Codes of Practice and Standards, as approved by the Engineer. Any deviation from the project specifications must be duly requested and justified in writing from the Engineer with formal Design Change Authorizations.

The building, structures and roads within the site and their design and detailing shall comply with the fundamental technical and operational requirements of the electrical equipment to be accommodated therein and with the requirements of this specification.

Buildings and structures shall be earthed and be provided with a lightning protection system.

Ducts, trenches and/or tunnels shall be provided with suitable permanent pumps and sump pits to enable the easy removal of water spillages and firefighting water collected in these areas.

If culvert(s), and /or tunnel(s), a trench(s) or any other underground services are crossing roads and railways, other ducts, etc., these shall be constructed as bridges calculated for heavy truck loading.

Where sizes and/or dimensions are given in the Tender Package, those shall be considered as informative and for guidance only.

The Contractor shall be responsible to finalize all such sizes and dimensions during his detailed engineering to fulfill all functional and specified requirements.

3.16.2.3 PREPARATORY WORKS

Preparatory works include all necessary topographical surveys and soil investigations, as well as all other investigations and studies necessary for the design and execution of works:

- Safety and security measures;
- Investigation of all areas which have to be cleared and cleaned, for the execution of new works, filling of cavities, grubbing, etc.

3.16.2.4 ENGINEERING WORKS

Engineering works include:

- Preparation of all documents, drawings, and calculations, necessary for the execution of civil works;
- Piling calculations (if any);
- Structural calculations for buildings, structures, and foundations;
- General arrangement and reinforcement drawings for concrete works, including bar bending schedules;
- Architectural arrangement drawings and details for the substation building;
- Layout with details of outdoor facilities;
- General arrangement and manufacturing drawings for steel structures;
- Preparation and submission of drawings for statutory approvals of local authorities and of the agencies, if applicable;
- Calculations for VAC works, drainage and sewage systems

All documents, drawings, and calculations prepared must be submitted and approved by the Engineer before the execution of the engineering work.

3.16.2.5 TEMPORARY SITE INSTALLATION WORKS

Appropriate areas shall be made available to the Contractor for their organization works and storage facilities.

Temporary site installation works include:

- Within the proposed area for site organization, the Contractor shall provide and maintain appropriate office(s) for the Employer and the Engineer;
- Temporary latrines and sanitary facilities have to be installed by the Contractor;
- The temporary water and electricity demand and connection point shall be discussed during the Contract clarifications;
- Temporary roads, parking areas, and fences shall be constructed as necessary for the execution of works;
- All kinds of necessary temporary buildings for the execution phase of the project (storage, offices, workshops, security posts, laboratories, etc.).

3.16.2.6 SITE RELATED SURVEYS

3.16.2.6.1 TOPOGRAPHIC SURVEY

A topographical survey, concerning the three (3) sites of the project shall be carried out by the Contractor.

The Contractor shall perform all the necessary surveying works in order to:

- obtain topographic survey maps;
- ensure that the position and elevation of all constructed works are correct.

The existing benchmarks (if available) shall be used as the basis for the surveying works.

3.16.2.6.2 SOIL INVESTIGATION

The extent of the investigations done by the Contractor shall be such as to permit the satisfactory determination of all necessary subsoil characteristics, to exclude any unacceptable settlement and to determine the reliable type, size, and execution of foundations. These investigations have to be completed before the works start. Detailed instructions for the Soil Investigations are given in this specification.

3.16.2.7 SITE DEVELOPMENT WORKS

Site development works include:

- Site clearance including diversion of existing services, if any;
- Site leveling and grading;

- Roads, drains, surfacing;
- Temporary constructions works and services enabling the works of the project;
- Temporary and permanent security fences around the substations' works.

3.16.2.8 MAIN CIVIL WORKS

General layout

The limits of the substations are given in the attached general layout plans.

Based on the attached draft layouts, the Contractor shall propose detailed arrangements with the various components for the final configuration of the substations, subject to the approval of the Engineer. In doing so, adequate safety clearances, fire compartments, the favorable layout of the plant components for monitoring and maintenance, a possibility for extension and any other requirements of up to date substation construction shall be taken into account.

GIS and Control buildings

The buildings will be designed and constructed by the Contractor according to the basic design indicated in the provided general arrangement.

The proposed arrangement of the buildings can be modified by the Contractor according to the specific conditions (i.e. transport ways, the arrangement of the equipment, a partition of the building, etc.), subject to the Engineer's approval.

Guard house

A guard house as shown in general arrangement plans shall be provided at the entrance of the substations.

Outdoor foundations

Transformer foundations

The main oil-filled transformers shall be supported on reinforced concrete foundations. Necessary firewall, oil/water collecting and separating pits shall be provided.

Switchgear foundations

The following foundations shall be provided:

- Foundations for outdoor switchgear equipment, supports, and gantries

Miscellaneous foundations

Foundations for lighting poles, Bay marshaling box, panels and control cubicles of equipment.

3.16.2.9 CABLE DUCTS

Where necessary, reinforced concrete trenches and ducts shall be provided.

3.16.2.10 ROADS, PAVEMENTS AND SURFACING

The proposed roads and paving are indicated in the layout plan.

The new road system must be arranged by the Contractor in such a way that non obstructed traffic is guaranteed.

The connection portion of the access roads, outside of the site areas belongs also to the scope of works of the Contractor.

The rest of the areas of the substations, where no foundations, buildings or roads and landscaping are provided, will be covered by a layer of gravel, as per Engineer's instructions.

3.16.2.11 FENCES AND GATES

All substations have to be provided with fences and adequate gates.

3.16.2.12 DRAINAGE AND SEWAGE SYSTEM

Storm water drainage system

The storm water drainage system collects only clean storm water which should be discharged into the storm water system of the zone. For the substations, complete storm water drainage systems are required. Substantially maintenance-free and operationally safe installation must be guaranteed. The surface water drainage shall include all necessary gutters, down pipes, gullies, traps, catch pits, manholes, etc.

Sanitary sewage drainage

The sanitary water from the WC, urinals, shower, wash basins and kitchen shall be discharged to a treatment plant made of reinforced concrete.

The pre-cleaned water shall be led to a soak-away pit.

3.16.2.13 LANDSCAPING

The free areas of land inside the substations, where no roads or gravel is provided, shall be landscaped, using low to medium-high growing plants and grass. The landscaping is subject to the approval of the Engineer.

3.16.2.14 SPECIFIC CIVIL WORKS IN THE SUBSTATION

The exact amount of necessary construction works in the substations will be determined by the Contractor, subject to the approval of the Engineer. The anti-weed treatment & stone spreading at the substation, site drainage i.e. internal drainage (temporary for the construction phase and permanent) and external drainage, rainwater harvesting, river protections works and others necessary civil work should be carried out as per the Chapter: Civil work of B12: Technical specification. The major works are listed below.

The main civil works are, but not limited to, the following:

- Construction of a control building, GIS building and other structures as required by the Engineer;

- Foundations for transformers including an oil/water collector with oil separator and firewall.
- Construction of fire walls between Auto-Transformer units.
- Foundations for the equipment as well as supply and erection of supporting steel structures;
- Construction of all internal and external drainage and substation flood protection works, as well as river protection works have to be carried out in conformity to the flood risk assessment following the hydrological study.
- Construction of a rainwater drainage system for the complete substation area, including an adequate discharge system outside of the substation area including also the dewatering of cable channels, as well as a discharge system to the outdoor area, as requested and approved by the Engineer;
- Supply and installation of fences/walls and gates, according to the instructions of the Engineer around the complete substation area;
- Supply and installation of steel structures for outdoor equipment with long-time resistant corrosion protection and transformer gantries;
- Landscaping and/ or covering by the grass of the substation area according to the instructions of the Engineer;
- The surfacing of the substation area by gravel, according to the instructions of the Engineer;
- Construction of roads as well as the construction of service roads, as instructed by the Engineer;
- Provision of cable trenches and ducts, including also the supply and installation of covering plates, where required;
- Installation of permanent water supply from bore well/single point of water supply system with a underground storage tank of capacity 18m3, one (1) pump with discharge capacity of 0.6 liter/s, one (1) filter unit, one (1) pressurize unit, one (1) lot of pipes, valves etc. to be supplied to the Fire Fighting pump house, Fire water tank, control room building, GIS building, guard house, etc.; Installation of internal water supply system (including water pipes, arrangement for potable water system, pumping stations etc.) and domestic water drainage system (canalization).Installation of an outdoor lighting system.
- Installation of an adequate designed septic tank, according to the local rules.
- Installation of an outdoor lighting system

Topographic Survey

Topographic site surveys are to be made in all the substations.

Scope of Topographic Survey

The Contractor shall carry out all the necessary topographic surveying works in order to:

- Obtain (if available) maps of the construction and surrounding areas;
- Propose and install new transferred benchmarks (TBM). Their level and grid coordinates shall be related to the existing reference system;
- Conduct spot level topographic survey of the development area and adjacent prominent surface boundaries;
- Acquire all survey data in digital format for processing and detailed maps development;
- Produce CAD adaptable and editable maps, natural ground profiles and survey data files of all surveyed items;
- Prepare a survey report of resources, procedures, site and office works, data acquisition, data processing, and presentation;

The survey shall include all buildings and structures in the substation area (e.g. foundations, fences, overhead power lines, roads, tracks, finished grade, paving, buried services, etc.).

The required accuracy in Northing, Easting, etc. and elevations shall be ±10 mm, relative to the existing benchmarks.

The benchmarks shall be secured and marked in such a manner so as to ensure that they can be found at any time, that they will not be destroyed by the ongoing construction activities and that they can be constantly used for reference and check measurements.

The results of the survey shall be reported as follows:

Preliminary Site Survey Report

This shall include:

An executive summary, stating the objectives of the survey and containing a brief description of the work undertaken as well as the major conclusions;

A description of the survey work, referring to the method applied, equipment used, work organization, field operation, data processing, interpretation and presentation of the results;

A site survey plan on a scale of 1:500.

Within two (2) weeks after the receipt of the Engineer's comments, the Contractor shall submit the Final Site Survey Report.

Final Site Survey Report

This shall have incorporated all of the Engineer's comments.

For the final report, the Contractor shall also provide all the survey data in a digital format. Additionally, the Contractor shall provide the necessary software in order to gain access to the data in digital format, as well as the specifications for the computer workstation to be used.

3.16.2.15 GEOTECHNICAL INVESTIGATIONS

3.16.2.15.1 GENERAL

The extent of the subsoil investigations shall be such as to permit the satisfactory determination of the geotechnical conditions and to allow reasonable foundation proposals. Soil investigation data will be prepared by the Contractor. This document does not release the Contractor from the execution of his investigations on the proposed location of the switchgear building, various outdoor foundations and the route of cable ducts.

3.16.2.15.2 SCOPE OF WORKS FOR GEOTECHNICAL INVESTIGATIONS

The purpose of the geotechnical investigations is to accurately capture, sample and in-situ test throughout the substation area, including site reconnaissance, site geology, site previous utilization history and above ground and subsurface conditions.

The Contractor shall comply with all local laws, rules, and regulations, applicable to the works. The investigation procedure shall be governed by recognized international standards and codes, in their latest edition.

Anticipated work activities breakdown is summarized in, but not limited to, the following:

- Conduct site reconnaissance, in-situ geophysical and geotechnical exploration including open trial pits, boring, in-situ borehole, and open-pit testing, piezometer installation as per planned exploration program;
- collect disturbed and undisturbed soil samples and extract water samples from boreholes and open trial pits;
- select properly collected samples and perform geotechnical lab tests to classify soils and assess their geotechnical behavior;
- compile in-situ data collection, in-situ test results, lab test results and desk studies accounts;
- produce a comprehensive factual report of resources, procedures, acquired data, site works, and lab tests, desk study, data processing, and conclusions;
- liaise with a topographic survey for an interchange of information to be superposed on topographic survey maps or to obtain topographic survey information useful in setting out the geotechnical investigation works.

3.16.2.15.3 FIELD WORKS

BOREHOLES

Exploratory boreholes shall be sunk at the locations approved by the Engineer; the boreholes shall be 12 cm in diameter. The depth of boreholes shall not be less than 10 m unless the rock is encountered, in which case the thickness shall be proved to be greater than 1.5 m. Where

weak soils are encountered, boreholes shall be continued down to a load-bearing stratum, with a minimum thickness of 3 m proved.

The boreholes shall be drilled by locally trained drillers under the direct supervision of the Contractor, according to the established instructions and specifications. Casing shall be used where necessary so as to prevent the collapse of the borehole wall.

An appropriate boring method with the continuous recovery of soil samples shall be used. Disturbed and undisturbed samples shall be collected for the visual examination and laboratory testing.

The soil stratifications encountered in the boreholes shall be logged during drilling and the borehole logs shall include at least the following information:

- Soil stratification;
- Number, depth, and type of soil samples;
- Corrected penetration resistance;
- Groundwater level;
- Grain size distribution;
- Index and engineering properties of representative samples collected from different strata;
- SPT values;
- Drilling method, coring, casing.

Standard penetration tests (SPT)

Down to the depth of drilling, SPT shall be performed in the boreholes at 1.5m intervals, in both cohesive and non-cohesive soils.

Sampling

During SPT, at 1.5 m intervals, disturbing samples shall be collected and submitted in polyethylene bags with proper identification.

Undisturbed samples shall be collected for cohesive soils at 1.5 m intervals.

A thin-walled sample tube shall be pressed into the cohesive soils by means of hydraulic pressure produced by the drilling rig. The dimension of the tube must refer to the applied standard. The undisturbed samples shall be trimmed and scaled with non-shrinkage wax at both ends and clearly labeled.

Disturbed and undisturbed soil samples shall be sent for laboratory tests.

Groundwater level measurement

The water level in each borehole shall be recorded before commencement and after completion of drilling when the water level has settled. The depth of the borehole and the casing (if any) shall be also recorded.

Cone penetration tests (CPT)

CPT shall also be carried out as a second method of soil investigation (after borehole sinking) at the locations approved by the Engineer.

CPT shall be carried out using static penetrometers (Dutch core apparatus) for determination of the soil type, density, and consistency.

The results of the CPT´s shall be presented in the report.

Test (trial) pits (TP)

Test or trial pits down to 1.5 m shall be used as a third method of soil investigation in order to visually identify the top strata and its sequence as well as to prove the suitability of dredgers. The Contractor shall obtain at least one disturbed and one undisturbed sample of each stratum encountered.

The description of the encountered strata and of the strata sequence, accompanied by colored photographs, shall be specified in the soil investigation report.

General soil/subsoil description

A general soil/subsoil description shall be made for the investigation, comprising of:

- Soil conditions at the surface;
- Expected soil conditions below the surface (slopes, etc.);
- The inclination of the ground surface, inclination and orientation of cracks and fissures as well as their stratification, evaluation of slope stability, in case there is a potential for sliding.

This information shall be provided to the Engineer through intermediate reports, to enable them to give instructions for more intensive or additional investigations, if necessary.

The minimum number of boreholes/soundings/trial pits will be as per the below-mentioned Table

Location	**Borings**	**Cone Penetration Tests (CPT)**	**Trial Pits (TP)**
400 kV Switchyard	4	4	4

Location	Borings	Cone Penetration Tests (CPT)	Trial Pits (TP)
220 kV Switchyard	2	2	2
Building Zones	2	2	2

Table: Number of boreholes/soundings/trial pits

The final number of boreholes will be agreed between the Contractor and the Engineer.

3.16.2.15.4 LABORATORY TESTS

Natural moisture content

Tests to determine that natural moisture content (natural water content) and the in-situ wet and dry densities shall be performed on undisturbed samples.

Atterberg limit tests

Tests to determine the liquid limit and the plastic limit shall be performed on representative cohesive soil samples collected from different strata. The Liquidity Index/Consistency Index shall be determined.

Grain size distribution tests

The specific gravity and the grain size distribution of representative soil samples collected from different strata shall be determined with standard sieves and a hydrometer.

Grain size distribution curves with USCS classification of representative samples shall be specified in the soil investigation report.

Unconfined compression tests

Unconfined compression tests shall be performed with a constant strain rate on representative undisturbed specimens. Stress-strain diagrams of these shall be attached to the soil investigation report.

Consolidation tests

With a 1:1 load increment ratio and a 24-hour duration for each increment, standard consolidation tests shall be performed representative undisturbed specimens. The dimension of the specimens must refer to the applied standard.

Chemical analyses

The groundwater and the soil shall be analyzed and classified with regard to their aggressive action on concrete. The classification shall comply with DIN 4030 or recognized standards.

The results and recommendations shall be part of the soil test report.

The chemical analyses shall determine the sulphate and chloride contents as a minimum as well as the pH value.

Electrical Resistivity Test

This test shall be conducted to determine the Electrical resistivity of soil required for designing safety-grounding system for the entire station area. The specifications for the equipment and other accessories required for performing electrical resistivity test, the test procedure, and reporting of field observations shall confirm to relevant British standard codes (B S Codes)/ equivalent International Standards. The test shall be conducted using Wagner's four electrode method as specified in relevant British standard codes (B S Codes)/ equivalent International standards.

3.16.2.15.5 RESULTS OF GEOTECHNICAL INVESTIGATIONS

The report shall be complete and shall contain, but not be limited to, the information specified below.

Description of the scope of work carried out, containing:

- work program;
- methods and systems (equipment) used;
- works carried out (field investigations and laboratory tests).

Layout location plan of soil investigations, showing:

- the area;
- the general layout plan;
- locations of boreholes, soundings, trial pits and plate tests (if any) carried out;
- Comprehensive map surrounds.

Logs, tables

The subsurface conditions, for example, the sequence of the strata, the nature, and properties of the individual strata, as well as the groundwater conditions, shall be determined and described in the borehole logs. The results of the laboratory tests and the diagrams of the test results shall be included in the report.

Borehole logs, trial pit logs, and surroundings logs shall include:

- actual ground level and reference to the local Datum;
- description and limits of various soil layers;
- samples were taken;
- SPT results;

- water levels;
- depth of borehole/pit/sounding.

Soil profiles (cross-sections)

The results of the subsoil investigations shall (in addition to the borehole logs) also be shown in the form of cross-sectional drawings with a vertical scale of 1:100 showing, e.g.:

- actual ground level and plant datum at the points of investigations;
- results of boreholes including standard penetration test (SPT) graphs;
- trial pit profiles;
- CPT diagrams;
- proposed foundation levels;
- limit lines of soil layers (soil strata);
- groundwater level;
- legend (key).

Groundwater classification

After the chemical analysis, the groundwater shall be classified according to its aggressive action on concrete. The classification shall comply with ASTM standards or equivalent codes.

Foundation Proposal

Admissible bearing pressures of different types of foundations shall be advised. Type and engineering values of proposed pile foundations - if necessary - shall be given. Explanation of recommended soil improvement methods shall be made. Geotechnical restrictions of earthworks (cut and fill, slopes, etc.) shall be advised.

Recommendations for foundations shall be derived from the in-situ investigations and from the laboratory tests.

3.16.2.15.6 REPORTING

A comprehensive investigation report shall be produced in two (2) stages. Within six (6) weeks of completion of the soil investigation fieldwork, the Contractor shall submit the draft report to the Engineer for comments and approval. The draft report shall be complete and shall contain, but not be limited to, the information specified above. A final revision shall be issued after the incorporation of comments and requirements.

All report deliverables, documentation, maps, and drawings shall be compatible with MS Office 2010 suite and CAD systems. Data to be interchanged with topographic surveyors shall be in electronic format for further electronic processing.

3.17 SPARE PARTS, TOOLS, AND OTHER EQUIPMENT

The following shall be offered:

- mandatory spare parts and tools (as per price sheets)
- recommended spare parts, equipment, tools and instruments for maintenance

Separate price sheets to be filled out and separate brochures, documents, etc. to be provided.

3.18 OTHER SERVICES AND EQUIPMENT

3.18.1 TRAINING IN FIELD

During an erection, commissioning and trial operation, the Employer's selected operating staff is to be familiarized with the functions of the system. The Contractor shall arrange appropriate training in the operation and maintenance of the equipment for the Employer's personnel at the site.

As specified in the "Instructions to Bidders", a tentative training program shall be submitted by the Bidder. The training program shall consider the availability of the "shift personnel" and structure its training program in various sessions.

The training shall be conducted in the English language.

- The traveling and living expenses of Employer's personnel for the training program conducted in Nepal shall be borne by the Employer. The training shall be provided to Employer's personnel in the field of erection, testing, operation and maintenance at substation site as per the following:

  1. Control & Protection: 5 Days.

  2. Substation Automation System including the integration aspect of SCADA: 5 days.

  3. For 400kV Indoor GIS and Outdoor Switchyard Equipment (CT, CVT, Isolator and Circuit Breaker) Operation and Maintenance: 5 days.

  4. Operation and Maintenance of Transformers, 5 days.

  5. AC & DC Auxiliaries and mechanical systems: 5 Days

- Before energizing, training sessions of at least one week per substation shall be performed with a focus on operation and troubleshooting. The Contractor shall provide sufficient qualified personnel on-site during trial operation in order to perform further training during operation.

The Contractor shall provide comprehensive training documents.

3.18.2 TRAINING AT MANUFACTURER'S WORKS

a) Cost for training at manufacturer's works shall be borne by the contractor. However the travel fares and insurance, lodging, boarding, and incidentals shall be borne by the Engineer/Employer. The contractor shall be responsible for managing local travel at

the place of training. Arrival and respectively departure shall be scheduled for the day before and respectively after the training(s).

The training shall be provided in the field of design, testing and maintenance at Manufacturer's works as per the following:

1. Control & Protection, Substation Automation System and Communication System: 10 Days, (3Nos. Trainees)

2. 400 kV GIS Equipment and System (Circuit Breaker, Isolator, CT, CVT & LA) and EHV GIS/AIS Substation Design: 10 Days, (3 Nos Trainees)

3.19 SITE CONDITIONS - REQUIREMENTS

3.19.1 SITE EXAMINATION

Contractor shall be deemed to have conducted an examination of the Site and to have informed itself fully regarding the risks, contingencies and all other data, matters and things, local or otherwise, in relation to the Site and to any other aspects of the Work necessary to satisfactorily perform the Contract in all respects. Contractor shall confirm and represent that it has had sufficient opportunity to visit the Site and carry out all examination, inspection, measurements, and testing necessary for it in order to enter into the contract on the terms and conditions set out in the Contract Documents and that has informed and satisfied itself with respect to all aspects of the Work. Without limitation, Contractor shall confirm and represent that it has informed and satisfied itself with respect to the nature, and conditions of the Site, and the Existing Employer Equipment, the quantities, location, and nature of the Work, the facilities, accommodations, labour, Equipment, and Materials necessary or required for performance of the Work, the means of access to the Site and the conditions under which its employees and Subcontractors will be employed and the Work will be performed.

The Contractor shall carry out for each site a geotechnical study or other investigations needed to understand the soil conditions/site better.

3.19.2 SITE HANDOVER TO CONTRACTOR

Access to the site will be permitted and construction phase can begin when the Employer has accepted from the Contractor the following documents:

- Site-Specific Safety Management Plan
- Appointment of safety officer
- Site Organization Chart
- Detailed construction program
- Work area drawings
- Environmental and Social Plan according to IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement and MCC's Environ-mental Guidelines.

- Confirmation that the Contractor has set up its main construction facilities and its equipment is ready to commence the Work at Site.

3.19.3 WATER/ POWER SUPPLY FOR CONSTRUCTION

Water Supply

The Contractor is responsible for its own water supply, including the provision of any reservoirs, pumps, piping and ancillary equipment required for such purposes.

Electric Power Supply

The Contractor is responsible for the electric power supply required during construction and could be provided by:

- Own Distribution Transformer
- Diesel Generator Set, 230/400V, 50 Hz, up to 200kVA.
- Mobile substation

The Contractor shall be also responsible for providing all extensions and distribution facilities, including breakers, transformers, and cables from the source required for construction purposes. The electrical safety of personnel and equipment shall be of prime concern.

3.19.4 ENVIRONMENTAL AND SOCIAL ISSUES

Contractor to Demonstrate Environmental and Social Responsibility - Contractor shall demonstrate in the performance of the Work that it is environmentally responsible by:

(a) complying with all applicable environmental legislation and regulations;

(b) following all Engineers work instructions and all applicable policies, practices, and procedures established by Employer;

(c) being observant for, and immediately notifying Engineer of, any environmental problems that develop on Site;

(d) while handling the SF6 gas, the contractor must ensure that the following standards are complied

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

(e) taking all necessary measures in the performance of the Work to avoid causing negative impacts to the environment, by complying with the requirements of ESHSMP Report, Environmental and Social Impacts and Mitigation Measures, during Pre-Construction and Construction and Commissioning;

(f) constantly monitoring for, and immediately notifying Engineer of, any kind of pollution, damage to vegetation, soil or watercourse that might develop on Site; and

(g) where any impact or damage occurs, Contractor shall be solely liable to undertake all reasonable and necessary measures to repair and restore the effects of such negative impacts immediately, and to the satisfaction of Engineer and Employer.

3.19.5 ACCESS

The Contractors shall avoid using private access roads belonging to individual grand owners for accessing the works. Any damage to their ground shall be repaired so that the owner shall not be dissatisfied.

The Contractor shall arrange temporary material and equipment storage at the site. If the storage area is required outside the site area the Contractor shall negotiate with the grand owners for using their lands as a storage space.

The Employer shall provide the following facilities:

a) Such right of access at the proposed area is necessary to enable the Contractor to proceed with the clearance of trees and scrubs for all the works specified in Bill of Quantities.
b) The right to construct and make use of the reasonable track to the proposed area for the transport of materials and the carrying out of erection operations, except where the route crosses orchards, gardens or other ground over which the Employer decides that such a track is not reasonably practical.

The Contractor shall, at an early stage of the Contract, examine the site and shall design on the map his proposed entry route to the plant and the type of equipment or transport intended to traverse the routes. The maps shall indicate the types of access to be constructed, if necessary, the places where it is proposed to use existing roads, community roads and existing roads not maintained by the government.

The Contractor shall arrange for his own store yard for storing materials and equipment. The Contractor shall arrange with the landowners for using their lands as store yards if required in addition to the site storage devices.

3.19.6 EXISTING ACCESS

Where the Contractor uses government maintained roads to enter the site for construction purposes then he must make sure the drains are properly protected or reinforced. The junction must be cleaned and a proper danger sign board erected on the roadside to warn the public. The drains must not be blocked.

However, when the Contractor has the approval to use existing community roads that are not maintained by the government, he shall get the consent from the landowners concerned and shall undertake to maintain the road during the works to such a standard that its use by the customary traffic is not impeded in any way. He shall then restore the road to a condition

equal to that existing before the start of execution. The Employer will assist the Contractor in negotiating with the persons or organization normally responsible for maintaining the road.

The Contractor shall avoid using access roads undertaken by other departments unless directed by the Engineer. Consent must be sought before entering these access roads.

3.19.7 CULVERTS

Temporary culverts, which are compulsory to be included in the access road rate, shall be provided at low points of the new access. The culvert shall be of different sizes and of reinforced concrete tubes sufficient to prevent retention of floodwaters upstream of the access. The reinforced concrete tubes can be used again.

The Engineer shall approve the types of culverts proposed by the Contractor. All culverts shall be deemed to be included in the new access road rates.

3.19.8 SITE FACILITIES PROVIDED BY THE CONTRACTOR

3.19.8.1 SITE FACILITIES FOR CONTRACTOR'S STAFF

Site Accommodation

The Contractor shall make his own arrangements with regard to accommodation for his expatriate and locally recruited staff during the construction period. All dwellings and buildings, existing or erected, shall comply with local regulations with regard to construction, water supply, sanitation, and other requirements.

Temporary construction camps shall be provided with proper sanitation and other necessary facilities. All accommodation shall be removed by the Contractor when no longer required. After the removal of accommodation, the ground shall be left in a clean and tidy condition.

Site offices

The Contractor shall provide for his own staff such buildings as may be necessary for office accommodation for site staff during the construction period. The cost of these shall be deemed to be included in the Contract Price.

Site transport

The Contractor shall provide at his own expense all necessary transport for his personnel and materials.

3.19.8.2 SITE FACILITIES FOR THE EMPLOYER/ENGINEER

Additionally to his own infrastructure facilities, the Contractor shall establish Infrastructure facilities for the Employer and the Engineer, as described herein, in the vicinity of the construction sites.

Site accommodation

The Contractor shall provide site accommodation fully furnished residential family accommodation for 6 Employer´s and the Engineer's Personnel (minimum 2BHK i.e. 2 Bedroom, 1 Living Room Hall, and 1 Kitchen per accommodation).The Site accommodation for the Engineer/Employer Personnel shall be of a standard at least equivalent to that provided for the Contractor's most senior expatriate management staff on Site and in any case, should meet the minimum requirements as with local regulations with regard to construction, water supply, sanitation, and other requirements. The site accommodation will have at least following facility

- Kitchen
- Clean Toilet and shower facility with running water
- Air-conditioning
- Safe drinking water
- Bed and resting area
- Reliable electric power
- Internet and phone line
- Graded parking
- Good ventilation and heating

The arrangement for food should also be made on a chargeable basis to the Employer or the Engineer as the case may be.

Site accommodation shall be provided in the vicinity of the substation. The exact type and location of the site accommodation will be proposed by the Contractor and shall be subject to Engineer/Employer approval.

The above infrastructure shall be provided from inception to the handing over of the substation.

Site offices

The Contractor shall supply and maintain Site offices for the Employer´s and the Engineer's Personnel.

At least one (1) office with suitable cubicles etc. for around 6 staff of Engineer and one (1) meeting room shall be provided in the substation.

These offices shall be separate from - but adjacent to - the Contractor's own offices and other facilities and shall meet the Employer's Requirements. The offices shall be air-conditioned and suitably furnished with desks, chairs, benches and lockable filing cabinets. The offices shall be installed with full office facilities, including lighting and electricity, telephone lines, water supply, sewerage, and drainage. The facility will be equipped with

- Six desks and chairs
- Ten filing cabinets
- Two common photocopiers/printers

- Clean Toilet facilities
- Sufficient number of fire extinguishers of suitable size and type
- Safe bottled drinking water
- Graded parking area close to the office
- Internet & Phone line with rentals paid by the Contractor

The above infrastructure shall be provided from inception to the handing over of the substation.

Site transportation

The Contractor shall provide, maintain and keep available at all times, transport for the exclusive use of the Engineer/Employer Personnel.

For the Engineer/Employer Personnel three (3) SUV type vehicles including one driver per vehicle. The details of vehicles are presented in Annex_B01_5_Vehicle_Spec.

Furthermore, the minimum following standards shall be provided:

- Power Steering
- Anti-Locking Braking System
- Driver and Passenger Airbag
- Power Windows
- Air Conditioning (non CFC)
- Central locking with alarm
- Headrests and Seat belts for each passenger place
- Tubeless tyres Toolkit and Jack Owner's manual

Two (2) double cabin 4 WD vehicles (Pick Type) including one driver per vehicle shall be provided. The details of vehicles are presented in Annex_B01_5_Vehicle_Spec.

The cost shall be deemed to include the cost of vehicles, comprehensive insurance (≥ 2 Mio. USD per incident, however, to be in compliance also with local regulations) and licenses, fuel, lubricants, repairs, wheels, maintenance, cleaning and all other costs and charges incurred in running and upkeep of the vehicles. Furthermore, the vehicles shall be provided with a driver.

The Contractor shall cover the fuel costs for 2500km/month for each vehicle.

The vehicles shall be provided to cover the whole construction period including the defects notification period and not less than 42 months beginning with the contract award/commencement date. If the vehicles are not available on the commencement date, the Contractor shall cover the cost for the transportation of the Engineer's Personnel until the above-mentioned vehicles will be made available.

At the end of the project, the vehicles shall be handed over to the Employer.

At the end of the project, the vehicles shall be handed over to the Employer.

3.19.9 LOCAL TRANSPORT AND OTHER EQUIPMENT

Shipment by sea freight shall be made to the port to be defined by the Contractor (Town, Country).

Airfreight shall be made to be defined by the Contractor (Name of International Airport of Town or Name of International Airport of Town), whatever more advantageous to the project.

Shipments are to be made on a "DDP" basis according to Incoterms and explained in the commercial conditions.

The Contractor shall ensure that adequate handling equipment is available to unload the heaviest piece of equipment.

Prior to shipment, the Contractor shall furnish by airmail or telefax the shipping documents (bill of lading, original shall accompany the merchandise until delivered at site) to the Engineer. Details will be fixed during the Kick-Off Meeting. It will be the Contractor who is solely responsible for custom clearance while MCA-Nepal will provide documents to the Contractor for duty free import.

When actual transport has been completed, the Engineer/Employer shall be so notified.

All cases and boxes shall be clearly and boldly marked and shall be addressed to:

Name of the Employer, Country of the Employer

Project Title

Project Subtitle

Lot Title

The site at Town or Region

c/o (Contractor's name)

In order to facilitate custom examination, all packages and transport documents shall regardless of other markings be clearly and indelibly marked.

The Contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangements with the appropriate authorities for the transportation of the equipment. The dimension of the equipment shall be such that when packed for transportation, it will comply with the requirements of loading and clearance restrictions for the selected route. It shall be the responsibility of the contractor to coordinate the arrangement for transportation of the Transformers for all the stages from the manufacturer's work to the site.

The conditions of roads, the capacity of bridges, culverts, etc. in the route shall also be assessed by the Contractor. The scope of any necessary modification/ extension/ improvement to the existing road, bridges, culverts, etc. shall be included in the scope of the Contractor.

3.19.10 INSPECTION AND TEST PLAN (ITP), FACTORY ACCEPTANCE TESTS (FAT), COMMISSIONING TESTS

3.19.10.1 INSPECTION AND TEST PLAN (ITP)

The Contractor shall establish an Inspection and Testing Plan (ITP) to describe and control what inspection and tests will be conducted, how, when and what quality records will be generated for the Scope of Work, including procurement, component fabrication, system integration, delivery, installation, and commissioning.

The Contractor shall submit the ITP to the Engineer for review and acceptance. As a minimum, the ITP shall include all type, routine and conformance tests specified in the Contract, as well as inspection and tests necessary for special process control, such as for welding.

All test reports generated and submitted to the Engineer shall be certified by the Contractor's personnel, responsible for quality assurance. The ITP customer (Employer) Witness Points shall be established jointly between the Contractor and Engineer.

The Contractor shall notify Engineer prior to each established "Customer Witness Point". The Contractor shall carry out inspection and tests at its own expense, in accordance with the accepted ITP, to verify the conformity of each part of the Work. At the discretion of the Engineer, the Contractor shall repeat the inspection and testing at the Contractor's expense.

3.19.10.2 INSPECTION AND AUDIT BY EMPLOYER

Any inspection and audits carried out by the Engineer, separately or in conjunction with the Contractor, shall in no way relieve the Contractor's responsibility for the quality of the Work. The engineer reserves the right to witness all tests and perform an inspection of material at the place of manufacture, including sub-suppliers. Engineers shall at all times have access to all places of manufacture where equipment or materials are being made or prepared for use under the Contract and shall have full facilities for unrestricted inspection of such materials and equipment. Engineers may employ independent inspection and testing agencies.

3.19.10.3 FACTORY ACCEPTANCE TEST

Cost for factory acceptance tests (FAT) including travel fares and insurance, lodging, boarding, and incidentals shall be borne by the Engineer/Employer. The contractor shall be responsible for managing local travel at the place of testing. Arrival and respectively departure shall be scheduled for the day before and respectively after the test(s).

The following FAT is foreseen:

- GIS 400 kV
- Outdoor 72.5 kV Circuit breaker.

- 400 kV surge arrester
- Current and Voltage Transformers
- Auto Transformer 400/220/33 kV
- SAS/SCADA/Communication equipment
- Control and Protection Equipment.

3.20 LIMIT SCOPE OF SUPPLY AND INTERFACES

The interfaces are as following:

1) The 400 kV line shall be terminated on the substation gantry tower by the line contractor with a provision of a termination pad for the jumper. The substation contractor will be responsible to connect to the termination pad and bring the jumper to the AIS equipment in the case of New Damauli S/S. The gantries and beams for New Damauli Substation shall be supplied and installed by Substation. Proper interface and coordination with the other contractor regarding Communication/SAS/SCADA aspects at Ratmate S/S and New Butwal S/S for Ratmate-New Damauli line and New Damauli-New Butwal line will be the responsibility of Contractor involved in the present contract. Furthermore the task of coordination will be performed by the Engineer but the Contractor is sole responsible for technical compatibility of interface

2) The 400/220/33 kV Auto transformers cable connection up to the 220 kV GIS shall be the end of this scope. The connector at the 220 kV bushing, the 220 kV LA on the transformer, termination at Auto transformer end, 220 kV cable and termination at 220kV GIS end shall be included in this scope. Also the coordination required to connect the Auto transformer to the 220 kV Control and Protection and Automation systems shall be included in the scope.

3) All earthing, lightning and lighting shall be provided to match and complement the installation at the 220 kV yard.

The following supplies/works are not part of the Lot Substations:

1) Boundary Wall for the entire property. Note that the fence for the station is in the scope of the project
2) Permanent Residential Quarters for employers personnel.
3) Protection and Substation Automation for future lines, transformers, and corresponding tie breakers.

3.21 SPECIFIC REQUIREMENTS

- The Bidders are advised to visit Substation sites and acquaint themselves with the topography, infrastructure, etc.
- The Frequency range for the earthquake spectra shall be as per IEC-62271-300.
- The Empty gas Cylinders may be taken back by the contractors after filling the gas in GIS compartments. However, in view of the future maintenance requirement,

the contractor shall provide the Gas storage capacity equivalent to the Gas used in the largest Gas tight GIS Module. Further, the spare Gas shall be supplied in Gas storage cylinders. While handling the SF6 gas, the contractor must ensure that the following standards are complied

- IEEE C37.122.3: IEEE Guide for Sulphur Hexafluoride (SF6) Gas Handling for High Voltage (over 1000Vac)
- IEC 60736:2018

3.22 OTHER INFORMATION

- The Contractor shall also be responsible for the overall coordination with internal/external agencies; Supplier of Employer's supplied equipment, project management, training of Employer's manpower, loading, unloading, handling, moving to the final destination for successful erection, testing and commissioning of the substation.
- Any works, which are not expressly specified/included in the Employer's Requirements but are required for safe and reliable operation/successful commissioning of the plant, shall be deemed to be included in the scope of works and the Contractor shall carry out such works (e.g. terminal connection) at no extra cost to the Employer.
- The drawings attached to the bid document are only for reference, which shall be further engineered by the bidder. The enclosed drawings give the basic scheme, layout of the substation, substation buildings, associated services, etc. In case of any discrepancy between the drawings and text of the specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from the Employer.
- In case of any discrepancy between Project Specific Requirement, General Technical Requirement and other technical specifications on the scope of works, the final decision will be made by the Engineer/Employer.
- In case of any discrepancy between Project Specific Requirement, General Technical Requirement and other technical specifications on the scope of works, the final decision will be made by the Engineer/Employer. The Bidder is advised to get clarification from the Employer.

3.23 PRE-COMMISSIONING, COMMISSIONING, TRIAL-RUN & COMPLETION

As soon as the Facilities covered by these specifications are physically completed in all respects, the Pre-commissioning, Commissioning, Trial run, and Completion of the Facilities, as mentioned below, shall be attained

a. Pre-commissioning: As per relevant Sections in the specifications
b. Commissioning: Charging of the Facilities at rated voltage. Further, wherever appearing in these specifications, the words – 'commissioning checks', 'installation checks', 'site tests', 'performance guarantee tests for fire protection system', is to be considered as 'pre-commissioning checks'.
c. Trial-run: Contractor will not be authorized to operate the live facilities. Only NEA operators will be switching equipment to energize the new facilities or de-energize them. Operation of the Facilities or any part thereof immediately after the Commissioning for a period of 1(One) month with no more than 48(Forty-Eight) hours cumulative interruption over 1(One) month. In case of interruption due to problem/failure in the respective equipment, the contractor shall rectify the problem and after rectification if

the cumulated interruption time has reached 48 (Forty-Eight Hour) then the one month trial test shall resume from the beginning.

d. Completion: After successful completion of Pre-Commissioning Tests ,Trial run and operational acceptance of equipment the warranty on equipment will start, the warranty period for the equipment has been summarized below:

i. 400kV GIS: 3 years after the date of operational acceptance.

ii. Auto-Transformer: 3 years after the date of operational acceptance.

iii. Transformer Condition Monitor: Equipment warranty of 3 years.

iv. Control & Relay Panel: 3 years after the date of operational acceptance.

v. SAS: 3 years after the date of operational acceptance.

vi. Tele-Communication: 3 years after the date of operational acceptance.

vii. Air-Conditioner: All compressors should have 3 years warranty after the date of commissioning.

viii. The below listed works done and equipment will have warranty period starting after the date of operational acceptance for the period of DNP which has been defined in the relevant section of the Bid Document. The works done and equipment are as follows :

- Outdoor Switchgear including Circuit Breaker, Isolator and Earthing Switches, Instrument Transformer and Surge Arrester
- LV Switchgear
- Fire Protection System
- Control and Power Cable
- XLPE Cable
- Battery and Battery Charger
- Diesel Generator
- Telephone Systems
- Air-Conditioning System excluding Compressors

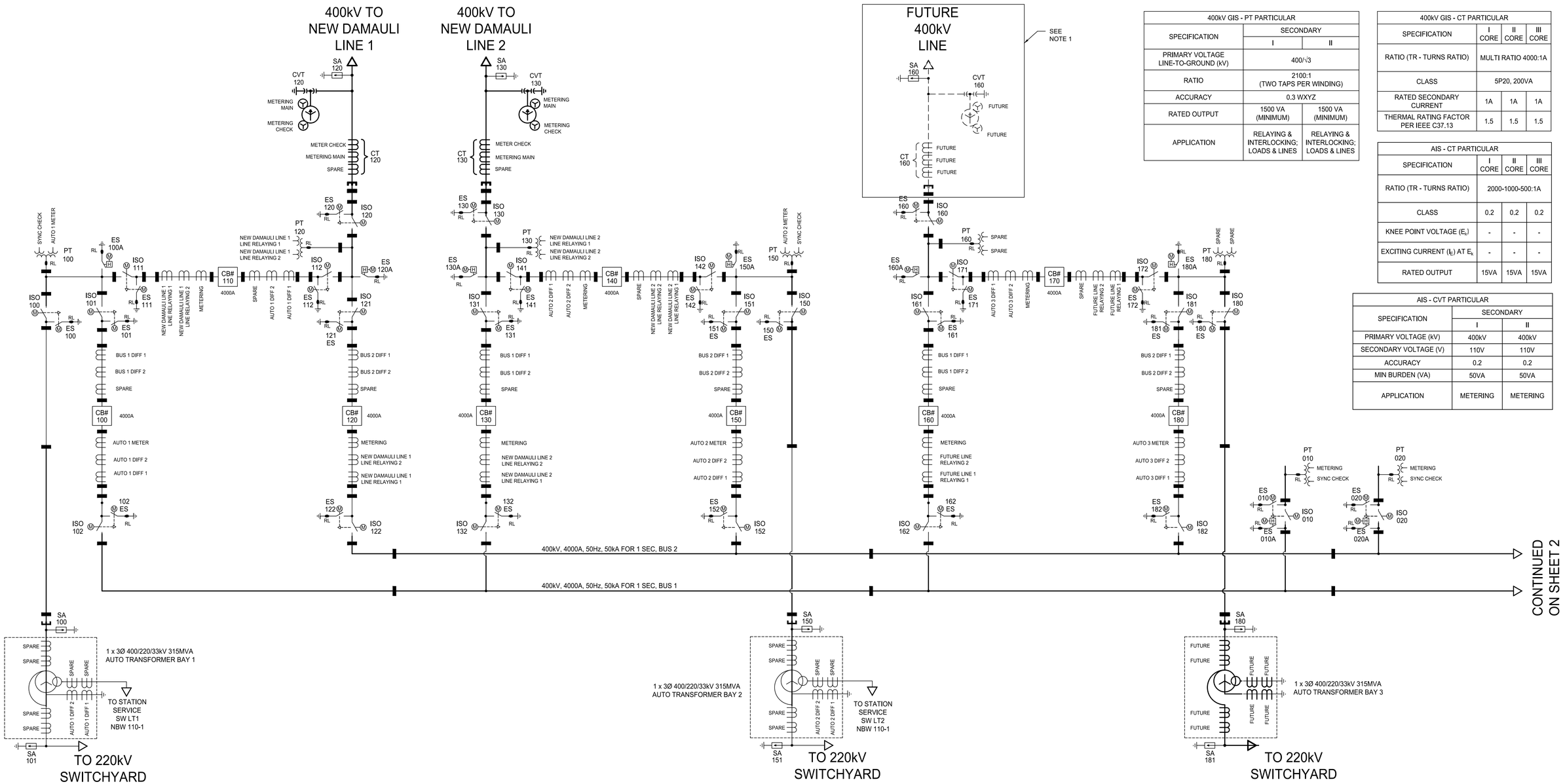
ix. The equipment to be supplied under the contract but not stated above, the warranty shall remain valid for twelve (12) months after successful completion of Pre-Commissioning Tests, Trial run and operational acceptance of equipment. The warranty period for equipment that were repaired or replaced during the warranty period shall be twelve (12) months from the date on which such Goods were repaired or replaced.

Attachment #6

SYSTEM DRAWINGS

NBW_100_1_Rev_9.pdf

NBW_101_1_Rev_4.pdf



400kV GIS - PT PARTICULAR		
SPECIFICATION	SECONDARY	
	I	II
PRIMARY VOLTAGE LINE-TO-GROUND (kV)	400/√3	
RATIO	2100:1 (TWO TAPS PER WINDING)	
ACCURACY	0.3 WXYZ	
RATED OUTPUT	1500 VA (MINIMUM)	1500 VA (MINIMUM)
APPLICATION	RELAYING & INTERLOCKING; LOADS & LINES	RELAYING & INTERLOCKING; LOADS & LINES

400kV GIS - CT PARTICULAR			
SPECIFICATION	I CORE	II CORE	III CORE
RATIO (TR - TURNS RATIO)	MULTI RATIO 4000:1A		
CLASS	5P20, 200VA		
RATED SECONDARY CURRENT	1A	1A	1A
THERMAL RATING FACTOR PER IEEE C37.13	1.5	1.5	1.5

AIS - CT PARTICULAR			
SPECIFICATION	I CORE	II CORE	III CORE
RATIO (TR - TURNS RATIO)	2000-1000-500:1A		
CLASS	0.2	0.2	0.2
KNEE POINT VOLTAGE (E_k)	-	-	-
EXCITING CURRENT (I_E) AT E_k	-	-	-
RATED OUTPUT	15VA	15VA	15VA

AIS - CVT PARTICULAR		
SPECIFICATION	SECONDARY	
	I	II
PRIMARY VOLTAGE (kV)	400kV	400kV
SECONDARY VOLTAGE (V)	110V	110V
ACCURACY	0.2	0.2
MIN BURDEN (VA)	50VA	50VA
APPLICATION	METERING	METERING

EQUIPMENT LEGEND

CB - CIRCUIT BREAKER
CT- CURRENT TRANSFORMER
CVT - CAPACITIVE VOLTAGE TRANSFORMER
ES- EARTH SWITCH
ISO - 3 PHASE ISOLATOR SWITCH
SA- SURGE ARRESTER
PT-POTENTIAL TRANSFORMER

DESIGN CRITERIA

RATING	DESCRIPTION
420kV	MAXIMUM SYSTEM VOLTAGE RATING
400kV	NOMINAL SYSTEM VOLTAGE RATING
50Hz	RATED FREQUENCY
4000A	RATED CURRENT
1 SECOND	SHORT CIRCUIT CURRENT DURATION
50kA	SHORT CIRCUIT CURRENT

LEGEND

SYMBOL	EQUIPMENT	SYMBOL	EQUIPMENT	SYMBOL	EQUIPMENT	SYMBOL	EQUIPMENT
	4000A CIRCUIT BREAKER		400kV MOTORIZED OPERATED ISOLATOR WITH ONE MOTORIZED EARTH SWITCH WITH MECHANICAL INTERLOCKING		400/220/33kV AUTO TRANSFORMER		GAS BARRIER INSULATOR
	400kV VOLTAGE TRANSFORMER						
	CURRENT TRANSFORMER		400kV MOTORIZED OPERATED ISOLATOR WITH TWO MOTORIZED EARTH SWITCHES WITH MECHANICAL INTERLOCKING		400kV CAPACITIVE VOLTAGE TRANSFORMER		
	SURGE ARRESTER						

NOTES

1. NOT IN MCC SCOPE

NBW_100_1.DWG

NOT FOR CONSTRUCTION 12-18-19

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD	REFERENCE DRAWINGS
5	REVISED PER INTERNAL CHECK	7-22-19	JLT	JLT	VAD	*	
4	REVISED FOR LINE POSITION CHANGE	7-3-19	JLT	JLT	VAD	*	
8	REVISED PT LOCATION	11-14-19	JLT	JLT	VAD	*	
7	REVISED FOR WSP COMMENTS	10-10-19	JLT	JLT	VAD	***	
6	REVISED PER RECEIVED COMMENTS	8-7-19	JLT	JLT	VAD	***	* *

DSGN	JLT	11-30-18
DRN	JLT	11-30-18
CKD	VAD	11-30-18

SCALE: NONE
FOR 22x34 DWG ONLY

POWER ENGINEERS

STANTEC CONSULTING SERVICES, INC.
SINGLE LINE DIAGRAM 400KV YARD SHEET 1 OF 2
NEW BUTWAL 400/220/132/33/11kV SUBSTATION

JOB NUMBER 153312
REV 9
DRAWING NUMBER NBW-100-1

FUTURE 400kV LINE

FUTURE 400kV LINE

400kV TO INDIA BORDER

LINE 1

LINE 2

FUTURE 400kV LINE

SA

CT

CVT

ES

ISO

PT

CB# 100

CB# 110

CB# 120

CB# 130

CB# 140

CB# 150

CB# 160

CB# 180

CB# 190

CB# 200

CB# 210

CB# 220

CB# 240

CB# 250

CB# 270

CB# 280

CB# 300

1 x 3Ø 400/220/33kV 315MVA AUTO TRANSFORMER BAY 1

SA 130

1 x 3Ø 400/220/33kV 315MVA AUTO TRANSFORMER BAY 2

SA 130

1 x 3Ø 400/220/33kV 315MVA AUTO TRANSFORMER BAY 3

1 x 3Ø 400/220/33kV 315MVA AUTO TRANSFORMER BAY 4

TO 220kV SWITCHYARD AUTO BAY 1

TO 220kV SWITCHYARD AUTO BAY 2

FUTURE TO 220kV SWITCHYARD AUTO BAY

SYMBOL	EQUIPMENT	SYMBOL	EQUIPMENT	SYMBOL	EQUIPMENT
	4000A CIRCUIT BREAKER		400kV MOTORIZED OPERATED ISOLATOR WITH ONE MOTORIZED EARTH SWITCH WITH MECHANICAL INTERLOCKING		400/220/33kV AUTO TRANSFORMER
	400kV VOLTAGE TRANSFORMER				
	CURRENT TRANSFORMER		400kV MOTORIZED OPERATED ISOLATOR WITH TWO MOTORIZED EARTH SWITCHES WITH MECHANICAL INTERLOCKING		400kV CAPACITIVE VOLTAGE TRANSFORMER
	SURGE ARRESTER				

EQUIPMEN

CB - CIRCUIT BREAKER
CT- CURRENT TRANSFOR
CVT - CAPACITIVE VOLTAG
ES- EARTH SWITCH
ISO - 3 PHASE ISOLATOR S
ISOSL - 1 PHASE ISOLATOR
SA- SURGE ARRESTER
PT-POTENTIAL TRANSFOR

NOTES

1. NOT IN MCC SCOPE

Attachment #7

Details of Lighting Fixtures

Table 6-1: Fixture Type to be used for various applications

S.N.	Locations	Type of Lighting Fixture
1	**Control Room cum Administrative Building**	RSQ-I, RC-I, SL-I, SSQ-I, SC-I , SC, RL-I, BL etc.
2	**GIS Building**	
(i)	400kV & 220kV GIS Hall	IHB
(ii)	Air Handler Room	SL-1
(iii)	Relay and Control Room	RSQ-I
3	**Fire Fighting Pump House**	SL-1, BL etc.
4	**Switchyard and Outdoor Substation Area**	FL-1 & FL-2
5	**Street lighting roads**	SL-LI & SL-DI

Note: In control room building, rooms without Air-conditioned ceiling fans are to be provided. In toilets & pantry exhaust fans are to be provided. In fire Fighting building wall mounted fan to be provided.

Table 6-2: Details of Lighting Fixture

a) Indoor Applications

S.N	Technical Specification	SL-1 (Surface Mounted Linear LED Tube with Box)	RL-I (Recessed Mounted 4 x 1 Feet LED Panel)	SC-I (Surface Mounted Circular LED Downlight Luminaire)	Type RC-I (Recessed Mounted Circular LED Downlight Luminaire)	Type SSQ-1 (Surface Mounted 2X2 LED Luminaire)	Type RSQ-1 (Recessed Mounted 2x2 LED Luminaire)	Type IHB (LED Indoor High Bay)
1	System Wattage	≤ 2 X 20 W	≤ 40 W	≤ 15 W	≤ 15 W	≤ 40 W	≤40 W	≤150W
2	System Lumen Output	≥ 3600	≥ 3600	≥ 1200	≥ 1200	≥ 3400	≥ 3400	≥14000
3	System efficacy (Lumens/Watt)	≥ 100	≥ 100	≥ 80	≥ 80	≥ 85	≥ 85	≥ 100
4	Housing	CRCA Housing	CRCA Housing	Pressure Die Cast Housing	Pressure Die Cast Housing	CRCA Housing	CRCA Housing	Pressure Die Cast Aluminum Housing
5	Ingress Protection	IP20	IP-20	IP20	IP-20	IP-20	IP-20	IP-65
6	Surge Protector	2kV	2kV	2kV	2kV	2kV	2kV	4kV (Internal) & 10kV (External)

S.N	Technical Specification	SL-1 (Surface Mounted Linear LED Tube with Box)	RL-I (Recessed Mounted 4 x 1 Feet LED Panel)	SC-I (Surface Mounted Circular LED Downlight Luminaire)	Type RC-I (Recessed Mounted Circular LED Downlight Luminaire)	Type SSQ-1 (Surface Mounted 2X2 LED Luminaire)	Type RSQ-1 (Recessed Mounted 2x2 LED Luminaire)	Type IHB (LED Indoor High Bay)
7	Mounting	Surface Mounted	False Ceiling	Surface Mounted	False Ceiling	Surface Mounted	False Ceiling	Hanging Type under Shed
8	THD	<10%	<10%	<10%	<10%	<10%	<10%	<10%
9	CRI	>80	>80	>80	>80	>80	>80	>70
10	CCT	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k
11	Power Factor	>0.95	>0.95	>0.95	>0.95	>0.95	>0.95	>0.95
12	Ik Protection	NA	NA	NA	NA	NA	NA	IK-05
13	Operating Humidity	90% RH	90% RH	90% RH	90% RH	90% RH	90% RH	90% RH
14	Burning Hours	50,000	50,000	50,000	50,000	50,000	50,000	50,000
15	Operating Temperature	-5°C to 45°C						
16	Lumen Maintenance	70% at the End of Burning Hours						

b) Outdoor Applications

S.N.	Technical Specification	BL (Surface Mounted Bulk Head)	Type SL-L1 (LED Street Light Luminaire)	Type SL-D1 (Pole Mounted LED Post Top Luminaire)	Type FL-1 (LED Flood Light Luminaries)	Type FL-2 (LED Flood Light Luminaries)
1	System Wattage	≤ 10W	≤45W	≤ 30W	≤150W	≤250W
2	System Lumen Output	≥ 800	≥4000	≥ 2600	≥ 14000	≥ 23000
3	System efficacy (Lumens/Watt)	≥ 80	≥ 100	≥ 90	≥ 100	≥ 100
4	Housing	Pressure Die Cast Housing and with Polycarbonate diffuser	Pressure Die Cast	Die Cast Aluminum	Pressure Die Cast Housing	Pressure Die Cast Housing
5	Ingress Protection	IP-65	IP-65	IP-65	IP-65	IP-65
6	Surge Protector(Internal)	3kV	3kV	3kV	3kV	3kV
7	Surge Protector(External)	10kV	10kV	10kV	10kV	10kV
8	Mounting	Wall Mounting	Pole Mounting for 40mm max O.D	Suitable for 60mm max O.D	On Lattice Structure	On Lattice Structure

S.N.	Technical Specification	BL (Surface Mounted Bulk Head)	Type SL-L1 (LED Street Light Luminaire)	Type SL-D1 (Pole Mounted LED Post Top Luminaire)	Type FL-1 (LED Flood Light Luminaries)	Type FL-2 (LED Flood Light Luminaries)
9	THD	<20%	<10%	<10%	<10%	<10%
10	CRI	>70	>70	>70	>70	>70
11	CCT	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k
12	Power Factor	>0.90	>0.95	>0.95	>0.95	>0.95
13	Ik Protection	IK-09	IK-05	IK-05	IK-05	IK-05
14	Operating Humidity	90% RH	90% RH	90% RH	90% RH	90% RH
15	Burning Hours	50,000	50,000	50,000	50,000	50,000
16	Operating Temperature	-5°C to 45°C				
17	Lumen Maintenance	70% at the End of Burning Hour				