Government of
Democratic Socialist Republic of Sri Lanka

Ministry of Energy

Ceylon Electricity Board

Request for Proposal

Development of 2 x 50 MW Wind Farm Facility at Mullikulam on Build, Own and Operate (BOO) Basis

RFP Document

Volume II of VI

Proposal Letters and Forms

Issued on: 20th March 2025
Bid No: TR/REP&PM/ICB/2025/001/C
Employer: Ceylon Electricity Board

Ceylon Electricity Board
P.O. Box 540
Colombo 02.

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Introductory Notes

1. General

The Proposal to be prepared by the Project Proponent shall include the documents and Forms of Part I and Part II of this Volume II. The Project Proponent's attention is drawn to the requirements of Volume I, Instructions to Project Proponents, and in particular to the requirement that the Project Proponent shall complete the Forms and respond to the questions in the specified format and in compliance with the RFP Document. The Project Proponent shall prepare technical and financial proposal separately for Wind Farm Facility and submit as per conditions detailed in Volume I.

Where the Project Proponent comprises two or more members to a consortium, each being a properly constituted company, corporation, firm, joint venture or other entity, each member shall, where relevant and applicable, separately complete the Forms and otherwise respond to the RFP Document so that the Proposal contains the required information about each constituent member of the Project Proponent.

The Project Proponent's attention is drawn to the requirements of Volume I and to the general need to fully describe its Proposal. To the extent that information additional to that specifically requested in the Forms is required, the Project Proponent may include such information on other sheets and attach them to the Proposal.

2. Attachment to the Technical Proposal Letter

The Project Proponent's Financial Proposal will not be opened until its Technical Proposal has been evaluated. So that the responsiveness of the Financial Proposal can be confirmed as part of the Responsiveness Test, the Technical Proposal shall contain an explicit and unequivocal affirmation regarding the contents of the Financial Proposal in the form expressly sought as an attachment to the Technical Proposal letter (refer Section A of Volume II).

3. Inclusions in the Proposal

The Project Proponent's attention is drawn particularly to the provisions of Section 2.10 of Volume I, *Mandatory Proposal Requirements* and to the responsiveness requirements of the Responsiveness Test (Annex V of Volume I). Failure to satisfy the requirements of these provisions will be grounds for rejection of the Proposal as non-responsive.

Part I: Technical Proposal Forms

Section A: Proposal Letter

Proposal Letter for the Development of 2 x 50 MW Wind Farm Facilities at Mullikulam on Build, Own and Operate (BOO) Basis

To: Cabinet Appointed Negotiation Committee,

In response to the Bid No.: TR/REP&PM/ICB/2025/001/C titled "Request for Proposals for Development of 2 x 50 MW Wind Farm Facility at Mullikulam on Build, Own and Operate (BOO) Basis" and in accordance with the Instructions to Project Proponents, the undersigned hereby proposes to Ceylon Electricity Board, an agency of the Government of the Democratic Socialist Republic of Sri Lanka (the Government), to finance, design, procure, construct, test, commission, operate and maintain a wind power generation facility, "Wind Farm Facility" at Mullikulam on a Build-Own-Operate basis, in accordance with the provisions of the Project Agreements (included as part of this RFP).

The undersigned agrees that this Proposal shall remain open for acceptance and shall remain irrevocable for a period of 150 days from the Proposal Closing given in the RFP Document, and it shall remain binding upon the undersigned and may be accepted at any time before the expiration of that period. The undersigned certifies that it has examined and is fully familiar with all the provisions of the RFP Document, the Project Agreements and any addenda thereto; has carefully reviewed the accuracy of all statements in the RFP Document and attachments thereto, has carefully examined the RFP Document (including the Project Agreements) and any addenda thereto, is satisfied as to the nature and location of all the works, the general and local conditions and all other matters which can in any way affect the Project or the cost thereof, and has otherwise taken steps to inform itself as required under the RFP Document. The undersigned hereby agrees that the Government or its Representatives will not be responsible for any errors or omissions on the part of the undersigned in preparing this Proposal.

Within a period of not more than 30 calendar days commencing on the day of issuance of a notice that the undersigned has been selected to undertake the Project, the undersigned will submit a Preliminary Obligations Bond to an amount of USD 2.7 million or equivalent LKR and agrees to execute a Power Purchase Agreement, Lease Agreement and Implementation Agreement for the provision of the Wind Farm Facility to be financed, designed, constructed, tested, commissioned, operated and maintained by a Project Company formed by the undersigned.

The undersigned agrees to complete the Wind Farm Facility and to fulfil all conditions for it to enter commercial service on or prior to the respective date so stipulated in the Power Purchase Agreement.

Attached hereto and by this reference incorporated herein and made a part of this proposal are the data required under the heading "TECHNICAL PROPOSAL".

In addition to the proposal data required, the undersigned encloses the following additional information:

The undersigned also acknowledges receipt, understanding, and full consideration of the following addenda to the RFP Document into the proposal;

Addenda Nos: _____

Signature: _____

In the Capacity of: _____ (Title)

duly authorised to sign the proposal for and on behalf of:

Project Proponent: _____ (Name)

Dated: _____

Home Office: _____ (Address)

_____ (Country)

_____ (Telephone No.)

_____ (Fax No.)

_____ (E-mail)

Attention: _____ (Name & capacity of authorised representative for Project Proponent)

Address in Sri Lanka (if applicable):

_____ (Address)

_____ (Telephone No.)

_____ (Fax No.)

_____ (E-mail)

Attachment to: Section A- Proposal Letter

Project Proponent's Affirmation in Respect of its Financial Proposal

The Project Proponent unequivocally affirms that its Financial Proposal conforms to the requirements of the RFP Document and specifically meets the following conditions:

- The Bid Tariff offered for energy exported from Wind Farm Facility by the Project Proponent complies with the structure and pricing mechanisms specified in the draft Power Purchase Agreement;
- The Project Proponent's Financing Plan provided as Section H of its Proposal is comprehensive and has been endorsed by the Project Proponent's Financial Advisor as bankable without material change to either the Project Agreements or the Government's support package, such endorsement being in the form specified in Volume II, Section F.
- The Financing Plan proposes a financing structure based on fixed/variable interest rates, adequate interest rate protection (hedging) and a debt service coverage ratio in all years of the Operational Period.
- The lead member of the Project Proponent shall retain at least twenty six percent [26%] of the equity capital in the Project Company and the members of the consortium shall collectively maintain not less than fifty-one percent [51%] of the equity capital of the Project Company till for a minimum of [5] years from Commercial Operation Date.

Signature: _____

In the Capacity of: _____(Title)

duly authorized to sign the proposal for and on behalf of:

Project Proponent: _____(Name)

Section B1: General Qualifications of the Project Proponent

(i) General Information

1. Name of Project Proponent: _____

(if the Project Proponent is a consortium give the Names of all the members of the consortium)

2. Date of Submission: _____

3. Country of incorporation, if applicable: _____

4. Year or incorporation, if applicable: _____

5. Type of organisation of Project Proponent: _____

(e.g. company / joint venture / partnership)

6. Project Proponent's representatives for purposes of this Proposal:

Authorised signatories: _____

7. Project Proponent's contact address for communications:

_____

_____

Fax no: _____

Tele. no: _____

E-mail: _____

8. Attachments:

i) Powers of attorney authorising the signatory to sign on behalf of the Project Proponent from member company / companies.

ii) Resolutions from the Board of each member company authorizing their participation in the Proposal.

iii) The consortium agreement among the members of the consortium in the case of the Project Proponent is a consortium.

(ii) Legal Entities Comprising the Project Proponent

The table below shall be completed in respect of each individual legal entity comprising the Project Proponent. Information provided shall include information about the entity making up the Project Proponent, their experience and intended role in the Project.

Name Of the Member Companies Notes 1, 2, 3	**Country Of Origin/ Postal Address of the Head Office** (Including Phone & Fax No.)	**Role of the Member in This Project**	**% Equity Contribution** Note 4	**Years Of Experience & Type of Work Undertaken** Note 5	**The Name and The Designation of the Representative for the Company for this Project.**

1 The Memorandum and Articles of Association, Joint Venture Agreement, pre-bid agreement or other relevant agreement shall be attached hereto, as appropriate.

2 Attach certified copy of Board's resolution authorising its representatives to file the Proposal.

3 Brochures, leaflets, annual reports, etc. describing each member (or relevant parent/affiliates) shall be attached.

4 Attach memorandum of commitment of members to provide the required equity.

5 State the main activity or business of each member (or parent/affiliate), i.e. construction, design, project management, utility operations, finance etc.

(iii) Project Proponent's Boards of Directors

1. The Project Proponent shall provide the names of the members of the Boards of Directors for each member making up the Project Proponent's group and their relevant parents and affiliates.

Lead Member of Project Proponent:

Name:	**Function:**
Members of the Board Chief Executive Officer	

Member No. 2:

Name:	**Function:**
Members of the Board Chief Executive Officer	

Member No. 3: (etc.)

(iv) Financial Capability of the Project Proponent

This section shall be filled in accordance with the provisions given in the Clause 4.2 of the Volume I of this RFP Document and shall be filed separately for each member of the Project Proponent.

Financial Situation

1. Financial Data

Name of the Member - _____

Type of Financial Information in (currency)	**Historic Information for Previous 5 years (Amount, currency, exchange rate, USD equivalent)**				
	Year 1	Year 2	Year 3	Year 4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (CA - CL)					
Most Recent Working Capital		To be obtained for most recent year and carried forward to source of financing in financial resources; in case of a Consortium, to the corresponding consortium partner's resources.			
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Profits After Taxes (PAT)					

2. Financial Documents

The Project Proponent and its members shall provide copies of the financial statements for last 05 years pursuant to the Clause 4.2.1 of Volume I. The financial statements shall:

(a) reflect the financial situation of the Project Proponent or in case of a consortium, of each member, and not an affiliated entity (such as parent company or group member).

(b) be independently audited or certified in accordance with local legislation.

(c) be complete, including all notes to the financial statements.

(d) correspond to accounting periods already completed and audited.

2.1. Average Annual Turnover

Name of the Member - _____

Annual Turnover Data			
Year	**Amount and Currency**	**Exchange rate**	**USD equivalent**
[*indicate year*]	[*insert amount and indicate currency*]	[*insert applicable exchange rate*]	[*insert amount in USD equivalent*]
Average Annual Construction Turnover *			

* Total USD equivalent for all years divided by the total number of years, in accordance with the Section 4.2.2 of Volume I, as appropriate.

2.2. Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject Project as indicated in Section 4.2.3 of Volume I, as appropriate.

Name of the Member - _____

No.	Source of Financing	Amount (USD equivalent)
1	Working Capital (to be taken from Financial Data)	
2	Credit Line [a]	
3	Other Financial Resources	
	Total Available Financial Resources	

a. To be substantiated by a letter from the bank issuing the line of credit.

2.3. Current Contract Commitments

Project Proponent and each member of the consortium should provide information on their current commitments on all Contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for Contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued, in accordance with Section 4.2.3 of Volume I, as appropriate.

Name of the Member - _____

No.	Name of Contract	Employer's Contact Address, Tel, Fax	Contract Completion Date	Value of Outstanding Work [Current USD Equivalent]	Remaining Contract Period in Months	Monthly Financial Resources Requirement [USD/month)]
1						
2						
3						
4						
5						
Total Monthly Financial Requirement for Current Contract Commitments						

Section B2: Qualifications of the Project Proponent

(i) Project Proponent's Completed Wind Power Plants

Relevant projects completed by each member of the Project Proponent (for last 10 years) to be provided in the following format:

(Certified Copies of Certificates of final acceptance of each project shall be attached. Use additional sheets for additional information)

Name And Address of the Client (Including Phone No.)	**Name of Project** (Note 1)	**Total Project Cost**	**Date Completed**	**Completed On Time** (Note 2)	**Short Project Description**	**Member Company Role in the Project** (Note 3)	**Value of Project Proponent's Contribution**

1. State if project failed to achieve completion or to enter commercial operation.
2. If the project did not achieve its scheduled completion date (as extended), give the period by which it was late.
3. For instance: owner, operator, contractor, supplier, lender. If more than one role, give all roles.

In the case of the Project Proponent does not have any experience in development of Wind power plant projects, provide the agreement as per the clause 4.1.1 of the Volume 1 of the RFP.

(ii) Project Proponent's On-Going Wind Power Plants

List of all relevant on-going projects each member of the Project Proponent or their member companies are engaged in:

Name And Address of The Client (Including Phone No.)	**Name And Value of The Project**	**Date Of Commencement**	**Short Project Description**	**Expected Date of Completion** (Note 1)	**% Completion To Date** (Note 2)	**Role Or Responsibility in Project**	**Value Of Member's Contribution** (Note 3)

1 Give the date of completion of the phase in which the member is involved. Where this involvement spans more than one phase (e.g. development, construction, operation), give the completion dates of each phase.

2. % completion for construction involvement to be expressed in % physical completion. For involvement in project operation, describe completion on the basis of the % of the period of the operating concession completed.

3. Value of contribution to reflect consortium share or equity involvement. Value to be clarified according to role in the project (owner, lender, contractor, operator, etc.)

(iii) EPC Contractor's / Expert Company's Experience

For the proposed EPC Contractors / expert companies under clause 4.1.1, 4.1.2 & 4.1.4, provide the following (attach separate sheet for each company):

1. Name and Address of the Proposed EPC Contractor/ expert company: *
2. Years of experience:
3 Type of main business: **
4. Provide the following details on the EPC Contractor's / expert company's experience.

   (I) Name and Address of the Client.

   (II) Name of the Project

   (III) Short Description of the Project.

   (IV) Dates of commencement, completion and no of years in operation

   (V) Completion on Time***

   (VI) Total Project Cost

   (VII) % value of contractor's contribution

   (VIII) Nature of financing****

* Attach expression of interest for the supply of the turnkey contractor / design services to this Project

** Literature/brochures/technical magazines describing the business/facilities/organisation shall be attached. Also, a certificate issued by an independent international organization to ensure compliance with the ISO 9001:2000 standards shall be submitted.

*** If the project did not achieve its scheduled completion date (as extended), give the period by which it was late. Attach authentic certificate of final acceptance of each project.

**** Commercial loan, export credit, bond floatation, etc.

(iv) List of Engineers

Provide the details of Engineers in following format where Project Proponent wish to appoint for the Turnkey Contracts with the consent of Finance Parties;

a) wind power plant

Name of the Engineer & Address	Type of Main Business	Details of Similar Projects Involved	Details of Years of Experience

b) 220/33kV collector substation

Name of the Engineer & Address	Type of Main Business	Details of Similar Projects Involved	Details of Years of Experience

(v) O&M Contractor's Experience

For proposed O&M contractors, provide the following:

1. Name and Address of the O & M Contractor: *
2. Number of years of experience as an O & M Contractor:
3. Provide the following details of the O&M Contractor's experience

Name And Address of the Client	Name Of Project	Short Description of Project **	Date of Commencement	Duration of the Contract

* Literature/brochures/technical magazines describing business/ facility of the contractor shall be attached, as well as an expression of interest for the supply of O&M services to this Project. Also, a certificate issued by an independent international organization to ensure compliance with the ISO 9001:2000 standards shall be submitted.

** Authentic certificates of achieved performance duly issued by owners or clients of the works described above shall be attached.

(vi) Experience of WTG Manufacturer

For the proposed WTG manufacturers, provide the following as per section 4.1.5 of the volume I:

a) Name and Address of WTG manufacturer *:

b) Number of years of experience:

c) Model/Type of the proposed WTG:

d) Provide the following details for the proposed WTG model experience in existing wind farms:

Name & Address of the Client	Name of the Project**	Model**	Capacity / Rating **	Quantity Supplied**	Year of Supply

* Literature/brochures/technical magazines describing the business / facilities / organization of manufacturer shall be attached as well as an expression of interest in the supply of the item. Also, a certificate issued by an independent international organization to ensure compliance with the ISO 9001:2000 standards for the particular manufacturing facility shall be submitted.

** Authentic certificates of final acceptance and successful operation up to date, duly issued by clients of the works described above shall be attached.

(vii) Experience of 33/220kV Collector Substation's Main Equipment Manufactures

For the main equipment manufacturers of 33/220kV collector substation as listed in section 4.1.6 of volume I, provide the following (for each item / manufactures separately):

e) Item:

f) Name and Address of manufacturer *:

g) Number of years of experience:

h) Model/Type of the proposed item:

i) Provide the following details of the item manufacturer's experience:

Name & Address of the Client***	Name of the Project**	Model***	Capacity / Rating ***	Quantity Supplied	Year of Supply

* Literature/brochures/technical magazines describing the business / facilities / organization of manufacturer shall be attached as well as an expression of interest in the supply of the item. Also, a certificate issued by an independent international organization to ensure compliance with the ISO 9001:2000 standards for the particular manufacturing facility shall be submitted.

** Authentic certificates of final acceptance duly issued by clients of the works described above shall be attached.

*** Specific documents requested in section 4.1.6 of volume I shall be attached to verify the details.

Section C: Project Milestones Schedule

Project Proponent's Project Milestone Schedule

The Project Proponent shall provide a detailed Project Milestones Schedule which supports and confirms the Project Schedule starting from execution of the Project Agreements.

The Project Proponent's detailed Project Milestones Schedule shall be a time-scaled critical path network programme that has been analysed in terms of time and resources. The Project Milestones Schedule shall clearly demonstrate the timing and sequence in which the Project Proponent intends carrying out the Project activities including financing, design, permits and approvals, procurement, construction, commissioning and operation. The Project Milestones Schedule shall provide sufficient detail to demonstrate competence in the development of projects similar to the Project, as well as a sound knowledge of procedures and prevailing conditions in Sri Lanka.

A breakdown of activities in the Project Milestones Schedule will be provided with a description of each activity that permits clear identification of the portion of the work included under the activity. The breakdown will provide the following, as appropriate:

- Breakdown of the Preliminary Obligations Period, Construction, the Operational Period into constituent activities to the extent necessary to establish a clear sequence and timing of activities from the execution of the Project Agreements through to full commercial operation;
- Activities breakdown that will clearly demarcate financing, design, procurement, erection, commissioning and operations phases;
- Scheduled start, scheduled finish and duration of each activity with critical path clearly indicating critical activities;
- The identity and duration of all external interface events, i.e. an activity which must be done before or after, as the case may be, some activity by another person.
- Any float and/or dependencies between activities,

The Project Proponent shall outline its project controls strategies and shall explain how timely remedial actions will be initiated to correct programme delays.

The Project Milestones Schedule shall be prepared in Microsoft Project format. The Project Proponent shall state other project management tools and software it proposes to use.

Section D: Technical Data for Wind Farm Facility

(i) Introduction

The total installed capacity of the power plant shall be 50 MW with maximum variation -5 / +10 MW. The technology proposed for the project shall have a proven track record with demonstrated success in similar project conditions. The offered wind turbine and associated facility shall be new and unused. The plant design and the equipment proposed shall be conformed to CEB regulations stipulated in CEB Grid Code and Schedule 5 – Minimum Functional Specification of Volume VI of this RFP Document. CEB has the right to decline interconnection of any equipment which is of substandard or does not conform to the Grid Code or requirements specified in this RFP Document and the project proponent shall bear any loss incurred as a result.

The Project Proponent shall provide the following technical information with the Proposal for the proposed Project:

a. Estimation of Annual Energy Production (AEP) based on the wind turbine model and power curve proposed by the Project Proponent conforming to site wind data, land use data and roughness of the area based on WAsP®. The resource assessment shall be done for the relevant hub height of the proposed wind turbine with wind shear estimates from site wind data.

b. Wind turbine specifications and type tested power curve data (documentary proof shall be provided along with the proposal) which shall be complied with IEC 61400-1 or latest available equivalent standard.

c. The wind turbines proposed shall be capable of operating with different noise modes and the same shall be programmable and make available at the wind turbine controller and wind farm SCADA system. A comprehensive noise assessment considering all potential receptors complying to the EIA requirements shall be carried out and provided with the proposal.

d. An Expression of Interest (EOI) from each prospective WTG supplier and 220/33kV Collector substation's main equipment suppliers (for equipment listed in item 'f' below) willing to supply the required number of wind turbines for the proposed project.

e. Valid full type test reports obtained from an internationally accredited testing agency shall be produced for all major equipment of the wind turbine generator which are stipulated below;

   i. Generator
   ii. Drivetrain (if applicable)
   iii. Main transformer
   iv. Back-to-back converter (if applicable)
   v. Hub (including pitch control system)
   vi. Blades
   vii. Nacelle and accessories (including yaw motors)
   viii. Tower and accessories
   ix. SCADA & control system (i.e., main controller, servers, switches etc.)
   x. 33kV cables and accessories (i.e., termination kits, jointing kits etc.)
   xi. Fibre cables and accessories (i.e., splicing kits, jointing enclosures etc.)
   xii. MV and LV switchgear
   xiii. Auxiliary transformers
   xiv. Power quality meters/energy meters & instruments inside wind turbines

f. Valid full type test reports obtained from an internationally accredited testing agency shall be produced for all major equipment of the 220kV/33kV Collector substation which are stipulated below;

   i. 220/33kV Power Transformer

   ii. 245kV Three phase circuit breaker

   iii. 245kV Single phase current transformer

   iv. SF_6 Insulated 36kv indoor switchgear

   v. 245kV & 36kV Protection & control facilities

g. Country of origin certificates for the major equipment which are mentioned above, shall be provided.

h. Details of the proposed wind farm controlling system, protection system and SCADA system.

i. Details of proposed Radar Based Bird Collision Avoidance (RBBCA) system.

j. Details of proposed power conversion equipment (such as STATCOM) required to meet CEB Grid Code requirements.

k. Detailed drawings and supplementary documents to be provided at the time of submission of Proposal, including but not limited to:

   i. Wind farm design reports
      - General specification of wind turbine model and its features
      - Wind data assessment and AEP calculation report
      - Noise assessment report for wind farm
      - General specification of power plant controller and controlling methodology

   ii. 220kV & 33kV power collector route layout drawings including:
      - 33kV Power collector system up to the collector substation
      - Power collector system within 220/33kV collector substation
      - Wind farm single line diagram
      - 220kV/33kV collector substation single line diagram

   iii. Communication network layout
      - Network layout from wind turbines up to the collector substation
      - Network configuration layout within collector substation
      - Overall functional drawing/layout of termination points at the CEB metering substation

   iv. SCADA & wind farm control monitoring system
      - Wind farm SCADA architecture
      - SCADA functional design document
      - Operation modes of power plant controller
      - Details of the wind forecasting system
      - SCADA panel layout in collector substation

l. Contingency plan to guarantee the reliable operations of the wind power plant

(ii) Technical Data of Wind Power Plant

No	Item	Units	Requirement	Offered
Guaranteed Plant Capacity of the Project Proponent at the Interconnection Point		MW	Between 45MW to 60MW	
Wind Turbine Generator				
A	**General**			
A.1	Manufacturer/Product Name			
A.2	Country of Origin			
A.3	Country/Place of Manufacture			
A.4	Year of Manufacture			
A.5	Make			
A.6	Model No.			
A.7	Type tested (valid test certificates shall be attached as supplementary information for all major wind turbine components specified under item g of Technical Scope for Wind Power Plant.		Provide full product type test certification obtained from internationally accredited agency for the offered wind turbine model	
A.8	Type test certification reference		IEC 61400-22	
A.9	Designed lifetime	Years	20	
A.10	Power curve		Provide type tested power curve	
B	**Specifications**			
B.1	Configuration		Three (03) bladed, up-wind, horizontal axis wind turbine with variable pitch and active yaw mechanism	
B.2	Wind class & turbulence index of the wind turbine as per IEC 61400-1			
B.3	Rated wind speed & survival wind speed	m/s		
B.4	Noise level at rated speed at standard air density	dB		

B.5	Noise level at 10m above tower footing at rated speed at standard air density	dB		
B.6	Nominal power rating	MW		
B.7	Wind speed at which nominal power is generated	m/s		
B.8	Hub Height	m		
B.9	Blade type	m		
B.10	Blade length	m		
B.11	Rotor + hub diameter	m		
B.12	Drivetrain manufacturer (if applicable)			
B.13	Generator manufacturer			
B.14	Generator rating & power factor	MW		
B.15	Generating voltage (nominal & maximum)	V		
B.16	Generator designed frequency	Hz		
B.17	Transformer manufacturer			
B.18	Continuous maximum rating of the transformer	MVA		
C	**Availability of Control Functions**			
C.1	Active power control		Yes	
C.2	Reactive power control		Yes	
C.3	Voltage variation capability		Yes	
C.4	Frequency variation		Yes	
C.5	Power factor variation capability		Yes	
C.6	LVRT capability		Yes	
C.7	HVRT capability		Yes	
D	**Wind Turbine Generator Protection System**			

D.1	Ground Fault Monitoring			
D.2	Grid Monitoring			
D.3	Frequency			
D.4	Voltage			
D.5	Anti-islanding			
E	**Standard Compliance**			
E.1	Applicable Standard (latest)		a) For the whole Wind Farm designs, fabrications, testing and commissioning, electrical equipment & works and mechanical equipment and works: IEC, ISO, EN, BS b) In absence of particular standard from the IEC, for areas such as resistivity measurements, earthing design or earth resistance measurements: IEEE c) For quality management system: ISO 9001 d) For Materials and testing: ASTM e) For Civil works: BS IEC AASHTO ASTM ACI Local standards for Buildings and Roads – ICTAD, SLS, RDA f) For corrosion protection of structures EN / ISO 8501-3:2006 and 12944-(1-8) g) For wind turbine towers:	

			For Materials – EN / ASTM For Welding – ANSI /AWS Painting - ISO	
G	**Radar Based Bird Collision Avoidance System (RBBCA)**			
G.1	Make			
G.2	Model			
G.3	Complying standards			
H	**Additional Equipment for Reactive Power Compensation**		(only if the proposed WTG is not capable of delivering the required reactive power)	
H.1	Proposed equipment			
H.2	Make			
H.3	Model			
H.4	Capacity		Shall capable of compensating reactive power required as per clause 3.17.1.3 of the Grid Code.	
H.5	Complying standards			

(iii) Technical Data for Energy Meters

Item	Item Description	Requirement	Offered
A.1	**General**		
A.1.1	Name of the Manufacturer		
A.1.2	Address of the Manufacturer		
A.1.3	Country of Manufacture		
A.1.4	Make		
	Model No.		
	Manufacturers Catalogue Ref. No.		
A.1.5	Type	3P4W	
A.1.6	Applicable Standards	As per clause 2.0	
A.2	**Principle Parameters**		
A.2.1	Reference voltage	110 V AC	
A.2.2	Standard Rated Current	1A	
A.2.3	Rated Maximum Current (Imax)	1.2 times of the rated current	
A.2.4	Starting Current of Meter	at 0.001 of basic current	
A.2.5	Auxiliary Supply	60-240 V AC/DC	
A.2.6	Frequency	50 Hz	
A.3	**Basic Features**		
A.3.1	Limit of errors 1. Active Energy 2. Reactive Energy	 Class 0.2S Class 2	
A.3.2	Capability of measurement in full p.f range	Accuracy in full p.f range	
A.3.3	TOD measurement	Yes	
	Minimum TOD intervals	6	
A.3.4	Demand integration period	15 min	

A.3.5	Maximum demand reset both Locally and Remotely	Yes	
A.3.6	Password Authorization Levels	Min 2 levels	
A.3.7	No. of Blinking LEDs	Min 2	
	Blinking LED analogues to 1. Active Energy consumption 2. Reactive Energy consumption	 Yes Yes	
A.3.8	Battery lifetime of calendar clock battery	Min 10 years	
A.3.9	Display Sequence	As per in Clause 3.2.8 in the Annex 1 of Schedule 7 (Volume VI)	
A.3.10	Meter Sampling rate	30s or less	
A.3.11	Memory retention period (months)	12 months	
A.3.12	Programming parameters	As per Clause 3.3.9 in the Annex 1 of Schedule 7 (Volume VI)	
A.3.13	Logging Load profile	as per Clause 3.3.9 in the Annex 1 of Schedule 7 (Volume VI)	
A.3.14	Event log	as per Clause 3.3.9 in the Annex 1 of Schedule 7 (Volume VI)	
A.3.15	Display memory type	non-volatile	
A.4	**Remote/ Local Communication**		
A.4.1	Types of communication ports available	Optical Port	
		RS 232	
		Ethernet	
A.4.2	Remote meter access via a GSM and 2G/3G/4G modem	Yes	
A.4.3	Software and manuals	As per Clause 3.3.4 in the Annex 1 of Schedule 7 (Volume VI)	

A.4.4	Meter communication 1. software name 2. version		
A.4.5	Facilities provided by remote operation		
	(a) To programme each meter	Yes	
	(b) To take the relevant meter reading individually	Yes	
	(c) To download stored data from meter	Yes	
A.4.6	Type of Modem	Dual band GSM modem (900/1800 MHz) or 2G/3G/4G modem	
A.4.7	Mounting of Modem	Built In	
A.4.8	Power Supply to the modem	Through Meter	
A.4.9	Minimum speed of the modem (kbps)		
A.4.10	Type of the Network Switch	Unmanageable	
A.4.11	Number of IP Ports and the speed	**Minimum 24 Nos.** 10/100 Mbps	
A.4.12	Download data to be stored in MS Access/SQL	Yes	
A.4.13	Tamper proof SIM card holder	Yes	
A.4.14	DLMS based communication enable	Yes	
A.4.15	APIs are provided	Yes	
A.5	**Mechanical Requirement**		
A.5.1	Protective class	Class 2 (Double Insulation)	
A.5.2	Type of meter cover and terminal cover	As per clause 3.4.1 and 3.4.3 in the Annex 1 of Schedule 7 (Volume VI)	
A.5.3	Bore Size of the terminals and number of screws provided	As per clause 3.4.2 in the Annex 1 of Schedule 7 (Volume VI)	

A.5.4	Degree of protection (IP Category)	IP 51 (minimum)	
A.5.5	No. of digits in the LCD display	Minimum 10 including three decimals	
A.5.6	Size of numbers in the LCD display	Minimum 4mm high and 4 mm width	
A.5.7	Seal-ability of meters to prevent from: • Access to adjustment or calibration devices on meter • Access to terminals of incoming current or potential wiring	Yes Yes	
A.6	**Climate Condition**		
A.6.1	Operating Temperature range	As per table 5 of IEC 62052-11 for indoor meters	
A.6.2	Conform to operate accurately under Maximum Relative Humidity of 90%	Yes	
A.7	**Electrical Requirement**		
A.7.1	Active and apparent power consumption in the voltage and current circuits of the meter at a reference voltage, frequency, temperature	not more than that stipulated in table 1 of IEC 62053-22	
A.7.2	Permissible error due to voltage variation	conform to the table 7 of IEC 62052-11	
A.7.3	Meter operation during Voltage dips and short interruptions	conform to Clause 7.1.2 of IEC 62052-11	
A.7.4	Meter operation during short time over current	as per the clause 7.2 of IEC 62053-22.	
A.7.5	Variation of error due to self – heating	not exceed the value given in IEC 62053-22	
A.7.6	Reference Temperature and Temperature coefficient		
A.7.7	Insulation Level		
	(a) Power Frequency Withstand voltage for 1 min	4 kV	

	(b) Impulse Voltage at 1.2/50 µsec	6 kV	
A.8	**Electromagnetic compatibility**		
A.8.1	meter operation conform to the clause 3.7 of this specification	Yes	
A.9	**Accuracy Requirements**		
A.9.1	Limits of error due to variation in current and influence quantities	do not exceed the limit given in IEC 62053-22 for class 0.2S	
A.9.2	Meter starting and running with no-load	conform to the clause 3.8 (a) in the Annex 1 of Schedule 7 (Volume VI)	
A.9.3	Meter constant	conform to the clause 3.8 (b) in the Annex 1 of Schedule 7 (Volume VI)	
A.10	**Marking of Meters**		
A.10.1	Making of Meters	as per clause 3.9 in the Annex 1 of Schedule 7 (Volume VI)	
A.11	**Quality Assurance**		
A.11.1	Quality Assurance conforming ISO 9001	Yes	
A.11.2	ISO/IEC 17025 accreditation for the Laboratory	Yes	

(iv) Technical Data for 220/33kV Collector Substation

245 kV Outdoor Circuit Breaker				
No	Item	Units	Required	Tendered
			245 kV	245 kV
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Place of Testing			
4.	Applicable Standard - IEC		IEC62271-100	
5.	Manufacturer's type designation, and type ref or model number			
6.	Interrupting Medium		SF_6	
7.	Number of Phases	Nos.		
8.	Frequency	Hz		
9.	Rated Voltage	kV	245	
10.	Impulse withstand voltage on 1.2/50 Wave	kV	1050	
11.	One minute Power frequency withstand voltage			
	Closed	kV	460	
	Open	kV	460	
12.	Rated normal current	A		
13.	Short- time withstand current switchgear – 1 Sec:	rms kA	40	
14.	Rated short-circuit breaking current.			
	Symmetrical	rms kA	40	
	DC component	%	More than 20%	
15.	Short-circuit making current	Peak kA	100	
16.	Rated transient recovery voltage at rated short circuit breaker current	V		
17.	Rated Operating duty cycle		O-0.3Sec- CO-3Min-CO	
18.	First phase to clear factor		1.3	
19.	Rated short circuit Breaking current			
	(a) kV (pk)			
	(b) RRRV			
20.	Rated small inductive breaking current.	A		
21.	Rated line charging breaking current	A	145	
22.	Rated cable charging breaking current.	A	250	

245 kV Outdoor Circuit Breaker				
No	Item	Units	Required	Tendered
			245 kV	245 kV
23.	Rated out of phase breaking current	kA		
24.	Rated characteristic for short line fault as per IEC -60056	A		
25.	Maximum allowable switching over voltage	kV		
26.	Minimum time for arc extinction to contact remake when adapted for auto-reclosing (dead time)	ms		
27.	Time from closing of control switch for completion of closing stroke during fault making (make time)	ms		
28.	Type Testing Authority			
29.	Type Test Certificate Report Reference No.			
30.	Opening time			
	- Without current.	ms		
	- at 100% of rated breaking current	ms		
31.	Maximum arcing time of any duty cycle of (IEC 60056-2)	ms		
32.	Duty on which maximum arc duration occurs			
33.	Current at which maximum arc duration occurs	A		
34.	Make time	ms		
35.	Minimum time for arc extinction to contact remake when adopted for auto reclosing	ms		
36.	Time from closing of control switch to completion of closing stroke during fault making.	ms		
37.	Is an external series break incorporated in break?	Yes/No		
38.	Is a device used to limit transient recovery voltage?	Yes/No	No	
39.	Method of closing.			
40.	Method of tripping.			
41.	Rated voltage for spring winding motor for closing	V DC	220	
42.	Closing release coil current	A		
43.	Closing release coil voltage	V DC	220	
44.	Trip coil current	A		
45.	Trip coil voltage	V DC	220	
46.	Is the circuit-breaker trip free?	Yes/No	Yes	

245 kV Outdoor Circuit Breaker				
No	Item	Units	Required	Tendered
			245 kV	245 kV
47.	Minimum clearances in air:			
	(a) between phases	mm		
	(b) phases to earth	mm		
	(c) across interrupters	mm		
	(d) live parts to ground level	mm		
48.	Material of tank interrupter chamber			
49.	Material of moving contact operating rod			
50.	Material of contact surfaces			
	(a) Main contact			
	(b) Arcing contact			
51.	Number of breaker per phase	Nos.	01	
52.	Length of each break	mm		
53.	Length of stroke	mm		
54.	Weight of circuit-breaker unit complete	kg		
55.	Maximum shock load imposed on floor of foundations when opening under fault conditions (state whether tension or compression)	kg		
56.	Quantity of gas in complete three- phase circuit breaker	Liters		
57.	Maximum pressure rise in circuit breakers due to the making or breaking of rated current.	Bar		
58.	Routine pressure test on circuit breaker tanks or containers	Bar		
59.	Pressure type test on Circuit Breaker tanks or containers	Bar		
60.	Interrupting Gas Pressure			
	(a) at (20^0C) normal	Bar		
	(b) at (30^0C) normal	Bar		
61.	(a) Limits of gas pressure at 20^0 C			
	Maximum	Bar		
	Minimum	Bar		
	(b) Limits of gas pressure at 30^0 C			
	Maximum	Bar		
	Minimum	Bar		

245 kV Outdoor Circuit Breaker				
No	Item	Units	Required	Tendered
			245 kV	245 kV
62.	Period of time equipment has been in commercial operation	Years		
63.	Number of operations before interrupter maintenance required.			
	(a) At rated short circuit current	Nos	10	
	(b) At full load current	Nos	5000	
64.	Mechanical Endurance Class		Class M2	
	Type Tests *Document reference number and Type tested model shall be written in tendered column.*	Included in the Bid (Yes or No)		
65.	Dielectric tests	Yes/No	Yes	
66.	Measurement of the resistance of the main circuit	Yes/No	Yes	
67.	Temperature-rise tests	Yes/No	Yes	
68.	Short-time withstand current and peak withstand current tests	Yes/No	Yes	
69.	Additional tests on auxiliary and control circuits	Yes/No	Yes	
70.	Mechanical operation test at ambient temperature	Yes/No	Yes	
71.	Short-circuit current making and breaking tests	Yes/No	Yes	

245 kV Current Transformer				
No	Item	Units	Required	Tendered
			245 kV	245 kV
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Place of Testing			
4.	Applicable Standard - IEC		IEC 61869-1&2	
5.	Manufacturer's type designation, and type ref or model number			
6.	Number of phases		Single	
7.	Installed location		Outdoor	
8.	Highest system voltage	kV	245	
9.	Rated frequency	Hz	50	
10.	Rated current ratio.	A		

245 kV Current Transformer				
No	Item	Units	Required	Tendered
			245 kV	245 kV
11.	Rated Primary Current	A		
12.	Rated Secondary Current	A		
13.	Number of cores			
14.	Accuracy			
	(i) For revenue metering		0.2s	
	(ii) For Protection			
15.	Rated burden	VA		
16.	Continuous Current Rating Factor		1.2	
17.	Rated short Circuit current 1 sec	rms kA	40	
18.	Rated short time thermal current (as per breaker)	kA Sec		
19.	Rated insulation level			
	(i) AC withstand voltage 1 min.dry			
	Primary	kV	460	
	Secondary			
	(ii) Impulse withstand voltage full wave	kV	1050	
20.	Knee point voltage	V		
21.	DC Resistance			
22.	Dimensions			
	(i) Overall height			
	(ii) Total length			
	(iii) Total weight per phase			
23.	Rated Dynamic peak current.	A		
24.	Creepage distance of the insulators	mm		
		mm/kV	53.7	
	Type Tests *Document reference number and Type tested model shall be written in tendered column.*	Included in the Bid (Yes or No)		
25.	Temperature-rise test	Yes/No	Yes	
26.	Impulse voltage tests on primary terminals	Yes/No	Yes	
27.	Electromagnetic Compatibility tests	Yes/No	Yes	
28.	Electromagnetic Compatibility tests	Yes/No	Yes	

245 kV Current Transformer				
No	Item	Units	Required	Tendered
			245 kV	245 kV
29.	Verification of the degree of protection by enclosures	Yes/No	Yes	
30.	Enclosure tightness test at ambient temperature	Yes/No	Yes	

245 kV Neutral Current Transformer				
No	Item	Units	Required	Tendered
			245 kV	245 kV
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Place of Testing			
4.	Applicable Standard - IEC			
5.	Manufacturer's type designation, and type ref or model number			
6.	Rated voltage	kV	245	
7.	50 Hz 1 minute withstand voltage, wet	kV	460	
8.	Type of construction (post, ring, etc.)			
9.	Material of primary insulation			
10.	RTV Silicone coating	Yes/No	Yes	
11.	Minimum thickness of RTV Silicone coating	µm	> 300	

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Place of Testing			
4.	Applicable Standard - IEC			
5.	Manufacturer's type designation, and type ref or model number			
6.	Rated voltage	kV	36	
7.	Rated frequency	Hz	50	
8.	Maximum continuous system voltage at minimum gas pressure	kV	36	

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
9.	Impulse withstand voltage (peak) at minimum gas pressure	kV	170	
10.	Power frequency withstand voltage 1 min. at minimum gas pressure	kV	70	
11.	Power frequency withstand voltage 1 min at atmospheric pressure	kV		
12.	Rated short time withstand current	kA	25	
13.	Rated duration of short time withstand current	s	1	
14.	Rated peak short circuit current	kA		
15.	Heaviest part of any feeder for crane	kg		
16.	Feeder Width	mm		
	Depth	mm		
	Height	mm		
17.	Current SF6 gas replenishing	Yes/No	No	
18.	Material of filter employed for moisture absorption			
19.	Heat losses per feeder at rated Power	kW		
Busbars				
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Rated normal current	A		
4.	Rated current at max. ambient temperature	A		
5.	Conductor material			
6.	Standard applicable			
7.	Single conductor cross section	mm^2		
Circuit Breaker				
	(These sheets to be copied and filled in for each different type of CBs)			
1.	Manufacturer's Name			
2.	Manufacturer's Address			
3.	Manufacturer's Type Designation and Model No.			
4.	Applicable Standard			
5.	Type tested	Yes/No	Yes	

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
6.	Type test report, Ref. No.			
7.	Rated normal current at 20deg. C			
	- line feeder circuit breaker	A	1250	
	- transformer feeder circuit breaker	A	1600	
	- bus coupler circuit breaker	A	-	
8.	Rated current at max. ambient temperature	A		
	- line feeder circuit breaker	A		
	- transformer feeder circuit breaker	A		
	- bus coupler circuit breaker	A		
9.	Rated short circuit breaking current (symmetrical, r.m.s.)	kA		
10.	Rated short circuit breaking current (asymmetrical, r.m.s.)	kA		
11.	Rated short circuit making current (peak)	kA		
12.	Rated cable charging breaking current	A		
13.	Rated line charging breaking current	A		
14.	Rated small inductive breaking current	A		
15.	Voltage drop across terminals of one pole at rated current	mV		
16.	Amplitude factor			
17.	First pole-to-clear factor		1.5	
18.	Rated operating sequence:		O-t-CO-t'-CO	
	- with t	sec.	0.3	
	- with t'	min.	3	
19.	Min. time t" between two successful three phase auto reclosures at full rated breaking current (sequence O-t-C-t"-O-t-C)	min.		
20.	Closing time	ms		
	- tolerances	ms		
21.	Dead time (max.)	ms		
	- tolerances	ms		

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
22.	Break time (max.) at full rated breaking current	ms		
	- tolerances	ms		
23.	Make time (max.)	ms		
	- tolerances	ms		
24.	Arcing time (max.) at full short circuit duty	ms		
	- tolerances	ms		
25.	Life duration of main contacts (no load mechanical operations)	operations		
26.	Number of switching operations at rated breaking capacity before contact maintenance becomes necessary	No.	min. 100	
27.	Rated pressure of SF6 for arc quenching	bar		
28.	Auxiliary contacts:			
	- number (NO/NC)			
	- voltage rating	V DC	220	
	- current rating	A DC		
29.	SF6 pressure at which lockout operates	bar		
30.	To be filled in only in case of hydraulic operating mechanism:			
	- Setting of pressure relief device	bar		
	- Rated pressure of hydraulic oil	bar		
	- Lowest oil pressure at which lockout	bar		
31.	Making coil			
	- Rated voltage	V DC	220	
	- min. operating voltage	V	176	
	- Rated power each	W		
32.	Trip coil			
	- Rated voltage	V DC	220	
	- min. operating voltage	V	110	
	- Rated power each	W		
33.	Motor voltage	V DC	220	
34.	Motor power	W		

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
35.	Total loss of heaters for 3 poles	W		
36.	Max. temperature rise of contacts at rated normal Current	K		
37.	Arc quenching medium		SF_6/VACUUM	
38.	Material of main contacts			
39.	Number of breaks in series (per pole)	No.		
	- for closing			
	- for opening			
40.	Single pole operation (only in Line Feeder Breakers)	Yes/No	No	
41.	Making coil:			
	- number	pcs		
42.	Trip coil:			
	- number	pcs	2	
43.	Gas quantity of complete breaker (3 Phase)	kg		
44.	Material of filter employed for the absorption of the products of combustion			
45.	Method of controlling voltage distribution between breaks (capacitor, resistor etc.)			
46.	Weight of complete 3 pole breaker	kg		
47.	Weight of heaviest part for shipment	kg		
Disconnector Switch				
1.	Model No.			
2.	Type tested	Yes/No	Yes	
3.	Type test report, Ref. No.			
4.	Standards to which disconnector conforms		IEC 62271-200	
5.	Power frequency withstand voltage across isolating distance	kV	80	
6.	Lightning impulse withstand voltage across isolating distance	kV	195	
7.	Rated normal current at 20 ^{0}C			
	- feeder disconnecting switch	A	1250	

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
	- bus coupler disconnecting switch	A	-	
	- BSC feeder disconnecting switch	A	-	
	- transformer feeder disconnecting switch	A	1600	
8.	Rated current at max. ambient temperature:			
	- line feeder disconnecting switch	A		
	- bus coupler disconnecting switch	A		
	- transformer feeder disconnecting switch	A		
9.	Voltage drop across terminals of one pole at rated current	mV		
10.	Rated breaking current (capacitive)	A		
11.	Rated momentary current (peak)	kA		
12.	Life duration of main contacts	operations		
13.	Material of main contacts			
14.	Auxiliary contacts:			
	- number (NO/NC)	pcs/pcs		
	- voltage rating	V DC	220	
	- current rating	A DC		
15.	Operating mechanism:			
	- for closing		electric motor	
	- for opening		electric motor	
16.	Manual operating facility	Yes/No	Yes	
17.	Motor voltage	V DC	220	
18.	Motor power	W		
19.	Hand operating facilities	Yes/No		
20.	Weight			
	- 3 phase unit with driving mechanism	kg		
21	Mechanism heater loss	W		
Maintenance Earthing Switch				
1.	Type tested	Yes/No	Yes	

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
2.	Type test report, Ref. No.			
3.	Standards to which earthing switch conforms			
4.	Life duration of main contacts	operations		
5.	Material of main contacts			
6.	Auxiliary contacts:			
	- number (NO/NC)	pcs/pcs		
	- voltage	V DC		
7.	Operating mechanism:			
	- for opening		Electric motor	
	- for closing		Electric motor	
8.	Motor voltage	V DC		
9.	Motor power	W		
10.	Hand operating facilities	Yes/No	Yes	
High Speed Earthing Switch				
1.	Type tested	Yes/No	Yes	
2.	Type test report, Ref. No.			
3.	Standards to which earthing switch conforms			
4.	Making current	kA r.m.s	25	
5.	Number of closing operations with maximum short circuit current before the contact maintenance becomes necessary	No	2	
6.	Short circuit withstand duration	s	1	
7.	Life duration of main contacts	operations		
8.	Material of main contacts			
9.	Auxiliary contacts:			
	- number (NO/NC)	pcs/pcs		
	- voltage	V DC		
10.	Operating mechanism:			
	- for closing			
	- for opening			

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
11.	Max. Operating time			
	- for closing	ms		
	- for opening	ms		
12.	Motor voltage	V DC		
13.	Motor power	W		
14.	Hand operating facilities	Yes/No	Yes	
Current Transformer				
	(These sheets to be copied and filled in for each different type of CTs)			
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Type			
4.	Standards to which CT conforms	IEC	IEC 61869-1&2	
5.	Rated secondary current	A	1	
6.	Rated primary current and number of cores	A	See Scope of Works and drawings	
7.	Rated momentary current (peak)	kA		
8.	Rated short-time current	kA		
9.	Measuring cores:			
	- Accuracy class		0.2s	
	- Burden			
	- Resistance of secondary winding at 75 ^{0}C	Ohms		
	- Instrument security factor			
10.	Protection cores:			
	- Accuracy class protection cores min. (higher class to be used wherever necessitated due to protection requirements)		5P	
	- Resistance of secondary winding protection cores at 75 0C	Ohms		
	- Resistance of secondary winding busbar protection cores at 75 0C	Ohms		
11.	Number of cores	Nos.	See Scope of Works and drawings	

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
12.	Knee point e.m.f. of protection cores	V		
13.	Knee point e.m.f. of busbar protection cores	V		
14.	Insulation material for windings			
15.	Limits on exciting current	A		
16.	Partial discharge			
Voltage Transformer				
	(These sheets to be copied and filled in for each different type of VTs)			
1.	Manufacturer's Name			
2.	Country of Manufacture			
3.	Type			
4.	Standards	IEC	IEC 61869-1&3	
5.	Method of transformation (inductive or capacitive)		inductive	
6.	Nominal primary voltage	kV	33/√3	
7.	Number of secondaries and accuracy class		See Scope of Works & Drawings	
8.	Thermal capacity of ground-fault detection winding	A/h		
9.	Rated burden (total on all secondaries)	VA		
10.	Partial discharge		acc. IEC 60044-4	
11.	Height	mm		
12.	Weight of single pole unit	kg		
Local Control Unit				
1.	Type			
2.	Manufacturer			
3.	Country of manufacture			
4.	Standards			
5.	Material			
6.	Thickness	mm		
7.	Surface finish			

36kV Gas Insulated Switchgear				
No	Item	Units	Required	Tendered
			36 kV	36 kV
8.	Dimensions: -			
	length	mm		
	width	mm		
	height	mm		
9.	Total net mass	kg		

Protection Equipment

220/33kV Transformer 220kV Protection IED				
No	Item	Units	Required	Tendered
1.	Manufacturer's Information			
	- Name & Address			
	- Country of Manufacture			
	- Relay type			
2.	Country of Origin			
3.	Model no.			
4.	Dimensions			
	- Width	mm		
	- Height	mm		
	- Depth	mm		
5.	Current Inputs			
	- Current Transformer			
	o Secondary current (In)	A	1	
	o No. of Inputs		8	
	- Thermal rating of current circuits			
	o Continuous		4 x In	
	o For 10s		30 x In	
	o For 1s		100 x In	
	- Burden	VA	≤0.1	
	- Rated Frequency	Hz	50	

220/33kV Transformer 220kV Protection IED				
No	Item	Units	Required	Tendered
	- Operating range	Hz	47 - 53	
5.	Voltage Inputs			
	- Voltage Transformer secondary			
	o Voltage (Phase-Phase) (Un)	V	110	
	o Operating Range	V	0 - 300	
	o No. of Inputs		5	
	- Thermal rating of voltage			
	o circuit (10s)	V	450	
	- Burden	VA	0.2VA at 110V	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
6.	Station DC voltage			
	- Station DC voltage Vdc=110V or 220V		Vdc +10% to -15%	
	- DC auxiliary Operating Voltage Range			
	o for 110V dc system	V	88 – 132	
	o for 220V dc system	V	176 - 264	
	- Maximum Relay Burden	VA	50	
7.	Binary Outputs			
	- No. of Binary Output contacts		≥ 23	
	- Voltage Vdc = 220V or 110V		Vdc ± 15%	
	- Breaking Capacity with L/R=40ms			
	o For nominal dc voltage 110V Systems		0.3A at 125V DC	
	o For nominal dc voltage 220V Systems		0.2A at 250V DC	
	- Carry Continuous	A	6	
	- Make and Carry for 0.2s	A	30	
8.	Binary Inputs			
	- No. of Binary Inputs		≥ 42	
	- Nominal Voltage Rating for 110V DC supply	V	110V DC	

220/33kV Transformer 220kV Protection IED				
No	Item	Units	Required	Tendered
	○ Pickup Threshold for 110V DC supply	V	88V DC	
	○ Drop off Threshold for 110V DC supply	V	66V DC	
	- Nominal Voltage Rating for 220V DC supply	V	220V DC	
	○ Pickup Threshold for 220V DC supply	V	176V DC	
	○ Drop off Threshold for 220V DC supply	V	132V DC	
9.	LED indications		≥ 15	
10.	Spare parts guarantee	Years	10	
11.	Warranty period and Warranty certificate		At least 10 years from the date of Commissioning	
12.	Design Features			
13.	Standard for communication with Remote equipment		Yes	
14.	Substation Automation		IEC 61850	
15.	Standards			
	- Temperature tests Cold		IEC 60068-2-1 (2007)	
	- Dry Heat		IEC 60068-2-2 (2007)	
	- Operation		0ºC to +70ºC	
	- Storage		0ºC to +85ºC	
	- Humidity		IEC 68-2-3(1984)	
	- Insulation		IEC 60255-27 (2013)	
	○ Dielectric Test		2kV AC 50Hz, 1min	
	○ Insulation resistance tests		500V DC	
	○ Impulse Voltage Test		5kV, 1.2/50 µs, 0.5J	
	- 1MHz burst disturbance tests		IEC 255-22-1(1988), ANSI/IEEE C37, 90.1-1989	
	- Electrostatic discharge tests		IEC 60255-26 (2013)	

220/33kV Transformer 220kV Protection IED				
No	Item	Units	Required	Tendered
	○ 2, 4, 6,8kV contact discharge		Yes	
	○ 2, 4, 8,15kV air discharge		Yes	
	- Fast transient tests (Burst)		IEC 60255-26 (2013)	
	○ 2kV/4kV 5kHz		Yes	
	- Power frequency magnetic		IEC 61000-4-9 (2001) 1000 A/m 50/60Hz permanent field	
	○ Field immunity test		Level 5	
	- Radio frequency		IEC 60255-26 (2013)	
	○ Conducted RFI Immunity		10Vrms	
	○ Radiated RFI Immunity		10V/m (Unmodulated)	
	- Emission			
	○ Cl.A EN 50081-2(1994)		Yes	
	○ (Industrial environment) EN 55011(1992)		Yes	
	○ CISPR 11(1990)		Yes	
	○ EN 55022(1995)		Yes	
	○ CISPR 22(1995)		Yes	
	- Seismic Test		IEC 60255-27(2013) / IEC 60255-21-3	
	○ Class 2		Yes	
16.	Functions			
	- Over excitation protection - 24		Yes	
	- Synchrocheck - 25			
	○ For HV Circuit Breaker		Yes	
	○ Availability of separate Synchrocheck for each circuit breaker in 1.5 circuit breaker stations			
	- Negative-sequence system overcurrent protection,			

220/33kV Transformer 220kV Protection IED				
No	Item	Units	Required	Tendered
	Unbalanced-load protection (thermal) - 46			
	- Thermal overload protection - 49		Yes	
	- HV Over Current Protection - 50/51 HV		Yes	
	- HV Earth Fault Protection - 50N/51N HV		Yes	
	- HV Directional Over Current & Earth Fault Protection - 67/67N HV		Yes	
	- HV Stand by Earth fault Protection - 51G HV		Yes	
	- HV Over/Under Voltage Protection - 27/59		Yes	
	- MV Over Current Protection - 50/51 MV		Yes	
	- MV Earth Fault Protection - 50N/51N MV		Yes	
	- LV Stand by Earth fault Protection - 51G LV		Yes	
	- Transformer differential Protection - 87T		Yes	
	- HV Transformer Restricted Ground-Fault Protection- 87N T		Yes	
	- LV Transformer Restricted Ground-Fault Protection- 87N T		Yes	
	- Availability of two sets of CT inputs for 1.5 Circuit Breaker Stations			
	- BCU function for HV side		Yes	
	- VTFF		Yes	
	- Ability to measure			
	o Active Power		Yes	
	o Reactive Power		Yes	
	o Apparent Power		Yes	
	o Power Factor		Yes	
	o Recording of Minimum /Maximum value		Yes	
	o Active Energy (Forward/Reverse)		Yes	

220/33kV Transformer 220kV Protection IED				
No	Item	Units	Required	Tendered
	○ Reactive Energy (Forward/Reverse)		Yes	
	- Basic Power Quality Measurements.			
	○ Voltage unbalance; voltage changes: overvoltage, dip, interruption; TDD(Total Demand Distortion), THD (Total Harmonic Distortion), and harmonics			
	- GPS Time Synchronization		Yes	
	○ Support for SNTP protocol		Yes	
	○ Support for IEEE 1588 protocol		Yes	
	- Rugged Design with Conformal Coating		Yes	
17.	IEC 61850 Conformance certificate			
	- Tested according to IEC61850 issued by an Independent laboratory empowered by UCA		Yes	

220/33kV Transformer 33kV Protection IED				
No	Item	Units	Required	Tendered
1.	Manufacturer's Information			
	- Name & Address			
	- Country of Manufacture			
	- Relay type			
2.	Country of Origin			
3.	Model no.			
4.	Dimensions			
	- Width	mm		
	- Height	mm		
	- Depth	mm		
5.	Current Inputs			
	- Current Transformer			

220/33kV Transformer 33kV Protection IED				
No	Item	Units	Required	Tendered
	○ Secondary current (In)	A	1	
	○ No. of Inputs		4	
	- Thermal rating of current circuits			
	○ Continuous		4 x In	
	○ For 10s		30 x In	
	○ For 1s		100 x In	
	- Burden	VA	≤0.1	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
5.	Voltage Inputs			
	- Voltage Transformer secondary			
	○ Voltage (Phase-Phase) (Un)	V	110	
	○ Operating Range	V	0 - 300	
	○ No. of Inputs		5	
	- Thermal rating of voltage			
	○ circuit (10s)	V	450	
	- Burden	VA	0.1VA at 110V	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
6.	Station DC voltage			
	- Station DC voltage Vdc=110V or 220V		Vdc +10% to -15%	
	- DC auxiliary Operating Voltage Range			
	○ for 110V dc system	V	88 – 132	
	○ for 220V dc system	V	176 - 264	
	- Maximum Relay Burden	VA	50	
7.	Binary Outputs			
	- No. of Binary Output contacts		≥ 12	
	- Voltage Vdc = 220V or 110V		Vdc ± 15%	
	- Breaking Capacity with L/R=40ms			

220/33kV Transformer 33kV Protection IED				
No	Item	Units	Required	Tendered
	○ For nominal dc voltage 110V Systems		0.3A at 125V DC	
	○ For nominal dc voltage 220V Systems		0.2A at 250V DC	
	- Carry Continuous	A	6	
	- Make and Carry for 0.2s	A	30	
8.	Binary Inputs			
	- No. of Binary Inputs		≥ 46	
	- Nominal Voltage Rating for 110V DC supply	V	110V DC	
	○ Pickup Threshold for 110V DC supply	V	88V DC	
	○ Drop off Threshold for 110V DC supply	V	66V DC	
	- Nominal Voltage Rating for 220V DC supply	V	220V DC	
	○ Pickup Threshold for 220V DC supply	V	176V DC	
	○ Drop off Threshold for 220V DC supply	V	132V DC	
9.	LED indications		≥ 15	
10.	Spare parts guarantee	Years	10	
11.	Warranty period and Warranty certificate		At least 10 years from the date of Commissioning	
12.	Design Features			
13.	Standard for communication with Remote equipment		Yes	
14.	Substation Automation		IEC 61850	
15.	Standards			
	- Temperature tests Cold		IEC 60068-2-1 (2007)	
	- Dry Heat		IEC 60068-2-2 (2007)	
	- Operation		0ºC to +70ºC	
	- Storage		0ºC to +85ºC	
	- Humidity		IEC 68-2-3(1984)	
	- Insulation		IEC 60255-27 (2013)	

220/33kV Transformer 33kV Protection IED				
No	Item	Units	Required	Tendered
	o Dielectric Test		2kV AC 50Hz, 1min	
	o Insulation resistance tests		500V DC	
	o Impulse Voltage Test		5kV, 1.2/50 µs, 0.5J	
	- 1MHz burst disturbance tests		IEC 255-22-1(1988), ANSI/IEEE C37, 90.1-1989	
	- Electrostatic discharge tests		IEC 60255-26 (2013)	
	o 2, 4, 6,8kV contact discharge		Yes	
	o 2, 4, 8,15kV air discharge		Yes	
	- Fast transient tests (Burst)		IEC 60255-26 (2013)	
	o 2kV/4kV 5kHz		Yes	
	- Power frequency magnetic		IEC 61000-4-9 (2001) 1000 A/m 50/60Hz permanent field	
	o Field immunity test		Level 5	
	- Radio frequency		IEC 60255-26 (2013)	
	o Conducted RFI Immunity		10Vrms	
	o Radiated RFI Immunity		10V/m (Unmodulated)	
	- Emission			
	o Cl.A EN 50081-2(1994)		Yes	
	o (Industrial environment) EN 55011(1992)		Yes	
	o CISPR 11(1990)		Yes	
	o EN 55022(1995)		Yes	
	o CISPR 22(1995)		Yes	
	- Seismic Test		IEC 60255-27(2013) / IEC 60255-21-3	
	o Class 2		Yes	
16.	Functions			

220/33kV Transformer 33kV Protection IED				
No	Item	Units	Required	Tendered
	- Synchrocheck - 25			
	o For MV Circuit Breaker		Yes	
	o Availability of separate Synchrocheck for each circuit breaker in 1.5 circuit breaker stations			
	- MV Over Current Protection - 50/51 MV		Yes	
	- MV Earth Fault Protection - 50N/51N MV		Yes	
	- MV Directional Over Current & Earth Fault Protection - 67/67N MV		Yes	
	- MV Over/Under Voltage Protection - 27/59		Yes	
	- Availability of two sets of CT inputs for 1.5 Circuit Breaker Stations			
	- LV Breaker Failure Protection - 50BF LV			
	- BCU function for MV side		Yes	
	- VTFF		Yes	
	- Ability to measure			
	o Active Power		Yes	
	o Reactive Power		Yes	
	o Apparent Power		Yes	
	o Power Factor		Yes	
	o Recording of Minimum /Maximum value		Yes	
	o Active Energy (Forward/Reverse)		Yes	
	o Reactive Energy (Forward/Reverse)		Yes	
	- Basic Power Quality Measurements.			
	o Voltage unbalance; voltage changes: overvoltage, dip, interruption; TDD(Total Demand Distortion), THD (Total Harmonic Distortion), and harmonics			

220/33kV Transformer 33kV Protection IED				
No	Item	Units	Required	Tendered
	- GPS Time Synchronization		Yes	
	o Support for SNTP protocol		Yes	
	o Support for IEEE 1588 protocol		Yes	
	- Rugged Design with Conformal Coating		Yes	
17.	IEC 61850 Conformance certificate			
	- Tested according to IEC61850 issued by an Independent laboratory empowered by UCA		Yes	

220kV, 33kV Bus Coupler/ Bus Section Protection IED				
No	Item	Units	Required	Tendered
1.	Manufacturer's Information			
	- Name & Address			
	- Country of Manufacture			
	- Relay type			
2.	Country of Origin			
3.	Model no.			
4.	Dimensions			
	- Width	mm		
	- Height	mm		
	- Depth	mm		
5.	Current Inputs			
	- Current Transformer			
	o Secondary current (In)	A	1	
	o No. of Inputs		8	
	- Thermal rating of current circuits			
	o Continuous		4 x In	
	o For 10s		30 x In	
	o For 1s		100 x In	
	- Burden	VA	≤0.1	

220kV, 33kV Bus Coupler/ Bus Section Protection IED				
No	Item	Units	Required	Tendered
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
5.	Voltage Inputs			
	- Voltage Transformer secondary			
	o Voltage (Phase-Phase) (Un)	V	110	
	o Operating Range	V	0 - 300	
	o No. of Inputs		5	
	- Thermal rating of voltage			
	o circuit (10s)	V	450	
	- Burden	VA	0.1VA at 110V	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
6.	Station DC voltage			
	- Station DC voltage Vdc=110V or 220V		Vdc +10% to -15%	
	- DC auxiliary Operating Voltage Range			
	o for 110V dc system	V	88 – 132	
	o for 220V dc system	V	176 - 264	
	- Maximum Relay Burden	VA	50	
7.	Binary Outputs			
	- No. of Binary Output contacts		≥ 18	
	- Voltage Vdc = 220V or 110V		Vdc ± 15%	
	- Breaking Capacity with L/R=40ms			
	o For nominal dc voltage 110V Systems		0.3A at 125V DC	
	o For nominal dc voltage 220V Systems		0.2A at 250V DC	
	- Carry Continuous	A	6	
	- Make and Carry for 0.2s	A	30	
7.	Binary Inputs			
	- No. of Binary Inputs		≥ 42	
	- Nominal Voltage Rating for 110V DC supply	V	110V DC	

220kV, 33kV Bus Coupler/ Bus Section Protection IED				
No	Item	Units	Required	Tendered
	○ Pickup Threshold for 110V DC supply	V	88V DC	
	○ Drop off Threshold for 110V DC supply	V	66V DC	
	- Nominal Voltage Rating for 220V DC supply	V	220V DC	
	○ Pickup Threshold for 220V DC supply	V	176V DC	
	○ Drop off Threshold for 220V DC supply	V	132V DC	
8.	LED indications		≥ 15	
9.	Spare parts guarantee	Years	10	
10.	Warranty period and Warranty certificate		At least 10 years from the date of Commissioning	
11.	Design Features		As Specified in chapter 5 of volume 5 of 8	
12.	Standard for communication with Remote equipment		Yes	
13.	Substation Automation		IEC 61850	
14.	Standards			
	- Temperature tests Cold		IEC 60068-2-1 (2007)	
	- Dry Heat		IEC 60068-2-2 (2007)	
	- Operation		0ºC to +70ºC	
	- Storage		0ºC to +85ºC	
	- Humidity		IEC 68-2-3(1984)	
	- Insulation		IEC 60255-27 (2013)	
	○ Dielectric Test		2kV AC 50Hz, 1min	
	○ Insulation resistance tests		500V DC	
	○ Impulse Voltage Test		5kV, 1.2/50 µs, 0.5J	
	- 1MHz burst disturbance tests		IEC 255-22-1(1988), ANSI/IEEE C37, 90.1-1989	

220kV, 33kV Bus Coupler/ Bus Section Protection IED				
No	Item	Units	Required	Tendered
	- Electrostatic discharge tests		IEC 60255-26 (2013)	
	o 2, 4, 6,8kV contact discharge		Yes	
	o 2, 4, 8,15kV air discharge		Yes	
	- Fast transient tests (Burst)		IEC 60255-26 (2013)	
	o 2kV/4kV 5kHz		Yes	
	- Power frequency magnetic		IEC 61000-4-9 (2001) 1000 A/m 50/60Hz permanent field	
	o Field immunity test		Level 5	
	- Radio frequency		IEC 60255-26 (2013)	
	o Conducted RFI Immunity		10Vrms	
	o Radiated RFI Immunity		10V/m (Unmodulated)	
	- Emission			
	o Cl.A EN 50081-2(1994)		Yes	
	o (Industrial environment) EN 55011(1992)		Yes	
	o CISPR 11(1990)		Yes	
	o EN 55022(1995)		Yes	
	o CISPR 22(1995)		Yes	
	- Seismic Test		IEC 60255-27(2013) / IEC 60255-21-3	
	o Class 2		Yes	
15.	Functions			
	- Synchrocheck - 25		Yes	
	- Over Current Protection - 50/51		Yes	
	- Earth Fault Protection - 50N/51N		Yes	
	- Directional Over Current & Earth Fault Protection - 67/67N		Yes	
	- Over/Under Voltage Protection - 27/59		Yes	
	- Breaker Failure Protection - 50BF		Yes	

220kV, 33kV Bus Coupler/ Bus Section Protection IED				
No	Item	Units	Required	Tendered
	- BCU function		Yes	
	- VTFF		Yes	
	- Ability to measure			
	o Active Power		Yes	
	o Reactive Power		Yes	
	o Apparent Power		Yes	
	o Power Factor		Yes	
	o Recording of Minimum /Maximum value		Yes	
	o Active Energy (Forward/Reverse)		Yes	
	o Reactive Energy (Forward/Reverse)		Yes	
	- Basic Power Quality Measurements.			
	o Voltage unbalance; voltage changes: overvoltage, dip, interruption; TDD(Total Demand Distortion), THD (Total Harmonic Distortion), and harmonics			
	- GPS Time Synchronization		Yes	
	o Support for SNTP protocol		Yes	
	o Support for IEEE 1588 protocol		Yes	
	- Rugged Design with Conformal Coating		Yes	
16.	IEC 61850 Conformance certificate			
	- Tested according to IEC61850 issued by an Independent laboratory empowered by UCA		Yes	

220kV Bus bar Protection Central IED				
No	Item	Units	Required	Tendered
1.	Manufacturer's Information			
	- Name & Address			
	- Country of Manufacture			

220kV Bus bar Protection Central IED				
No	Item	Units	Required	Tendered
	- Relay type			
2.	Country of Origin			
3.	Model no.			
4.	Dimensions			
	- Width	mm		
	- Height	mm		
	- Depth	mm		
5.	Current Inputs			
	- Current Transformer			
	o Secondary current (In)	A		
	o No. of Inputs		0	
	- Thermal rating of current circuits			
	o Continuous			
	o For 10s			
	o For 1s			
	- Burden	VA		
	- Rated Frequency	Hz		
	- Operating range	Hz		
5.	Voltage Inputs			
	- Voltage Transformer secondary			
	o Voltage (Phase-Phase) (Un)	V		
	o Operating Range	V		
	o No. of Inputs		0	
	- Thermal rating of voltage			
	o circuit (10s)	V		
	- Burden	VA		
	- Rated Frequency	Hz		
	- Operating range	Hz		
6.	Station DC voltage			
	- Station DC voltage Vdc=110V or 220V		Vdc +10% to -15%	

220kV Bus bar Protection Central IED				
No	Item	Units	Required	Tendered
	- DC auxiliary Operating Voltage Range			
	o for 110V dc system	V	88 – 132	
	o for 220V dc system	V	176 - 264	
	- Maximum Relay Burden	VA	50	
7.	Binary Outputs			
	- No. of Binary Output contacts		≥ 12	
	- Voltage Vdc = 220V or 110V		Vdc ± 15%	
	- Breaking Capacity with L/R=40ms			
	o For nominal dc voltage 110V Systems		0.3A at 125V DC	
	o For nominal dc voltage 220V Systems		0.2A at 250V DC	
	- Carry Continuous	A	6	
	- Make and Carry for 0.2s	A	30	
8.	Binary Inputs			
	- No. of Binary Inputs		≥ 3	
	- Nominal Voltage Rating for 110V DC supply	V	110V DC	
	o Pickup Threshold for 110V DC supply	V	88V DC	
	o Drop off Threshold for 110V DC supply	V	66V DC	
	- Nominal Voltage Rating for 220V DC supply	V	220V DC	
	o Pickup Threshold for 220V DC supply	V	176V DC	
	o Drop off Threshold for 220V DC supply	V	132V DC	
9.	LED indications		≥ 15	
10.	Spare parts guarantee	Years	10	
11.	Warranty period and Warranty certificate		At least 10 years from the date of Commissioning	
12.	Design Features		As Specified in Chapter 5 of Technical Specifications-Vol 5 of 8.	

220kV Bus bar Protection Central IED				
No	Item	Units	Required	Tendered
13.	Standard for communication with Remote equipment		Yes	
14.	Substation Automation		IEC 61850	
15.	Standards			
	- Temperature tests Cold		IEC 60068-2-1 (2007)	
	- Dry Heat		IEC 60068-2-2 (2007)	
	- Operation		0ºC to +70ºC	
	- Storage		0ºC to +85ºC	
	- Humidity		IEC 68-2-3(1984)	
	- Insulation		IEC 60255-27 (2013)	
	o Dielectric Test		2kV AC 50Hz, 1min	
	o Insulation resistance tests		500V DC	
	o Impulse Voltage Test		5kV, 1.2/50 µs, 0.5J	
	- 1MHz burst disturbance tests		IEC 255-22-1(1988), ANSI/IEEE C37, 90.1-1989	
	- Electrostatic discharge tests		IEC 60255-26 (2013)	
	o 2, 4, 6,8kV contact discharge		Yes	
	o 2, 4, 8,15kV air discharge		Yes	
	- Fast transient tests (Burst)		IEC 60255-26 (2013)	
	o 2kV/4kV 5kHz		Yes	
	- Power frequency magnetic		IEC 61000-4-9 (2001) 1000 A/m 50/60Hz permanent field	
	o Field immunity test		Level 5	
	- Radio frequency		IEC 60255-26 (2013)	
	o Conducted RFI Immunity		10Vrms	
	o Radiated RFI Immunity		10V/m (Unmodulated)	

220kV Bus bar Protection Central IED				
No	Item	Units	Required	Tendered
	- Emission			
	o Cl.A EN 50081-2(1994)		Yes	
	o (Industrial environment) EN 55011(1992)		Yes	
	o CISPR 11(1990)		Yes	
	o EN 55022(1995)		Yes	
	o CISPR 22(1995)		Yes	
	- Seismic Test		IEC 60255-27(2013) / IEC 60255-21-3	
	o Class 2		Yes	
16.	Functions			
	- Busbar differential protection - 87B		Yes	
	- 1/3-pole or 3-pole circuit-breaker failure protection - 50BF		Yes	
	- End-fault protection - 50EFP		Yes	
	- Over Current Protection - 50/51		Yes	
	- Earth Fault Protection - 50N/51N		Yes	
	- Disconnector-independent check zone as additional tripping criterion		Yes	
	- HMI (LCD Display)		Yes	
	- Event Log			
	o Capacity of event log			
	- Fault Recorder: It shall be possible to record all analogue inputs, binary inputs and binary outputs.		Yes	
	o Sampling frequency		Yes	
	o Recording duration			
	o no. of records possible with available storage		Yes	
	- User-friendliness		Yes	
	o Configuration by the user during the entire service life		Yes	
17.	IEC 61850 Conformance certificate			

220kV Bus bar Protection Central IED				
No	Item	Units	Required	Tendered
	- Tested according to IEC61850 issued by an Independent laboratory empowered by UCA		Yes	

220kV Bus bar Protection Bay IED				
No	Item	Units	Required	Tendered
1.	Manufacturer's Information			
	- Name & Address			
	- Country of Manufacture			
	- Relay type			
2.	Country of Origin			
3.	Model no.			
4.	Dimensions			
	- Width	mm		
	- Height	mm		
	- Depth	mm		
5.	Current Inputs			
	- Current Transformer			
	o Secondary current (In)	A	1	
	o No. of Inputs		4	
	- Thermal rating of current circuits			
	o Continuous		4 x In	
	o For 10s		30 x In	
	o For 1s		100 x In	
	- Burden	VA	≤0.1	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
5.	Voltage Inputs			
	- Voltage Transformer secondary			
	o Voltage (Phase-Phase) (Un)	V		

220kV Bus bar Protection Bay IED				
No	Item	Units	Required	Tendered
	○ Operating Range	V		
	○ No. of Inputs		0	
	- Thermal rating of voltage			
	○ circuit (10s)	V		
	- Burden	VA		
	- Rated Frequency	Hz		
	- Operating range	Hz		
6.	Station DC voltage			
	- Station DC voltage Vdc=110V or 220V		Vdc +10% to -15%	
	- DC auxiliary Operating Voltage Range			
	○ for 110V dc system	V	88 – 132	
	○ for 220V dc system	V	176 - 264	
	- Maximum Relay Burden	VA	50	
7.	Binary Outputs			
	- No. of Binary Output contacts		≥ 6	
	- Voltage Vdc = 220V or 110V		Vdc ± 15%	
	- Breaking Capacity with L/R=40ms			
	○ For nominal dc voltage 110V Systems		0.3A at 125V DC	
	○ For nominal dc voltage 220V Systems		0.2A at 250V DC	
	- Carry Continuous	A	6	
	- Make and Carry for 0.2s	A	30	
8.	Binary Inputs			
	- No. of Binary Inputs		≥ 13	
	- Nominal Voltage Rating for 110V DC supply	V	110V DC	
	○ Pickup Threshold for 110V DC supply	V	88V DC	
	○ Drop off Threshold for 110V DC supply	V	66V DC	
	- Nominal Voltage Rating for 220V DC supply	V	220V DC	

220kV Bus bar Protection Bay IED				
No	Item	Units	Required	Tendered
	○ Pickup Threshold for 220V DC supply	V	176V DC	
	○ Drop off Threshold for 220V DC supply	V	132V DC	
9.	LED indications		≥ 15	
10.	Spare parts guarantee	Years	10	
11.	Warranty period and Warranty certificate		At least 10 years from the date of Commissioning	
12.	Design Features		As Specified in Chapter 5 of Technical Specifications-Vol 5 of 8.	
13.	Standard for communication with Remote equipment		Yes	
14.	Substation Automation		IEC 61850	
15.	Standards			
	- Temperature tests Cold		IEC 60068-2-1 (2007)	
	- Dry Heat		IEC 60068-2-2 (2007)	
	- Operation		0ºC to +70ºC	
	- Storage		0ºC to +85ºC	
	- Humidity		IEC 68-2-3(1984)	
	- Insulation		IEC 60255-27 (2013)	
	○ Dielectric Test		2kV AC 50Hz, 1min	
	○ Insulation resistance tests		500V DC	
	○ Impulse Voltage Test		5kV, 1.2/50 µs, 0.5J	
	- 1MHz burst disturbance tests		IEC 255-22-1(1988), ANSI/IEEE C37, 90.1-1989	
	- Electrostatic discharge tests		IEC 60255-26 (2013)	
	○ 2, 4, 6,8kV contact discharge		Yes	
	○ 2, 4, 8,15kV air discharge		Yes	

220kV Bus bar Protection Bay IED				
No	Item	Units	Required	Tendered
	- Fast transient tests (Burst)		IEC 60255-26 (2013)	
	o 2kV/4kV 5kHz		Yes	
	- Power frequency magnetic		IEC 61000-4-9 (2001) 1000 A/m 50/60Hz permanent field	
	o Field immunity test		Level 5	
	- Radio frequency		IEC 60255-26 (2013)	
	o Conducted RFI Immunity		10Vrms	
	o Radiated RFI Immunity		10V/m (Unmodulated)	
	- Emission			
	o Cl.A EN 50081-2(1994)		Yes	
	o (Industrial environment) EN 55011(1992)		Yes	
	o CISPR 11(1990)		Yes	
	o EN 55022(1995)		Yes	
	o CISPR 22(1995)		Yes	
	- Seismic Test		IEC 60255-27(2013) / IEC 60255-21-3	
	o Class 2		Yes	
16.	Functions			
	- Busbar differential protection - 87B		Yes	
	- 1/3-pole or 3-pole circuit-breaker failure protection - 50BF		Yes	
	- End-fault protection - 50EFP		Yes	
	- Over Current Protection - 50/51		Yes	
	- Earth Fault Protection - 50N/51N		Yes	
	- Disconnector-independent check zone as additional tripping criterion		Yes	
	- HMI (LCD Display)		Yes	
	- Event Log			

220kV Bus bar Protection Bay IED				
No	Item	Units	Required	Tendered
	○ Capacity of event log			
	- Fault Recorder: It shall be possible to record all analogue inputs, binary inputs and binary outputs.		Yes	
	○ Sampling frequency		Yes	
	○ Recording duration			
	○ no. of records possible with available storage		Yes	
	- User-friendliness		Yes	
	○ Configuration by the user during the entire service life		Yes	
17.	IEC 61850 Conformance certificate			
	- Tested according to IEC61850 issued by an Independent laboratory empowered by UCA		Yes	

33kV Feeder Protection IED				
No	Item	Units	Required	Tendered
1.	Manufacturer's Information			
	- Name & Address			
	- Country of Manufacture			
	- Relay type			
2.	Country of Origin			
3.	Model no.			
4.	Dimensions			
	- Width	mm		
	- Height	mm		
	- Depth	mm		
5.	Current Inputs			
	- Current Transformer			
	○ Secondary current (In)	A	1	
	○ No. of Inputs		5	

33kV Feeder Protection IED				
No	Item	Units	Required	Tendered
	- Thermal rating of current circuits			
	o Continuous		4 x In	
	o For 10s		30 x In	
	o For 1s		100 x In	
	- Burden	VA	≤0.1	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
5.	Voltage Inputs			
	- Voltage Transformer secondary			
	o Voltage (Phase-Phase) (Un)	V	110	
	o Operating Range	V	0 – 300	
	o No. of Inputs		5	
	- Thermal rating of voltage			
	o circuit (10s)	V	450	
	- Burden	VA	≤0.1 at 110V	
	- Rated Frequency	Hz	50	
	- Operating range	Hz	47 - 53	
6.	Station DC voltage			
	- Station DC voltage Vdc=110V or 220V		Vdc +10% to -15%	
	- DC auxiliary Operating Voltage Range			
	o for 110V dc system	V	88 – 132	
	o for 220V dc system	V	176 - 264	
	- Maximum Relay Burden	VA	50	
7.	Binary Outputs			
	- No. of Binary Output contacts		≥ 18	
	- Voltage Vdc = 220V or 110V		Vdc ± 15%	
	- Breaking Capacity with L/R=40ms			
	o For nominal dc voltage 110V Systems		0.3A at 125V DC	
	o For nominal dc voltage 220V Systems		0.2A at 250V DC	

33kV Feeder Protection IED				
No	Item	Units	Required	Tendered
	- Carry Continuous	A	6	
	- Make and Carry for 0.2s	A	30	
8.	Binary Inputs			
	- No. of Binary Inputs		≥ 42	
	- Nominal Voltage Rating for 110V DC supply	V	110V DC	
	○ Pickup Threshold for 110V DC supply	V	88V DC	
	○ Drop off Threshold for 110V DC supply	V	66V DC	
	- Nominal Voltage Rating for 220V DC supply	V	220V DC	
	○ Pickup Threshold for 220V DC supply	V	176V DC	
	○ Drop off Threshold for 220V DC supply	V	132V DC	
9.	LED indications		≥ 15	
10.	Spare parts guarantee	Years	10	
11.	Warranty period and Warranty certificate		At least 10 years from the date of Commissioning	
12.	Design Features		As Specified in Chapter 5 of Technical Specifications-Vol 5 of 8.	
13.	Standard for communication with Remote equipment		Yes	
14.	Substation Automation		IEC 61850	
15.	Standards			
	- Temperature tests Cold		IEC 60068-2-1 (2007)	
	- Dry Heat		IEC 60068-2-2 (2007)	
	- Operation		0ºC to +70ºC	
	- Storage		0ºC to +85ºC	
	- Humidity		IEC 68-2-3(1984)	
	- Insulation		IEC 60255-27 (2013)	

33kV Feeder Protection IED				
No	Item	Units	Required	Tendered
	o Dielectric Test		2kV AC 50Hz, 1min	
	o Insulation resistance tests		500V DC	
	o Impulse Voltage Test		5kV, 1.2/50 µs, 0.5J	
	- 1MHz burst disturbance tests		IEC 255-22-1(1988), ANSI/IEEE C37, 90.1-1989	
	- Electrostatic discharge tests		IEC 60255-26 (2013)	
	o 2, 4, 6,8kV contact discharge		Yes	
	o 2, 4, 8,15kV air discharge		Yes	
	- Fast transient tests (Burst)		IEC 60255-26 (2013)	
	o 2kV/4kV 5kHz		Yes	
	- Power frequency magnetic		IEC 61000-4-9 (2001) 1000 A/m 50/60Hz permanent field	
	o Field immunity test		Level 5	
	- Radio frequency		IEC 60255-26 (2013)	
	o Conducted RFI Immunity		10Vrms	
	o Radiated RFI Immunity		10V/m (Unmodulated)	
	- Emission			
	o Cl.A EN 50081-2(1994)		Yes	
	o (Industrial environment) EN 55011(1992)		Yes	
	o CISPR 11(1990)		Yes	
	o EN 55022(1995)		Yes	
	o CISPR 22(1995)		Yes	
	- Seismic Test		IEC 60255-27(2013) / IEC 60255-21-3	
	o Class 2		Yes	
16.	Functions			

33kV Feeder Protection IED				
No	Item	Units	Required	Tendered
	- Synchrocheck - 25		Yes	
	- Over Current Protection - 50/51		Yes	
	- Earth Fault Protection - 50N/51N		Yes	
	- Directional Over Current & Earth Fault Protection - 67/67N		Yes	
	- Over/Under Voltage Protection - 27/59		Yes	
	- Breaker Failure Protection - 50BF		Yes	
	- Auto Reclose - 79		Yes	
	- Frequency protection - 81, 81O, 81U, 81R		Yes	
	- BCU		Yes	
	- VTFF		Yes	
	- Ability to measure			
	o Active Power		Yes	
	o Reactive Power		Yes	
	o Apparent Power		Yes	
	o Power Factor		Yes	
	o Recording of Minimum /Maximum value		Yes	
	o Active Energy (Forward/Reverse)		Yes	
	o Reactive Energy (Forward/Reverse)		Yes	
	- Basic Power Quality Measurements.			
	o Voltage unbalance; voltage changes: overvoltage, dip, interruption; TDD(Total Demand Distortion), THD (Total Harmonic Distortion), and harmonics		Yes	
	- GPS Time Synchronization		Yes	
	o Support for SNTP protocol		Yes	
	o Support for IEEE 1588 protocol		Yes	
	- Rugged Design with Conformal Coating		Yes	
17.	IEC 61850 Conformance certificate			

33kV Feeder Protection IED				
No	Item	Units	Required	Tendered
	- Tested according to IEC61850 issued by an Independent laboratory empowered by UCA		Yes	

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
(A)	**Rating and Performance**			
1.	Manufacturer's name and address			
2.	Continuous maximum rating (ONAN/ONAF)	MVA	48/63	
3.	Number of phases		3	
4.	Rated Frequency	Hz	50	
5.	Number of Windings		2	
6.	Applicable standards		IEC 60076:2011	
7.	System maximum voltages			
	- HV	kV	245	
	- MV	kV	36	
8.	Winding Insulation			
	- HV		Graded	
	- MV		Uniform	
9.	Highest voltage for equipment			
	- HV	kV	245	
	- MV	kV	36	
10.	Winding insulation levels			
	- HV		LI: 1050, AC: 460	
	- MV		LI: 170, AC: 70	
11.	Transformer nominal ratio		220 kV/ 33 kV	
12.	Phase connections			
	- HV winding		Star	
	- MV winding		Delta	

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	- Vector group		YNd1	
13.	Short circuit withstand fault level at terminals of			
	- 245 kV Busbars	kA	40	
	- 36 kV Busbars - Short circuit current duration	kA sec	25 3	
14.	Type of cooling		ONAN/ONAF	
15.	External cooling medium		Air	
16.	Service conditions			
	• Altitude not exceeding	m	1000	
	• Air temperature not exceeding	^{0}C	40	
	• Average air temperature in any one year not exceeding - In any one day - Average in one year	 ^{0}C ^{0}C	 32 30	
17.	On load tap changer			
	(a) Type		M.R. Germany	
	(b) Category of voltage control		CFVV	
	(c) HV or LV winding		HV	
	(d) Range (+ & -) (e) Interrupter		+7 to -10 Vacuum Type	
	(f) Step size	%	1.5	
	(g) Power frequency withstand test voltage between first and last contacts of the selector switch between any two adjacent contacts of the selector between diverter and switch contacts	kV		
	(h) Type test certificate reference			
	(i) Tap position indication	2nos BCD		
18.	Size of tapping step with position nos.		18 taps 1.5% step voltage	
19.	Approximate ONAN rating	MVA	33	
20.	Winding temperature rise at CMR	^{0}C	55	
21.	Top oil temperature rise			

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	(a) CMR	^{0}C	50	
	(b) ONAN rating	^{0}C		
22.	Maximum hot spot temperature at CMR	^{0}C	98	
23.	Maximum winding hot spot temperature of transformer at			
	(a) Normal Cyclic Loading (IEC 60076-7)	^{0}C	120	
	(b) Long time emergency loadings (IEC 60076-7)	^{0}C	140	
	(c) Short time emergency loading (IEC 60076-7)	^{0}C	160	
24.	Flux density in iron at nominal voltage and frequency and at nominal ratio – (no load)			
	(a) Core	Tesla		
	(b) Yokes	Tesla		
25.	Magnetizing current (approx) at nominal ratio and			
	- At 0.9 x nominal voltage	%		
	- At 1.0 x nominal voltage	%		
	- At 1.1 x normal voltage	%		
	- At 1.2 x normal voltage	%		
26.	Guaranteed losses at 75 ^{0}C			
	- No load losses at rated voltage, frequency and at nominal tap position	kW	Maximum 27.5	
	- Load losses at maximum tap position at ONAN base	kW		
	- Load losses at nominal tap position at ONAN base	kW		
	- Load loss at minimum tap position at ONAN base	kW		
	- Load losses at maximum tap position at ONAF base	kW		
	- Load losses at nominal tap position at ONAF base	kW	Maximum 160	
	- Load loss at minimum tap position at ONAF base	kW		
	- Auxiliary losses at CMR corrected to 75^{0}C	kW	Maximum 3	
	- Total losses at nominal tap position at ONAN base	kW		
	- Total losses at nominal tap position at ONAF base	kW		

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
27.	Efficiency referred to 75 ^{0}C and nominal ratio			
	(a) 100 % CMR at unity power factor	%		
	(b) 75 % CMR at unity power factor	%		
	(c) 50 % CMR at unity power factor	%		
	(d) 25 % CMR at unity power factor	%		
	(e) 100 % CMR at 0.8 power factor	%		
	(f) 75 % CMR at 0.8 power factor	%		
	(g) 50 % CMR at 0.8 power factor	%		
	(h) 25 % CMR at 0.8 power factor	%		
28.	Voltage regulation referred to 75 ^{0}C and nominal ratio			
	(a) 100 % CMR at unity power factor	%		
	(b) 75 % CMR at unity power factor	%		
	(c) 50 % CMR at unity power factor	%		
	(d) 25 % CMR at unity power factor	%		
	(e) 100 % CMR at 0.8 power factor	%		
	(f) 75 % CMR at 0.8 power factor	%		
	(g) 50 % CMR at 0.8 power factor	%		
	(h) 25 % CMR at 0.8 power factor	%		
29.	Impedance voltage at 75 ^{0}C			
	(a) For nominal tap position between HV and MV windings at ONAN rating	%		
	(b) For nominal tap position between HV and MV windings at ONAF rating	%	11.00	
	(c) For maximum tap position between HV and MV windings at ONAN rating	%		
	(d) For maximum tap position between HV and MV windings at ONAF rating	%		
	(e) For minimum tap position between HV and MV windings at ONAN rating	%		
	(f) For minimum tap position between HV and MV windings at ONAF rating	%		

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
30.	Equivalent zero sequence impedance between HV and LV windings			
31.	Maximum current density in windings at CMR			
	(a) HV winding	A/mm^2		
	(b) MV winding	A/mm^2		
32	Transformer warranty period	Years	2	
(B)	**Control Circuits**			
1.	Type of controls for on load tap changer and cooler controls		Automatic	
2.	Whether automatic control required		Yes	
	Reference voltage (VT output line to line)	V	220 AC (50 Hz)	
3.	Whether load compensation required on the AVR		Yes	
4.	Whether separate remote control panel required		Yes	
5.	Estimated distance between remote control point and transformer	m	<110	
6.	DC Supply (Control voltage)			
	- Nominal	V DC	220	
	- Maximum float voltage	V DC		
7.	AC supply voltage for tap changer operating motor 3 phase		400 V AC 50 Hz	
8.	Whether provision for supervisory control required, including AVR setting		Yes	
9.	Whether marshalling kiosk required		Yes/No	
10.	Transformer terminals for line and neutral			
	(a) HV line For Mannar GSS		Outdoor Bushings (with RTV Silicone Coating)	
	(b) MV line		Multi-Terminal Plug-in Type	
	(c) Neutral		Outdoor Bushings	
	(Attach all technical data of all types of bushings & ducts)			
11.	Accommodation for current transformers bushings at			
	(a) HV line			
	(b) MV line			

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	(c) Neutral			
12.	Accommodation of tank for outdoor weatherproof HV neutral current transformers			
13.	Pollution category of bushings Creepage distance based on system highest voltage	mm/kV	53.7	
(C)	**Cooling**			
1.	Minimum number of radiators per transformer			
2.	Maximum rating of each radiator as percentage of total loss at CMR	%		
3.	Cooling capacity 100% with one fan out of order		Yes	
(D)	**General**			
1.	Type of oil preservation system		Conservator with silica gel breather	
2.	Whether wheels, skid or flat base required		Wheels	
3.	Whether anti-vibration pads required		No	
4.	Transformer Sound Pressure Level	dB(A)	78	
(E)	**Details of Construction**			
1.	Types of winding			
	(a) HV			
	(b) MV			
2.	Material of Insulation			
	(a) HV			
	(b) MV			
3.	Insulation of tapping connections			
4.	Insulation of			
	(a) Yoke bolts			
	(b) Side plates			
5.	Winding connection brazed or crimped (specify winding and joint material)			
6.	Is facility for adjustment of axial pressure on windings	Yes/ No		
7	Thickness of transformer tank			
	(a) Sides	mm		

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	(b) Bottom	mm		
	(c) Cover	mm		
8.	Material used for gaskets for oil tight joints			
9.	Cover Flange			
	- Level	Low/high		
	- Joint	Welded		
10.	Maximum vacuum pressure safely withstand by tank	Pa		
(F)	**Radiators and Fans**			
1.	Thickness of radiator plates and/ or cooling tubes			
2.	Equipment for ONAN cooling state (a) or (b) (a) Radiator on main tank (b) Separate cooler bank			
3.	Number of cooling air blowers per transformer			
4.	Speed of air blowers and air flow	rpm/m^3 per min		
5.	Rating of each air blower motor	kW		
6.	Starting current of each air blower motor	A		
(G)	**Oil volumes, weights and dimensions**			
1.	Total oil required including cooler system	Liters		
2.	Volume of oil to fill transformer above the top yoke	Liters		
3.	Capacity of conservator	Liters		
4.	Volume of oil in conservator between highest and lowest visible points	Liters		
5.	Weight of core and winding assembly	Tons		
6.	Weight of each oil cooler bank complete with oil if mounted separately from transformer	Tons		
7.	Total weight of complete transformer, including attached coolers, voltage regulating equipment, all fittings and oil	Tons		
8.	Weight of transformer arranged for transport	Tons		
9.	Overall dimensions including bushings			

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	- Height	mm		
	- Depth	mm		
	- Width	mm		
10.	Shipping dimensions			
	- Height	mm		
	- Depth	mm		
	- Width	mm		
11.	Minimum space required for transformer bay			
	- Depth	mm		
	- Width	mm		
(H)	**Transformer oil**			
1.	Manufacturer			
2.	Type		Uninhibited	
3.	Class		1	
4.	Standard		IEC60296	
(I)	**Transformer parts subject to Short circuit test**			
1.	Demonstration of ability to withstand short circuit as per IEC 60076-5: 2006	(Yes / No)	Yes	
(J)	**Transformer bushing**			
1.	220 kV Bushings			
	- Manufacturer			
	- Insulator material (Solid/oil-paper)			
	- Manufacturer's type reference and rated voltage			
	- Rated current	A		
	- Manufacturer of porcelain			
	- Length of insulator (Overall)	mm		
	- Weight of insulator	kg		
	- Electrostatic capacity of complete bushings.	pF		
	- Dry lightning impulse voltage (1.2/50 wave) test voltage	kV		

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	- 50 Hz dry voltage withstand test voltage without arching horns	kV		
	- 50 Hz wet voltage withstand test voltage without arching horns	kV		
	- Total creepage distance of shed (USCD minimum 53.7mm/kV based on maximum system voltage)	mm		
	- Capacitive voltage tap available for testing purposes		Yes	
2.	33 kV Bushings			
	- Manufacturer			
	- Insulator material (Solid/oil-paper)			
	- Manufacturer's type reference and rated voltage			
	- Rated current	A		
	- Manufacturer of porcelain			
	- Length of insulator (Overall)	mm		
	- Weight of insulator	kg		
	- Electrostatic capacity of complete bushings.	pF		
	- Dry lightning impulse voltage (1.2/50 wave) test voltage	kV		
	- 50 Hz dry voltage withstand test voltage without arching horns	kV		
	- 50 Hz wet voltage withstand test voltage without arching horns	kV		
	- Total creepage distance of shed (USCD minimum 53.7mm/kV based on maximum system voltage)	mm		
	- Capacitive voltage tap available for testing purposes		Yes/No	
3.	220kV Neutral Bushings			
	- Manufacturer			
	- Insulator material (Solid/oil-paper)			
	- Manufacturer's type reference and rated voltage			
	- Rated current	A		
	- Manufacturer of porcelain			
	- Length of insulator (Overall)	mm		
	- Weight of insulator	kg		

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
	- Electrostatic capacity of complete bushings.	pF		
	- Dry lightning impulse voltage (1.2/50 wave) test voltage	kV		
	- 50 Hz dry voltage withstand test voltage without arching horns	kV		
	- 50 Hz wet voltage withstand test voltage without arching horns	kV		
	- Total creepage distance of shed (USCD minimum 53.7mm/kV based on maximum system voltage)	mm		
	- Capacitive voltage tap available for testing purposes		Yes/No	
(K)	**Transformer tank Fittings**			
1	Draining and filter valves (a) Type (b) Material for 75 mm and below (c) Material for above 75 mm		Yes Gate/ Ball Gunmetal	
2	Valves for tank oil sampling (a) Type (b) Material		Yes Gunmetal	
3	Radiator isolation valves (a) Type (b) Material for 75 mm and below (c) Material for above 75 mm		Yes Gunmetal	
4	Pulling eyes for complete transformer		yes	
5	Supports for hydraulic jacks		yes	
6	Lifting lugs		yes	
7	Tank earth terminals		yes	
8	Core earth terminal box		yes	
9	Inspection manholes		yes	
10	Ladder		yes	
11	Skids or wheels adjustable in two directions		yes	
(L)	**Transformer accessories**			
1	Oil preservation system with or without rubber bag		Yes	
2	Dehydrating breather		Yes	
3	Oil level indicator of magnetic type		Yes	
4	Contact thermometer for the oil temperature		Yes	
5	Winding temperature indicator		Yes	

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
6	Direct winding temperature measurement using fibre optic sensors		Yes	
7	Pressure relief device		Yes	
8	Rapid pressure relay		Yes	
9	Buchholz relay		Yes	
10	Buchholz relay gas sampling		Yes	
11	On-line gas monitor		No	
12	On-line monitoring system		No	
13	Fire protection system		Required	
(M)	**Quality Assurance**			
1	Manufacturer quality assurance acc. to ISO 9001 and 14001		Yes	
2	Manufacturer Quality Manual is submitted with offer		Yes	
3	Manufacturer a sample of Quality Inspection and Test Plan is submitted with offer		Yes	
(N)	**Other Information**			
1.	Negative pressure tank can withstand			
2.	Type & Special test Certificate for similar category transformer	To be annexed	Yes	
3.	Customer reference list for similar category Transformers	To be annexed	Yes	
4.	Tests carried out at the manufacture's work as per IEC 60076-1:2011	To be annexed	Yes	
(O)	**Routine tests at manufacturers works (IEC 60076-1:2011)**			
1	Measurement of winding resistance (11.2).		Yes	
2	Measurement of voltage ratio and check of phase displacement (11.3).		Yes	
3	Measurement of short-circuit impedance and load loss (11.4).		Yes	
4	Measurement of no-load loss and current (11.5).		Yes	
5	Dielectric routine tests (IEC60076-3).		Yes	
6	Tests on on-load tap-changers (11.7).		Yes	
7	Leak testing with pressure for liquid- immersed transformers (tightness test) (11.8).		Yes	

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
8	Check of the ratio and polarity of built-in current transformers.		Yes	
9	Check of core and frame insulation for liquid immersed transformers with core or frame insulation (11.12).		Yes	
10	Insulation of Auxiliary wiring (IEC 60076 , part 3)		Yes	
11	Partial discharge measurement (IEC 60076 , part 3		Yes	
12	Determination of capacitances windings- to-earth and between windings		Yes	
13	Measurement of d.c. insulation resistance between each winding to earth and between windings.		Yes	
14	Measurement of dissipation factor (tan δ) of the insulation system capacitances.		Yes	
15	Measurement of no-load loss and current at 90 % and 110 % of rated voltage(11.5).		Yes	
(P)	**Type tests**			
1	Temperature-rise type test (IEC60076-2).		Yes	
2	Dielectric type tests (IEC60076-3).		Yes	
3	Determination of sound level (IEC60076-10) for each method of cooling		Yes	
4	Measurement of the power taken by the fan and liquid pump motors.		Yes	
5	Measurement of no-load loss and current at 90% and 110% of rated voltage		Yes	
(Q)	**Special tests**			
1	Dielectric special tests (IEC60076-3).		Yes	
2	Winding hot-spot temperature-rise measurements.		Yes	
3	Determination of capacitances windings- to-earth, and between windings.		Yes	
4	Measurement of dissipation factor (tan δ) of the insulation system capacitances.		Yes	
5	Determination of transient voltage transfer characteristics (Annex B of IEC60076-3:2000).		Yes	

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
6	Measurement of zero-sequence impedance(s) on three-phase transformers (11.6).		Yes	
7	Short-circuit withstand test (IEC60076-5) (If theoretical evaluation is unsuccessful)		Yes (At an independent test lab such as KEMA or CESI)	
8	Measurement of DC insulation resistance each winding to earth and between windings.		Yes	
9	Vacuum deflection test on liquid immersed transformers (11.9).		Yes	
10	Pressure deflection test on liquid immersed transformers (11.10).		Yes	
11	Vacuum tightness test on site on liquid immersed transformers (11.11).		Yes	
12	Measurement of frequency response (Frequency Response Analysis or FRA). The test procedure shall be agreed between manufacturer and purchaser.		Yes	
13	Check of external coating (ISO 2178 and ISO 2409 or as specified).		Yes	
14	Measurement of dissolved gasses in dielectric liquid.		Yes	
15	Mechanical test or assessment of tank for suitability for transport (to customer specification).		Yes	
16	Determination of weight with transformer arranged for transport. For transformers up to 1,6 MVA by measurement. For larger transformers by measurement or calculation as agreed between manufacturer and purchaser.		Yes	
17	Measurement of the harmonics of the no- load current		Yes	
18	Insulation test of oil and Measurement of dielectric strength of oil		Yes	
(R)	**Site tests**			
1	insulation resistance measurement of core and frame insulation, winding insulation to earth and between windings		Yes	
2	frequency response analysis		Yes	
3	interrogation of shock recorders fitted for transport		Yes	
4	Voltage ratio		Yes	

63 MVA, 220/33 kV Power Transformer				
No	Item	Units	Required	Tendered
5	Vector group		Yes	
6	Dielectric tests on transformer oil		Yes	
7	Temperature rise test with rated load for 6 hrs		Yes	
8	Thermograph imaging from all possible views		Yes	
9	Measurement of Moisture in oil & DGA after temperature rise test		Yes	
10	Any other oil tests (Please specify)		Yes/No	
11	Winding resistance on each tap		Yes	
12	Insulation resistance measurement		Yes	
13	Check of protective earthing connections		Yes	
14	Current transformer polarity check		Yes	
15	Control equipment circuit check		Yes	
16	Operation test of supervisory equipment		Yes	
17	Operation test of cooling equipment		Yes	
18	Operation test of on load tap changer		Yes	
19	Visual Inspections and adjustments as per clause 10.24 of technical specifications		Yes	
20	fingerprint tests (Um>72 kV)		Yes	
(S)	**Type test reports submitted with the bid**			
1	Temperature-rise type test (IEC60076-2).		Yes	
2	Dielectric type tests (IEC60076-3).		Yes	
3	Determination of sound level (IEC60076-10) for each method of cooling		Yes	
4	Measurement of the power taken by the fan and liquid pump motors.		Yes	
5	Measurement of no-load loss and current at 90% and 110% of rated voltage		Yes	
(T)	**Special test reports submitted with the bid**			
1	Short circuit withstand test on similar transformer as per IEC 60076-5 at an internationally recognized test laboratory such as KEMA or CESI		Yes	

Section E: Project Proponent's Organisational, Staffing and QA Plan

1. General

The Project Proponent shall submit a plan setting out its proposed organisational arrangements. The Project Proponent's plan will describe the Company's proposals with respect to, amongst others:

i) The organisational structure of the Company;

ii) The staffing policies and personnel deployments to build, operate and administer the Project, and

iii) Quality management systems that would be implemented to give confidence to the CEB, investors, lenders and other parties that the Wind Farm Facility will be built, operated and managed to the standards required by them.

2. Organisational Plan

In respect of each of the Preliminary Obligations Period, Construction Period and the Operational Period, the Project Proponent shall submit separate and detailed organisation charts showing its home office management organisation (off-shore), its Sri Lankan and Site organisation (in-country) and the interfaces between them. The organisation chart shall designate for each period the following:

- authorised representative(s) of the Project Company and the limits of the authorisations;
- organisational units and their responsibilities;
- key personnel, their functional responsibilities and reporting paths;
- Project Company's interface arrangements with relevant Government Agencies.

3. Staffing Plan

In respect of the Construction Period, the Project Proponent shall describe the staff that will be employed to carry out the following functions:

- project preparation and financing;
- formation and administration of procurement and construction contracts;
- project controls functions including overseeing procurement and construction activities to ensure time, quality and cost objectives are achieved.

In respect of the Operational Period, the Project Proponent shall submit an O&M staffing plan that describes the proposed management and staffing of the Project. Maintenance staffing shall be provided based on a schedule of the routine maintenance and major overhauls over the Term.

4. Total Quality Management Plan

The Project Proponent shall describe the Project Company's Quality Assurance Plan. The Quality Assurance Plan shall meet the requirements of ISO 9001:2000 and cover all activities as required to comply with the Company's obligations under the Project Agreements.

Part II: Financial Proposal Forms

Section F: Financial Proposal Letter

Financial Proposal Letter for the Development of 2 x 50 MW Wind Farm Facilities at Mullikulam on Build, Own and Operate (BOO) Basis.

To: Cabinet Appointed Negotiation Committee,

In response to the Bid No.: TR/REP&PM/ICB/2025/001/C titled "Request for Proposals for Development of 2 x 50 MW Wind Farm Facilities at Mullikulam on Build, Own and Operate (BOO) Basis" and in accordance with the Instructions to Project Proponents, the undersigned hereby proposes to Ceylon Electricity Board, an agency of the Government of the Democratic Socialist Republic of Sri Lanka (the Government), to finance, design, procure, construct, test, commission, operate and maintain a Wind power generation facility, "Wind Farm Facility" at Mullikulam on a Build-Own-Operate- basis, in accordance with the provisions of the Project Agreements (included as part this RFP Document).

Bid Tariff for Wind Farm Facility (Lot 1 / Lot 2)	**Years 1-20**
USD Cents/kWh (maximum 4 decimals)	_ · _ _ _ _

Lot Preference	**Lot Number**
1st Preference	Lot - _
2nd Preference	Lot - _

The undersigned agrees that this proposal shall remain open for acceptance and shall remain irrevocable for a period 150 days from the Closing Date given in the RFP Document, and it shall remain binding upon the undersigned and may be accepted at any time before the expiration of that period. The undersigned certifies that it has examined and is fully familiar with all the provisions of the RFP Document, the Project Agreements and any addenda thereto; has carefully reviewed the accuracy of all statements in the RFP Document and attachments thereto and, by careful examination of the RFP Document, the Project Agreements and any addenda thereto, is satisfied as to the nature and location of all the works, the general and local conditions under which the Project will be undertaken and all other matters which can in any way affect the Facility or the cost thereof. The undersigned hereby agrees that the Government or its representatives will not be responsible for any errors or omissions on the part of the undersigned in preparing this Proposal.

The Project Proponent has appointed a Financial Advisor that is experienced in advising on project financed power stations in Asia. We have made available to the financial advisor all information known to the Project Proponent that could reasonably be considered to be relevant to the Project's financing. We have furnished the financial advisor with all information that it has sought from the Project Proponent in connection with its financial advisory assignment. The Project Proponent hereby represents and warrants that all information provided to the Financial Advisor was true, complete and accurate at the time it was given.

The Financial Advisor has assisted in the development of the financing plan set out in Section H and we have not deviated from that plan.

Prior to the signing of the Project Agreements, the undersigned shall provide the CEB with a Preliminary Obligations Bond to the value of USD 2.7 million or equivalent LKR.

Attached hereto and by this reference incorporated herein and made a part of this proposal are the data required for "FINANCIAL PROPOSAL".

The undersigned also acknowledges receipt, understanding, and full consideration of the following addenda to the RFP Document:

Addenda Nos: _____

Signature: _____

In the Capacity of: _____ (Title)

duly authorised to sign the proposal for and on behalf of:

Project Proponent: _____ (Name)

Home Office: _____ (Address)

_____ (Country)

_____ (Telephone No.)

_____ (Fax No.)

_____ (E-mail)

Attention: _____ (Name & capacity of authorised representative for Project Proponent)

Address in Sri Lanka (if applicable):

_____ (Address)

_____ (Telephone No.)

_____ (Fax No.)

_____ (E-mail)

[Letterhead of Financial Advisor]

Development of 2 x 50 MW Wind Farm Facilities at Mullikulam on Build, Own and Operate (BOO) Basis.

To: Cabinet Appointed Negotiation Committee

From: [Project Proponent's Financial Advisor]

In response to the Bid No.: TR/REP&PM/ICB/2025/001/C titled "Request for Proposals for Development of 2 x 50 MW Wind Farm Facilities at Mullikulam on Build, Own and Operate (BOO) Basis" and in accordance with the Instructions to Project Proponents, the undersigned hereby proposes to Ceylon Electricity Board, an agency of the Government of the Democratic Socialist Republic of Sri Lanka (the Government), to finance, design, procure, construct, test, commission, operate and maintain a Wind power generation facility, "Wind Farm Facility" at Mullikulam on a Build-Own-Operate- basis in accordance with the provisions of the Project Agreements (included as part this RFP) and in accordance with the Instructions to Project Proponents, the undersigned advises that we have been appointed by [ ] (the "Project Proponent") to provide financial advice in respect of the Project Proponent's Financial Proposal.

The undersigned certifies that we have examined and are fully familiar with all of the provisions of the RFP Document, the Project Agreements and any addenda thereto (in so far as they relate to the financing of the Project); and is satisfied as to all matters that relate to the financing of the Project (in so far as they can be reasonably known at this stage in the Project's development). The undersigned hereby acknowledges that it is aware that the Government and the CEB will be relying, inter alia, on our advice in determining whether the Project Proponent will be successful.

We are satisfied that we have had sufficient information and made sufficient enquiries to be able to assist the Project Proponent's development of a financing plan for the Project that is achievable under current market conditions. We have been assured by our client that all information it has provided was true, complete and accurate at the time it was given.

Accordingly, we endorse the financing plan contained in the Project Proponent's Financial Proposal without further reservation.

Yours Sincerely,

For and on Behalf of

[**Name of Financial Advisor]**

_____

Name of Authorised Signatory

Section G: Financial Data – Wind Farm Facility

The Project Proponent shall complete the following tables, adding additional lines where require.

i) Indicative Plant EPC Costs for WTGs & 33kV Collector Network

Task / Item Description	Cost (USD)
Wind turbine generator system	
Balance of plant (electrical)	
SCADA system	
Interconnection facility	
Civil works including site development	
Erection, installation & commissioning	
Wind monitoring system	
Radar based bird collision avoidance system	
Additional equipment for reactive power compensation	
Implementation of Environmental Management Plan	
Transport & logistic	
Insurance	
System design	
Project management	
Total of above items:	*<W>*

ii) Indicative EPC Costs for 220/33kV Collector Substation

Task / Item Description	Cost (USD)
Plant and equipment supplied from abroad	
Plant and equipment supplied locally	
Design services	
Erection, installation & commissioning	
Civil works	
Total of above items:	*<X>*

iii) Indicative Financing & Other Costs

Task / Item Description	Cost (USD)
Total of above items:	*<Y>*

iv) Total Capital Cost of Wind Farm Facility: USD *< W + X + Y >* Note 1

v) Indicative Operation and Maintenance Costs (Per Annum)

Task / Item Description	Cost (USD)
Total of above items:	*<Z>* Note 1

Note 1: Value shall be brought forward to the Financial Model.

vi) Financial Model

The Project Proponent shall provide its Financial Model (including electronic copy of the working Financial Model with the spread sheets) for Wind Farm Facility which shall include at a minimum, the following items for the Term of the Project;

- Capital cost
- Interest during construction
- Financing costs
- Debt service reserve requirements
- Equity and debt portions with relevant currencies
- Gross revenue
- Operating costs
- Loan schedules
- Depreciation rate
- Working capital requirements
- Tax calculations
- NPV, IRR & equity IRR projections
- Other financial assumptions

Section H: Financing Plan

The Project Proponent shall provide a detailed Financing Plan up until financial closure. The plan shall include at a minimum, the following items;

- The project tasks and timing
- Any information required to undertake these tasks
- The intended financial institutions Project Proponent intends to engage
- Necessary approvals and timing
- Any other information potentially impacting cost and timing