



**MR267/19**  
**DESIGN, MANUFACTURE, TESTING**  
**AND SUPPLY OF INDOOR HIGH-**  
**VOLTAGE 11kV DISTRIBUTION**  
**SWITCHGEAR**

**ENERGY FIJI LIMITED**

# REVISION HISTORY & DOCUMENT CONTROL

Rev.	Notes	Prepared By	Approved By	Date
0.1	Initial Draft for internal review	RS, NDE		17/06/19
1	Reviewed, Revised and Issued for Tender	RS	KDP	28/08/19

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## **INSTRUCTION TO BIDDERS**

- 1. Scope of Bid** The Energy Fiji Limited (hereinafter referred to as "the Purchaser"), wishes to receive bids for Design, Manufacture, Testing and Supply Of Indoor High-Voltage Distribution Switchgear as specified in these bidding documents (hereinafter referred to as "HV Switchgear Unit").
- 2. Eligible Bidders** This Invitation to Bid is open to bidders who have sound financial background and have previous experience in handling such projects.

Bidders shall provide such evidence of their continued eligibility satisfactory to the purchaser as the purchaser shall reasonably request.

Bidders shall not be under a declaration of ineligibility for corrupt or fraudulent.
- 3. Eligible Materials, Equipment and Services** The HV Switchgear Unit to be supplied under the Contract shall have their origin from reputable manufacturers from various countries. Bidders will be required to provide evidence of the origin of various components of the HV Switchgear Unit.
- 4. Qualification of the Bidder** To be qualified for award of Contract, bidders shall submit proposals regarding work methods, scheduling and resourcing which shall be provided in sufficient detail to confirm the bidder's capability to fulfill the contract.
- 5. Cost of Bidding** The bidder shall bear all costs associated with the preparation and submission of its bid and the Purchaser will in no case be responsible or liable for those costs.
- 6. One Bid per Bidder** Each bidder shall submit only one bid. A bidder who submits or participates in more than one bid will cause all those bids to be rejected.
- 7. Bid Prices** Unless specified otherwise, Bidders shall quote for the entire facilities on a "single responsibility" basis such that the total bid price covers all the Supplier's obligations mentioned in or to be reasonably inferred from the bidding documents in respect of the design, manufacture, including procurement and subcontracting (if any), testing and delivery.

Bidders shall give a breakdown of the prices in the manner and detail called for in this bidding document, or any issued addenda.

Bids shall be given a DDU basis where the Supplier shall take full responsibility for freight of items to designated point of delivery. The point of delivery shall be the site where the switchgear will be installed (Waila Water Treatment Plant).

## 8. Site Visits

Site visits are scheduled for Friday 6<sup>th</sup> September, 2019 and Wednesday 11<sup>th</sup> September, 2019. Interested Bidders are to report at 10:00hrs at EFL's Sawani Substation, from where they will be taken to the site where the switchgear will be installed.

Bidders shall make their own arrangements to come up to Sawani Substation site, and their own personal protective equipment. Attendance shall be compulsory and will be recorded by EFL and signed by the interested bidders.

## 9. Submission, Sealing and Marking of Bids

It is mandatory for Bidders to upload a copy of their bid in the TENDER LINK Electronic Tender Box no later than 4.00pm (1600hrs Fiji Time) Wednesday 18<sup>th</sup> September, 2019.

To register your interest and tender a response, view 'Current Tenders' at: <https://www.tenderlink.com/efl>

For further information contact The Secretary Tender Committee, by e-mail [TDelairewa@efl.com.fj](mailto:TDelairewa@efl.com.fj)

In addition, hard copies of the tender, one original and one copy must be deposited in the tender box located at the EFL Head Office, 2 Marlow Street, Suva. The inner and outer envelopes shall be addressed to the purchaser at the following address:

Tuvitu Delairewa  
General Manager Commercial  
2 Marlow Street, Suva, FIJI.  
Phone: 679 3224 185 Facsimile: 679 331 1882  
And

bear the following identification:

- For: Design, Manufacture, Testing and Supply Of Indoor High-Voltage Distribution CCMVV Switchgear
- Bid Tender Number: MR 267/2019
- DO NOT OPEN BEFORE (Wednesday, 18/09/19)

## 10. Deadline for Submission of Bids

Bids must be received by the purchaser at the address specified above no later than 1600 hours (Fiji Time) (Wednesday, 18/09/19). The Purchaser may, at its discretion, extend the deadline for submission of bids by issuing an addendum, in which case all rights and obligations of the purchaser and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

## 11. Bid Validity

Bids shall remain valid for a period of **120 days** from the date of Deadline for Submission of Bids.

**12. Late Bids** Any bid received by the purchaser after the deadline for submission of bids prescribed will be rejected and returned unopened to the bidder.

**13. Modification and Withdrawal of Bids** The bidder may modify or withdraw its bid after bid submission, provided that written notice of the modification or withdrawal is received by the Purchaser prior to the deadline for submission of bids.

The bidder's modification or withdrawal notice shall be prepared, sealed, marked and delivered, with the outer and inner envelopes additionally marked "MODIFICATION" or "WITHDRAWAL", as appropriate. A withdrawal notice may also be sent by fax but must be followed by a signed confirmation copy.

No bid shall be modified by the bidder after the deadline for submission of bids.

**14. Purchaser's Right to Accept any Bid and to Reject any or all Bids** The Purchaser reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the Purchaser's action.

**15. Notification of Award** Prior to expiration of the period of bid validity prescribed by the Purchaser, the Purchaser will notify the successful bidder by fax/email, confirmed by registered letter, that its bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") shall name the sum which the Purchaser will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called "the Contract Price").

The notification of award will constitute the formation of the Contract.

Upon the furnishing by the successful bidder of a performance security, the Purchaser will promptly notify the other bidders that their bids have been unsuccessful.

**16. Signing of Contract Agreement** At the same time that he notifies the successful bidder that its bid has been accepted, the Purchaser will send the bidder the Form of Contract Agreement provided in the bidding documents, incorporating all agreements between the parties.

Within 7 days of receipt of the Form of Agreement, the successful

bidder shall sign the Form and return it to the Purchaser.

**17. Corrupt or  
Fraudulent  
Practices**

The Purchaser requires that the Contractor observe the highest standard of ethics during the procurement and execution of such contracts. In Pursuance of this policy, the Purchaser:

- (a) defines, for the purposes of this provision, the terms set forth below as follows:
  - (i) "corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and
  - (ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Purchaser of the benefits of free and open competition;
- (b) Will reject a proposal for award if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

# 1 INTRODUCTION AND SCOPE OF WORK

Energy Fiji Limited (“EFL”) is responsible for generation, transmission and distribution of electricity in Viti Levu, Vanua Levu, Ovalau and Tavueni in Fiji. By the end of 2018, the EFL had more than 190,000 customers on the islands it operates on. This included residential, commercial and institutional customers.

EFL is seeking tender bids from reputable manufacturers and suppliers for design, manufacture, testing and supply of compact 11kV High-Voltage distribution switchgear. The 11kV High-Voltage distribution switchgear will be installed at the Waila Water Treatment Plant. The configuration of the switchgear shall be CCMVV, where C = cable switch module, M = metering module and V = circuit breaker module.

The following stock item is covered in these specifications:

Item Description	Configuration
11kV distribution switchgear	CCMVV Unit C - Cable Switch Module C - Cable Switch Module M - Metering Module V - Circuit Breaker Module V - Circuit Breaker Module

This tender specification outlines the instruction to bidders, design and performance criteria for the 11kV High-Voltage distribution switchgear, and supply of these for use in EFL’s distribution networks.

Site visits are scheduled for Friday 6<sup>th</sup> September, 2019 and Wednesday 11<sup>th</sup> September, 2019. Interested Bidders are to report at 10:00hrs at EFL’s Sawani Substation, from where they will be taken to the site where the switchgear will be installed.

GPS Coordinates for Sawani Substation:

Latitude - 18° 2'1.27"S  
Longitude - 178° 29'49.69"E

Bidders shall make their own arrangements to come up to Sawani Substation site, and their own personal protective equipment.

# 2 GENERAL CONDITIONS OF CONTRACT

The General Conditions of Contract shall be based upon AS 4911 - 2002 General Conditions of Contract for Supply of Equipment Without Installation.

The Conditions of Contract comprises two parts:

1. Part 1 - General Conditions; and
2. Part 2 - Conditions of Particular Application

### 3 REFERENCES

#### 3.1 Applicable Standards

High-Voltage switchgears and metering units shall be designed, manufacture and tested in accordance with the following international Standards and all amendments issued prior to the date of closing of tenders except where varied by this Specifications.

AS 1100	Drawing Practice Scales - Part 7
AS 1194	Winding Wires Parts 1-4
AS 1243	Voltage Transformers for Measurements and Protection
AS/NZS 1580	Paints and Related Materials - Methods of Test
AS 1627	Metal Finishing - Preparation and Pretreatment of Surfaces
AS 1650	Galvanized Coatings
AS 1675	Error Ratio & Phase Angle for Current Transformers
AS 1767.1	Insulating Oil for Transformers and Switchgears
AS 1931	HV Testing Techniques - General Definitions and Test Techniques
AS 2650	Common specifications for high-voltage switchgear and controlgear standards
AS 2312	Guide to the Protection of Iron and Steel Against Exterior Atmospheric Corrosion
AS 2067	Substations and High-Voltage Installations exceeding 1kV a.c.
AS 2700	Colour Standards for General Purpose
AS 3000	Electrical Installations
AS 4436	Guide for Selection of Insulators in Respect of Polluted Conditions
AS 4680	Hot-dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles
AS 60137	Insulated Bushings for Alternating Voltages Above 1000V
AS 60529	Degrees of Protection Provided by Enclosures for Electrical Equipment
AS 62271.200	High-Voltage Switchgear and Controlgear 9Part 200)
AS/NZS 9001	Quality Systems Model for Quality Assurance in Design, Development, Production, Installation and Servicing
IEC 60068	Environmental Testing (All parts)
IEC 60255	Electrical Relays (all parts)
IEC 60694	Common Specifications for High-Voltage Switchgear and Controlgear Standards
IEC 60870	Telecontrol equipment and systems - all parts
IEC 61000-4	Electromagnetic compatibility - all parts
IEC 61619	Insulating Liquids - Contamination by Polychlorinated Biphenyls (PCBs) - Method of Determination by Capillary Column Gas Chromatography
IEC 61869	Instrument Transformers (All parts)
IEC 62271	High-Voltage Switchgear and Controlgear (All parts)
IEC 17025	General Requirements for the Competence of Testing and Calibration Laboratories Production, Installation and Servicing

Equipment's conforming to any international standard(s) which ensure(s) equal or better quality than the standard(s) mentioned above will also be acceptable and in such case(s) the copy of standard (English version) adopted should be provided with the Bid.

Should inconsistencies be defined between Standards and these Specifications, this Specification will take precedence. However, significant inconsistencies shall be referred to EFL for resolution.

## 4 SERVICE CONDITIONS

### 4.1 Environmental Conditions

The 11kV High-Voltage distribution switchgear unit shall be designed to withstand the service conditions of Clause 1.2 of AS 2374 (Part 1), with the following additions.

Height above sea level	:	not exceeding 1000 m
Atmosphere	:	Saliferous, corrosive and dusty
Ambient temperature	:	Peak : 40°C
	:	24 Hour Average: 30°C
	:	Annual Average: 22°C
	:	Minimum: 10°C
Relative Humidity (Average)	:	90%
Annual Average Rainfall	:	1900 mm
Wind Speed	:	Sustained : 55 m/s
	:	Gusts : 70 - 110 m/s
Isokeraunic Level	:	60 Thunder days per year
Seismic	:	To a maximum of 7 on the open-ended Richter Scale

**Note:** Fiji is situated in a region where cyclones are experienced frequently. All plant and equipment shall be designed and constructed to withstand these extreme conditions. All plant and equipment shall be rust proof, vermin proof and weather proof and designed to be suitable for a damp, tropical climate, which may be experienced simultaneously.

### 4.2 System Conditions

The rated frequency of EFL's power system is 50 Hz.

Each unit shall be suitable for use on its respective system position.

Highest (Equivalent) System Voltage:	12kV
Number of phases:	3
Impulse Withstand voltage (peak):	95kV (peak)
Power frequency withstand voltage:	28 kV
Nominal system voltage:	11kV
System earthing:	Effectively earthed
Short Circuit Level	25kA for 3sec

## 5 DESIGN AND PERFORMANCE CRITERIA

### 5.1 High-Voltage Distribution Switchgear Unit

#### 4.1.1 General

The 11kV High-Voltage distribution switchgear unit will be used to link the Waila Water Treatment Plant to the existing EFL distribution network with 4MVA supply capacity. It shall be rated in accordance with the recommendations for a system rated voltage of 12kV as per AS 2650 and IEC 60694. The High-Voltage distribution switchgear shall meet the requirements set out in Clause 3.1 and 3.2 above.

The High-Voltage distribution switchgear unit offered shall be suitable for mounting indoors, shall be rust proof, vermin proof, and weather proof and designed to be suitable for a damp, tropical climate, which may be experienced simultaneously.

The front panel of each switch module shall incorporate mimic display of the switching arrangement with clear signs to ensure a high level of safety in operation. Facilities for voltage indication and phasing out checks shall be provided on each switch module.

The switchgear shall be ergonomically operator friendly so that operator cannot be injured during normal operating procedure. Operations shall be carried out using a removable operating handle. It is essential that a means be provided to ensure that the switch cannot be inadvertently connected to any position (i.e. "ON", "OFF" or "EARTH") other than that intended by the operator. **An adequate mechanical interlock system shall be provided to prevent mal-operation.**

The High-Voltage metering module shall be a component of the High-Voltage switchgear system and house the instrument transformers required to make the complete HV metering solution. It shall be designed such that if the current transformers or voltage transformers are to be replaced in future, then they shall be done with ease. Instructions for such repair or replacement work shall be provided with the offer.

The primary busbar system shall be designed to have a continuous rating of 630Amps minimum, without any temperature-dependent factors.

#### 4.1.2 High-Voltage Cable Switch Module

The cable disconnecter switch and the cable earth switch shall be load breaking and fault making type and comply in all respects with AS 60265.1-2001, AS 62271.102-2005 and AS 62271.100-2008. Switches shall be designed for interrupting full rated current as stated as well as small inductive or capacitive currents involved in disconnecting cables or overhead lines.

The cable disconnecter switch shall be provided with an interlocked earthing switch for earthing the isolated incomer cable. Option of having two independent manual operating mechanisms for switch disconnecter and earth switch is also acceptable with adequate mechanical interlocking mechanism. The Bidder shall ensure that the safety of operators is not compromised in any way and the interlock systems are incorporated in the design.

The design shall prevent simultaneous closing of the main disconnecter switch contacts and the earth switch contacts. The disconnecter switches and earth switches shall be three-pole gang operated type. The earth switch contacts shall be designed to close into a fault and shall have the same short circuit capacity as that of the main switch disconnecter itself. The front panel of each switch unit shall incorporate a mimic display of the switching arrangement with clear signs to ensure a high level of safety in operation. The operating positions shall be clearly marked, indicating the "ON" and "OFF" position for both the disconnecter switch and earthing switch.

### 4.1.3 Metering Module

Interconnectivity shall be provided for interfacing the cable switch module and circuit breaker module with the metering module. A total of six (6) bushings shall be available on the metering module whereby three (3) bushings would connect to the cable switch module on the left hand side and the circuit breaker module on the right hand side.

The configuration of the metering module shall be such that the power flow shall be from the cable switch modules through the metering module to the circuit breaker modules. Therefore, the system should meter the power consumed by the distribution transformers via the circuit breaker module.

The metering cubicle shall be housed with appropriately rated copper busbar system with provisions of instrument transformers (CTs & VT).

### 4.1.4 Circuit Breaker Module

The circuit breaker module shall be suitable for overcurrent and earth fault protection of 2,000kVA distribution transformers. The circuit breaker module shall have three (3) position disconnect/earthing switch (three position single spring mechanism) downstream from the circuit breaker.

Adequate interlocking mechanism shall be provided between the circuit breaker and disconnect/earthing switch. Switch position indication shall be provided for the circuit breaker, disconnect and earth switch.

The protection relay(s) shall be self-powered and should NOT require auxiliary power supply for operation.

The circuit breaker module shall be designed such that it does not require external power supply for normal or manual protection.

### 4.1.5 Cable Termination Area

The termination of cables shall be facilitated by provision of conically shaped bushings (preferably to DIN47636 or equivalent) enabling the use of dead break plug in and disconnectable (fixed by screws/bolts) elbow connectors. The cable sealing end arrangement on the fused tee off circuit may also be in the form of a slip on termination kit within a track proof fuse encapsulated plug in connector system. It is essential that the cable terminating arrangement on all circuits provide for a fully insulated design, with no exposed live parts. The supplier shall specify the make and type of cable terminating kits available and which are suitable for use with the equipment.

Cabling facilities on the switchgear shall be suitable for terminating 3 core AL XLPE insulated HDPE sheathed 11(12) kV cable upto 300mm<sup>2</sup>.

Cable boxes shall be suitable for vertical bottom entry.

Removable metal cable box access covers (fitted with handles - if difficult to fit/heavy) shall be provided and shall be fastened using stainless steel studs, nuts and washers.

The cable boxes shall be designed and constructed so as to minimize the dangers of fragmentation of the box in the event of an internal electrical failure.

With cable box access covers and additional barriers fitted (if necessary), a degree of protection IP20 shall be provided for personnel opening cubicle doors (and hinged lid) in the HV compartment.

The removable cable box covers shall preferably **not** be interchangeable with other covers on the same switchgear so as to avoid covers with labels attached being positioned in the wrong place.

#### 4.1.6 Clearances and Insulation

The minimum electrical clearance in air to earth for all High-Voltage parts of the equipment shall be not less than that specified in AS 2067. All current carrying High-Voltage conductors that are air insulated (not in SF<sub>6</sub> gas tank) shall be enclosed with either cold shrink or thermofit insulation.

#### 4.1.7 Equipment Housing

The design of the HV switchgear shall be such that all electrically active parts of each switchgear function and inter-bay busbars are housed in a sealed enclosure.

#### 4.1.8 Operation

The High-Voltage distribution switchgear unit shall be ergonomically designed with operating handles preferably of the removable type. The handle shall be of such a length that it complies with the relevant internal arc protection requirements and extends beyond the enclosure to enable ease of operation. The effort exerted on the handle by the operator should not be more than 250 N.

#### 4.1.9 Insulating and Switching Mediums

Switch units shall be of vacuum or SF<sub>6</sub> gas interrupter type. **Oil immersed switchgear will NOT be considered.**

The detailed procedure for replacing a vacuum bottle shall be stated in the instruction manual.

Where SF<sub>6</sub> gas interrupters are used, it shall comply with the requirements of AS 62271-200. Switchgear that requires the periodic filling of SF<sub>6</sub> gas WILL NOT be considered. A stainless steel label shall be fixed to the switchgear stating the total mass and volume of SF<sub>6</sub> gas present in the switchgear at a specified date. The Bidder shall state the nominal SF<sub>6</sub> gas filling pressure and nominal fill temperature.

The annual loss rate of SF<sub>6</sub> gas shall not exceed 0.1% of the total mass. The Bidder shall confirm that this requirement can be achieved and detail the guaranteed annual loss rate for the Switchgear. Any departure from this requirement shall be clearly stated in the Technical Schedules. The Bidder shall guarantee that pressure of the SF<sub>6</sub> gas shall be above the operating limit throughout the lifetime of the switchgear.

A robust SF<sub>6</sub> gauge(s) shall be provided for visual indication of SF<sub>6</sub> gas pressure inside the switchgear chamber. The SF<sub>6</sub> gauge shall be readily visible from the front of the unit without the necessity to remove any covers and be clearly marked to indicate the normal gas pressure by a green area on the gauge face and the low gas pressure by a red area on the gauge face.

The switchgear and busbar housing containing SF<sub>6</sub> gas shall be sealed for life except one common access point for the SF<sub>6</sub> gas gauge sensor via the SF<sub>6</sub> gas non return valve. A separate low pressure SF<sub>6</sub> gas switch shall be provided for low pressure alarm. The low pressure switch is to be set to operate at pressure which will indicate loss of SF<sub>6</sub> within switchgear and will not generate false alarms as the SF<sub>6</sub> gas pressure drops due to the ambient temperature drop or change.

Bidder shall state the pressure at which the switch is activated (in bar or kPa) which shall be greater than atmospheric pressure.

#### **4.1.10 Interlocks**

An adequate mechanical interlock system shall be provided to prevent mal-operation and to ensure operator safety. The design of the interlock system must be such that it shall not be possible for the operator to physically override the interlock controls.

#### **4.1.11 Padlocking**

The switchgear shall have robust padlocking facilities for locking each switch operating handle entries in the "ON" or "OFF" position. This provision includes disconnect switch and breaker switch and earth switch. These locking facilities shall prevent inadvertent operator switching as well as unauthorized switching.

The switchgear shall have a minimum 10 mm diameter hole for attaching the padlock at the lips of the operating handle entries. The padlocking facility material shall be robust and compatible with the life of the switchgear. The Bidder shall ensure that the padlocking facilities are properly secured so that they are not susceptible to damage during transportation.

#### **4.1.12 Voltage Indication**

The switchgear shall provide a means of permanent voltage indication with bright indicators on all phases. Provision shall also be made for the use of test lamps as an additional means of voltage indication. The lamps and test points shall strictly be wired from secondary output of the VT installed in the metering unit. The switchgear shall have voltage test points to allow phasing out of the switchgear. Voltage indication systems that require an external power supply will not be accepted.

#### **4.1.13 Cable Connections**

The disconnect switch and metering cubicles of the switchgear shall be provided with a cable box, enclosure or compartment suitable for the cable terminations. The High-Voltage CCMVV switchgear unit shall be equipped with facilities for earthing and testing of all connecting cables. There shall be adequate clearances so that HV testing of a cable may be carried out with safety for both the tester and equipment.

Bidders shall ensure that the cable compartment is designed to accommodate three-core 300mm<sup>2</sup> Aluminium-core XLPE insulated cables.

#### **4.1.14 Cable Entry and Cable Support**

Incoming cables shall be bottom entry. Suitable cable supports in the form of cable mounting plates and cable cleats complete with mounting accessories shall be supplied at the base of the switchgear units to support incoming cables so that the weight of the cables is not transferred to the switchgear terminal bushings.

#### **4.1.15 Earthing**

Earth connection points for terminating suitably sized cable lugs for the purpose of making earth connections shall be provided. All earth bars shall be rated for fault currents to allow for the termination of cable screen wires. The preferred location of these earth connection points shall be located inside the front left and right hand panel near the base of the leftmost and rightmost cable compartments respectively and away from the cable terminations.

#### **4.1.16 Surface Protection**

The Equipment may be installed in severely corrosive condition mainly induced by water, salt laden atmosphere and low levels of industrial pollutants. EFL requires all exposed internal and external surfaces to be cleaned, prepared and treated with a coating system suitable for severe marine environments corrosion category E-M in accordance with AS 2312-2002. It is not expected that the switchgear will require re-coating during the anticipated lifespan of the Equipment.

The estimated life of the protective coating shall also be specified.

Bidders shall provide details of all tests (accelerated aging, salt spray, fog, impact, etc.) that prove the effectiveness of the proposed protective coating. All testing shall be carried out in accordance with AS 1580.0-2004 or equivalent international standards.

#### **4.1.17 Mounting Bases**

Bidders shall advise if mounting bases are required for all switchgear, to prevent deformation of the equipment and its functionality during handling, lifting or transportation. Bidders shall submit details of the handling, lifting or transportation instruction for such a design with the bid. Separate designs and installation instructions along with details of centre of gravity.

### **4.2 Instrument Transformer Requirements**

The CTs and VTs shall be adequately braced to withstand all mechanical shocks which may occur under working conditions including those produced by short circuits and also stress resulting from transport, lifting by slings and forces arising from the connection of cables.

#### **4.2.1 Internal CT and VT Core and Primaries**

The Bidder shall provide information as to the quality of steel laminations used in the cores of the current and voltage transformers to maintain the initial accuracy and performance of the CTs and VTs.

The High-Voltage windings of the voltage transformers shall be insulated from the cubicle. The High-Voltage windings of the voltage transformers shall be star connected and brought out to a neutral bushing and connected to the earth terminal with an earth link.

#### **4.2.2 Current Transformer**

The design and performance of the current transformer shall comply with IEC 61869. The current transformer shall be installed in such a location that is easily accessible for inspection and testing.

The current transformers shall comply with the following:

- a. It shall be suitable for 11kV and with frequency of 50Hz
- b. It shall have a narrow type with dual ratio
- c. It shall have the tapped Primary current ratings of 200/400Amps
- d. It shall have secondary current rating of 5Amps (continuous)
- e. It shall have a minimum burden of 30VA at maximum ambient temperature so that it can support the EFL standard energy meter and secondary leads, and it shall have an accuracy of 0.5S class or lower
- f. It shall have a thermal limit current of not less than 200% of rated current

The secondary terminals of the CTs shall be robust in design so as to provide effective and firm termination.

#### **4.2.3 Voltage Transformer**

The design and performance of the voltage transformer shall comply with IEC 61869. The voltage transformer shall be installed in such a location that is easily accessible for inspection and testing.

The voltage transformer (VT) shall comply with the following specification:

- It shall be suitable for an operating voltage of 12kV under continuous operation and with a nominal frequency of 50 Hz
- It shall be rated at 11,000/110 V
- It shall have minimum rated burden of 100VA at ambient temperature

- It shall have a voltage factor of 1.5
- It shall be uniformly insulated
- It shall have an accuracy class of 0.5S or lower
- Colour coding shall be via Red/Yellow/Blue for identification of phases and black for neutral
- It shall be designed so that the increased magnetizing current due to any persisting over-voltage does not produce injurious overheating. Phase barriers shall be provided.
- The low voltage windings of the voltage transformers shall be star connected inside the enclosure with the phase ends and neutral brought out.
- The star point (neutral) shall be insulated from the enclosure and connected to a separate neutral terminal.

#### 4.2.4 Secondary Cable

A secondary cable shall be provided between the CTs and VTs and the low voltage compartment of suitable length and sufficient number of cores to allow connection to the CT and VT secondaries from the low voltage compartment. The conductor size has to be at least 4mm<sup>2</sup> and each core shall be individually labeled. The secondary cable shall be terminated at the terminal box with a suitable marine grade weatherproof cable gland.

All wiring within the low voltage compartment of the metering unit shall be laid and restrained as per AS/NZS 3000 Clause 3.9.8.3, so that there is no possibility of it coming into contact with any live apparatus.

Terminals or intermediate connectors between low-voltage compartment and the respective CT and VT secondaries shall not be used. Insulated crimp type lugs/connectors are not to be used in any of the CT-VT secondary wiring terminations, non-insulated crimp connectors are permissible.

### 4.3 Housing and Corrosion Protection

All internal and external surfaces shall be protected against corrosion. All exposed metal surfaces shall be protected by the application of a painting system at least equivalent to ISO 9223 Category C4-C5 in Table B1 and suitable for severe marine environments as specified in AS 2312.

### 4.4 Fittings

The complete HV CCMVV switchgear unit, with switch-disconnector and metering compartment, shall be supplied with fittings as detailed below.

#### 4.4.1 Lifting Provision

Lifting lugs/eyes shall be provided for lifting the unit.

#### 4.4.2 Nameplate

A nameplate shall be provided for the complete switchgear, labeled in accordance with AS 62271.1- 2012 and AS 62271.200-2005, and fitted such that it is clearly visible on the front of the panel. The true rating of each of the component parts shall be marked by etching or stamping on the plate. The following information shall be provided on the rating plate (minimum requirement):

- True rating of each of component parts (busbar, instrument transformers, switch-disconnector, earth switch etc.)
- Serial number of cubicle
- Year of manufacture and testing

- Engineering Standards to which equipment is manufactured and tested
- IAC category

The nameplate shall be made of stainless steel and shall be permanently fitted - by means of rivets or firmly bolted down using stainless steel bolts. Stick-on, glued-on or painted-on nameplate labels are NOT acceptable.

Nameplates shall be also provided for the instrument transformers, which shall be installed in a location which is accessible and visible when the unit is energized.

#### 4.4.3 Terminal Markings

The medium voltage terminals shall have markings in upper case, such that red phase is A1, A2, yellow phase is B1, B2 and blue phase is C1, C2. The terminal markings shall be so applied that at the instant when current through the primary winding is from A1 to A2 the direction of the secondary current through the external circuit providing the burden is from as1 to as2.

#### 4.4.4 External Markings

In addition to nameplate markings, EFL's stock code shall be stenciled in black numerals onto the tank where it can be easily seen. Each numeral shall be 75 mm high and have a body width of not less than 12 mm.

DANGER signs as per AS/NZS 3000 shall be fixed to the MV and LV panels which can provide access to High-Voltage parts. Wording on signs at these locations shall consist of letters not less than 12 mm high and shall contain the words 'DANGER – HIGH-VOLTAGE'.

#### 4.4.5 General Clearances around the HV Distribution Switchgear

To ensure the safety of operators and adequate access for installation and maintenance activities, the High-Voltage CCMVV switchgear shall be properly installed to achieve the following general clearances:

- 900 mm, between equipment, walls and other obstructions, where personnel must be able to pass through;
- 1500 mm, in front of equipment that must be operated and maintained; and
- Substation ceilings provided have clear headroom above the floor of at least 3000mm.
- The CCMVV switchgear unit shall have bottom cable entry for all equipment.

Considering the existing substation layout (Schedule H), the bidder shall submit proposals for modification to the existing trenches with respect to switchgear the bidder wishes to supply. These shall be submitted with the bid document for completeness.

## 5 TESTING

### 5.1 Test Requirements

Prior to delivery, the units shall have completed the type, routine and accuracy tests and inspections as required by the relevant international and Australian standards. The passing of such tests shall not prejudice the right of EFL to reject the Equipment if it does not comply with the Specification when installed.

All testing shall be undertaken by an IEC 17025 accredited test house. The Bidder shall submit evidence showing IEC 17025 compliance. A formal report covering the outcome of the testing shall be made available to EFL.

## 5.2 Type Test Obligations

All units of the same design shall be identical in all respects relating to materials, design and manufacture.

A copy of the type test certificates shall be provided upon request, free of charge, to EFL for any item purchased against this specification. If a specific item was not tested in the past, EFL shall allow the tests to be performed on units purchased at the Supplier's expenses. Should EFL require any test(s) to be repeated despite the earlier certificate being available for an identical (or similar, as allowed below) unit, the cost of such test will be borne by EFL.

The Bidder may be requested during the tender evaluation period to substantiate that claim with written engineering evaluation. Such evaluation shall provide all relevant details permitting EFL to establish validity of existing type tests.

Any modification, resulting from a type test failure or change of design instigated by the Supplier or change of design to comply with the specification, which could affect the result of earlier type tests, shall require a repeat of such earlier type test. Any repeat type tests to provide compliance with the Standard's requirements shall be to the Supplier's cost.

## 5.3 Metering Equipment

### 5.3.1 Type Tests

The instrument transformers shall be type tested in accordance with this specification and the IEC 61869-1, IEC61869-2 and IEC 61869-3.

As a minimum the following type tests shall be required:

- a) Temperature rise test
- b) Impulse voltage test on primary terminals
- c) Electromagnetic compatibility tests
- d) Tests for accuracy
- e) Verification of degree of protection

Accuracy tests shall include current flow in both directions through the current transformer of the HV metering unit. Where the offered product has already undergone such type testing according to IEC 61869, the Bidder shall furnish complete type test reports with its bid.

### 5.3.2 Routine Tests

Individual Routine tests shall be applied to each individual HV metering unit in accordance with this specification and IEC 61869-1, IEC61869-2 and IEC 61869-3.

As a minimum, the following shall be required:

- a) Power frequency voltage withstand tests on primary terminals
- b) Partial discharge measurements
- c) Power frequency voltage withstand tests between sections
- d) Power frequency voltage withstand tests on secondary terminals
- e) Test for accuracy
- f) Verification of markings

Where the offered product has already undergone such routine tests in the past, the Bidder shall submit copies of such routine tests with its bid.

The test reports of all routine tests performed on the HV metering units shall be submitted

to EFL prior to the delivery of the batch HV metering units.

## 5.4 High-Voltage Switchgear Tests

### 5.4.1 Type Tests

Type tests shall be carried out on the HV switchgear according to IEC 62271 and AS 62271, and other related standards.

The following shall be required as a minimum:

- a) Power frequency voltage withstand test according to IEC 62271-200
- b) Lightning impulse voltage withstand test according to IEC 62271-200
- c) Power frequency voltage withstand test on auxiliary circuits according to IEC 62271-200
- d) Short time withstand current test according to IEC 62271-200
- e) Verification of IP coding according to IEC 62271-200
- f) Enclosure tightness test according to IEC 62271-200
- g) Electromagnetic compatibility test according to IEC 62271-200
- h) Verification of making and breaking capacities according to IEC 62271-200
- i) Mechanical operation test according to IEC 62271-200

The equipment shall also have undergone seismic qualification dynamic analysis according to IEEE 693.

Where the offered product has already undergone such type testing according to IEC 62271, the Bidder shall furnish complete type test reports with its bid.

### 5.4.2 Routine Tests

Routine tests shall be carried out on the HV switchgear according to IEC 62271 and AS 62271, and other related standards.

The following shall be required as a minimum

- a) Dielectric test on the main circuit according to IEC 62271-200
- b) Tests on auxiliary and control circuits according to IEC 62271-200
- c) Tightness test according to IEC 60694
- d) Design and visual checks according to IEC 62271-200
- e) Mechanical operation test according to IEC 62271-200

Where the offered product has already undergone such routine testing according to IEC 62271 and other related standards, the Bidder shall furnish complete type test reports with its bid.

### 5.4.3 Other Tests

The Bidder shall carry out as many IAC tests necessary to gain compliance with AS 62271.200 and AS 62271.202 at their own cost. Any design modification done to the equipment must comply with the IAC test requirements. These tests will have to be carried out by the Bidder at their own cost.

The indoor IAC test on the switchgear equipment itself shall be carried out in accordance with AS 62271.200. The minimum test current shall be equal to the rated short circuit withstand current of the HV switchgear unit for a period of three (3) seconds.

If the various tests associated with fault levels of 25kA have not been carried out on the design offered, the Bidder shall state what tests it guarantees to have made and by which testing authority and shall demonstrate that the tests.

## **5.5 Factory Acceptance Test (FAT)**

The Bidder shall make allowance for witnessing of routine tests by two (2) EFL Engineers. The return-air travel, accommodation, meals and other incidental expenses related to routine test witnessing shall be borne by the Bidder.

The Supplier shall give EFL not less than four (4) weeks' notice of when each and every type test will be carried out. Such witnessing shall be required once in the contract period, upon purchase of the first unit. A copy of Inspection and Test Plan (ITP) shall be submitted to EFL with the bid submission, which shall be used in the factory.

## **5.6 Test certificates**

Two certified copies of all test results shall be supplied to EFL. Electronic copies shall also be submitted. All test certificates shall include the manufacturer's serial number. On allocation, the corresponding EFL stock code must be added to the certificate, or attachment to the test report.

# **6 RELIABILITY**

## **6.1 Service Life**

Bidders are required to comment on the reliability of the equipment and the performance of the materials offered for a service life of 45 years under the specified system and environmental conditions.

## **6.2 Spare Parts and Maintenance**

The Supplier shall supply a list of recommended spare parts, special tools and appliances required for the whole of life operation and maintenance of the HV metering unit installation. The list, together with prices, shall be indicated in the appropriate schedule. The Supplier must also provide details (if required) of the recommended maintenance and the frequency at which it must be carried out. Details of the manufacturers repair capability and options shall be provided.

## **6.3 Evidence in Support of Reliability**

The Supplier shall indicate and provide updates to EFL the mean time between failures (MTBF) of the HV metering unit and its components including the recommended maintenance regime and maintenance tasks and intervals. This regime shall be based on the mean time between failure (MTBF) and the critical failure modes identified by the failure mode, effects and criticality analysis (FMECA) of the equipment. Details substantiating the FMECA analysis shall be included in the offer.

Such comments will include evidence in support of the reliability and performance claimed including information on Failure Mode and Effect Analysis.

# **7 ENVIRONMENTAL CONSIDERATIONS**

Bidders are required to comment on the environmental soundness of the design and material used in the manufacture of the items offered. In particular, comments should address such issues as recyclability and disposal at end of service life.

EFL will require, after the evaluation and award of the Tender, to visit the Supplier's factory for compliance checks on various Environmental protection practices in the design, manufacturing, testing and supply of HV CCMVV switchgear unit.

## **8 PACKAGING AND MARKING**

The packaging of items by the Bidder must ensure that they are capable of being delivered undamaged giving due consideration to the quantity, distance of transportation and the preferred method of handling at each location.

The Bidder shall take all necessary precautions to ensure safe handling of all HV metering units and associated accessories supplied.

## **9 QUALITY REQUIREMENTS**

### **9.1 Quality System**

Bidders are required to submit evidence that the design, manufacture and testing of the HV metering units are in accordance with AS/NZS 9001.

Documentary evidence shall be provided concerning the level of Quality System Certification associated with the supplier and or manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

EFL may require, after the evaluation and award of the Tender, to visit the Supplier's factory for compliance checks on various quality management practices in the design, manufacturing, testing and supply of HV CCMVV switchgear units.

## **10 PRODUCT WARRANTY PERIOD**

The Bidder is required to provide the warranty period as part of the proposal.

A minimum warranty period of twenty-four (24) months from time of dispatch from factory shall be provided.

## **11 INFORMATION TO BE SUPPLIED BY THE BIDDER**

### **11.1 Documentation to be supplied with the tender**

To enable EFL to fully evaluate the HV switchgears and metering units offered, (in addition to the completed Specification Requirement and Guaranteed Performance schedules) the Bidder will submit the following information with their tender:

- List showing similar equipment supplied to or on order for other utilities for at least the past ten years, as per Schedule A
- Completed Schedule C as per specifications

- Completed Schedule D
- Typical arrangement drawings, wiring diagrams and full details of the dimensions of the HV switchgear and metering unit
- Type test certificates for the HV metering unit offered, including HV equipment, CTs, VTs, switchgear and circuit breaker
- Short circuit test details for equipment of similar design and rating
- Sample inspection and test plans
- Typical installation and maintenance manuals
- Operating manual for HV Cable switch module, metering module and circuit breaker module
- End of service life disposal method
- Full details of the protective coatings offered
- Evidence of quality management systems used in manufacture, testing and supply
- Evidence of Health, Safety and Environmental plans
- Evidence of financial ability to provide the level of service and support
- Origin of materials used in manufacture of the HV switchgear and metering unit
- Detailed procedure for receiving, handling, lifting and storage
- Names and resumes of key team members who will be assigned to work with EFL upon successful award

Where sub-contractors are used, the Bidder shall provide the above information for the sub-contractors as well.

Bidders may be asked to provide additional information during tender assessment period or following award of contract.

## **11.2 Documentation to be supplied during the course of the contract**

Within two (2) weeks of the placing of the order, the successful Bidder shall supply copies of the following:

- a) A certified outline drawing for HV switchgear and metering unit
- b) Inspection and Test Regimes and plans

The Bidder must exercise reasonable diligence in the design of items in order to satisfy EFL's specific integration requirements between the Bidder's offered item and EFL's requirement for the item to be utilized in its electricity distribution network.

EFL will comment on the drawings supplied under the contract in relation to how the equipment interfaces with EFL's design, construction, operation, maintenance and other requirements. Comments about drawings by EFL shall not in any way absolve the Supplier of responsibility for the safety and reliability aspects of the plant or equipment supplied. The Supplier shall amend the drawings as directed and resubmit them to EFL within one week.

Drawings shall be to scale and in accordance with AS 1100. The contract number shall be shown prominently on all contract drawings. All drawings shall be produced on standard EFL borders, which shall be issued to the Supplier upon award of contract.

## **11.3 Spares**

Bidders are required to provide the relevant spares for the High-Voltage switchgears and metering units. The list of spares required shall be provided with the bid.

## **11.4 Footprint on Existing Floor Plan**

Bidders are required to provide the proposed footprint of the switchgear on the existing floor plans. Floor plans shall be detailed giving due consideration to trenching width and depth, cables bending radius, clearance from walls, safe switching distance required and other details as deemed fit by the Bidder.

## **11.5 Supervision and Training**

The supplier shall provide complete supervision of installation of the High-Voltage CCMVV switchgear unit at the subject site. The supplier shall also provide formal training to EFL personnel. Such cost shall be included in the cost of supply of the High-Voltage CCMVV unit and EFL WILL NOT pay separately for such training.

Training material in the form of drawings, instructions and/or audio visuals shall be provided by the supplier. The training material shall include but is not limited to the following topics:

- Handling
- Storage
- Installation
- Maintenance program
- Environmental performance
- Electrical performance
- Mechanical performance
- disposal

## SCHEDULE A: LIST OF EXPERIENCE, PERSONNEL & FINANCIAL STATEMENTS

### Previous Experience

The Bidder is to submit a list of Projects worked under with a similar scope, involving the design and manufacture of control panels for outdoor switchgear 33kV and above, in chronological order of year completed.

Client	Scope and Description	Quantity of CCMVV Units Supplied	Contact Person

### Personnel

The Bidder is to submit list of personnel who will be allocated to work with EFL for the contract period and also provide their resumes in its bid.

Name	Designation	Duration of Employment with Company	Years of Experience

### Financial Statements

The Bidder shall also submit past three years audited financial statements and records showing its financial ability to undertake this project.

## SCHEDULE B: PRICING SCHEDULE

The bidders are required to submit the following price schedule with the offer.

Item Description	Price (DDU)
Design, Manufacture, Testing and Supply Of Indoor High-Voltage Distribution CCMVV Switchgear Unit with supervision of installation and training of EFL Staff.	
Factory Acceptance Tests by 2 x EFL Engineers (including Air Fares, transport, Meals and Accommodation)	
<b>TOTAL</b>	

EFL will retain 5% of the contract sum, and this retention will be paid six (6) months from the time the equipment delivered to the site.

## SCHEDULE C: SPECIFICATION REQUIREMENT (CABLE SWITCH MODULE)

ITEM	REQUIREMENTS	UOM	Specified requirement	Offered
<b>D1 GENERAL</b>				
D1.1	System highest voltage	kV (rms)	12	
D1.2	Nominal system voltage	kV (rms)	11	
D1.3	Lighting impulse withstand voltage	kV (peak)	95	
D1.4	Power frequency withstand voltage (1 -minute) (rms)	kV - min (rms)	28	
D1.5	Rated frequency	Hz	50	
D1.6	Internal arc withstand (3s) (rms)	kA	25	
D1.7	Design fault level (minimum 3s) (rms)	kA	25	
D1.8	Maximum dimensions			
D1.9	Details of protective coating			
D1.10	Serviceable life expectancy (supported with design report)			
D1.11	Country of Manufacture and Testing			
D1.12	Name of Manufacturer			
D1.13	Address of Manufacturer			
<b>D2 BUSBAR SYSTEM</b>				
D2.1	Rated current (rms)	A	630	
D2.2	Rated short - time withstand current (3s) (rms)	kA/time	25/3 second	
<b>D3.0 SWITCH-DISCONNECTOR</b>				
D3.1	Rated normal current (rms)	A	630	
D3.2	Power frequency withstand voltage (1-min) (rms)	kV	28	
D3.3	Lightning impulse withstand voltage	kV (peak)	95	
D3.4	Rated short- time withstand current (3s) (rms)	kA	25	
D3.5	Rated peak withstand current	kA	50	
D3.6	Making capacity (peak)	kA	50	
D3.7	Load breaking capacity	A	630	
D3.8	Busbar Current Rating	A	630	
D3.9	Maximum cable sizes supported	-	<ul style="list-style-type: none"> <li>• 11kV 3x 1 core 300 Aluminium XLPE insulated PVC/HDPE sheathed.</li> <li>• 11kV 3x 1 core 240 Copper XLPE insulated PVC/ HDPE sheathed.</li> </ul>	
D3.10	Minimum number of mechanical switching operations at no load	no.	1000	
D3.11	Minimum number of mechanical switching operations at rated normal current (630A)	no.	100	
D3.12	Minimum number of mechanical switching operations at rated short circuit current.	no.	5	
D3.13	Padlocking facility provided with minimum padlock hole size (mm)	mm	As per specification	
D3.14	Facilities for voltage indication (via Led lamp) and phase concordance provided per 3 - phase	-	Yes	

D3.15	Switchgear main electric circuits degree of protection (IPxx)	-	IP64	
D3.16	Switchgear drive mechanism degree	-		
D3.17	Switchgear MV cable compartment (with access cover closed) degree of protection	-		
<b>D4 EARTH-SWITCH</b>				
D4.1	Earth-Switches are provided for Switch-Disconnectors and Fuse-Switches panels.	-	Yes	
D4.2	Power frequency withstand voltage (1-min) (rms)	kV	28	
D4.3	Lightening impulse withstand voltage	kV (peak)	95	
D4.4	Rated short-time withstand current (3s)	kA	25	
D4.5	Rated Peak withstand current (3s)	kA	50	
D4.6	Busbar Current Rating	A	630	
D4.7	Stranded earth conductor size		70/150	
D4.8	Minimum number of mechanical switching operations at no load.	no.	1000	
D4.9	Minimum number of mechanical switching operations at rated short circuit current	no.	5	
D4.10	Padlocking facility provided with minimum padlock hole size (mm)	mm	10 mm hole	

Name of Tenderer: \_\_\_\_\_

Signature of Tenderer: \_\_\_\_\_

Date: \_\_\_\_\_

## SCHEDULE D: SPECIFICATION REQUIREMENT (METERING MODULE)

Item	Particulars	Specified Requirement	Offered
<b>General Details</b>			
	Name and Address of Manufacturer		
	Country of Manufacture of components: - HV cubicle - Current Transformer - Voltage Transformer		
	Number of years since the offered unit has been in production		
	Number of units sold worldwide		
<b>Metering High-Voltage Cubicle</b>			
	Nominal System voltage	11kV	
	Highest system voltage	12kV	
	Nominal system frequency	50Hz	
	Impulse withstand peak voltage	95kV	
	Power frequency withstand voltage (a) Primary (b) Secondary	28kV 3kV	
	Rated current	630Amps	
	Short time current (1 second)	25kA	
	Minimum phase to phase distance	255 mm	
	Shortest distance between metal part and earth	190mm	
	Make & type of HV bushing		
	Bushing Profile		
	Bushing Material		
	Bushing Creepage		
	Housing and Corrosion Protection of Equipment - Details (thickness of coating, paint system etc.)		
	Insulating Medium		
<b>Current Transformer</b>			
	CT Ratio	400/200/5A	
	Rated burden in VA	10VA	
	Kneepoint voltage (@ highest ratio)		
	Class of accuracy	0.5 or less	
	Maximum ratio error	As per AS 1675	
	Maximum phase angle error	As per AS 1675	
	Maximum attainable winding temperature	80 deg C	
	Insulation Level	28kVrms/75kVpk	
	Short time thermal current rating for 1 sec	CT Primary 6kA for upto 20/5A & 13KA for >20/5A	
	Saturation Factor	To be indicated	
	Normal Current density of primary winding	=<1.6 Amps per sq.mm	
	Continuous percentage over load	120%	
	ISF		
<b>Voltage Transformer</b>			
	VT Ratio	11,000/110 V	
	Rated burden in VA	100VA	
	Rated voltage factor and time	1.2 continuous and 1.9 for 30 seconds	
	Temperature rise over max ambient temperature	As per AS1675	

	Maximum phase angle error	As per AS1675	
	Maximum ratio error	As per AS1675	
	Maximum attainable winding temperature	80 deg C	
	Class of accuracy	0.5 or less	
	Insulation level	28kVrms / 75 kVpk	
	Winding connection	Star / Star	
<b>Weight of core &amp; winding</b>			
<b>Current Transformer</b>			
	Core	To be indicated in separate sheet for each rating	
	Primary Winding		
	Secondary winding		
<b>Potential Transformer</b>			
	Core	To be indicated	
	Primary Winding		
	Secondary winding		
	Quantity of oil in Ltr	To be indicated	
	Grade of oil	To be indicated	
	Total weight of complete ME including all accessories and oil	To be indicated	
<b>Resistance of primary &amp; secondary winding per phase at 75 °C</b>			
	CT Winding (i) Primary	To be indicated in separate sheet for each rating	
	(ii) Secondary		
	PT Winding (i) Primary	To be indicated	
	(ii) Secondary	To be indicated	
	Maximum attainable winding temperature	85 °C	
	Bi-metallic terminal connector with nut, plain washer, spring washer & check nut suitable for aluminium conductor as per CT ratio	6 nos to be provided	
	Type of core material	To be indicated	
<b>Type &amp; thickness of gasket used on</b>			
	Top cover tank	To be indicated	
	Secondary terminal box	To be indicated	
	HV bushings	To be indicated	
<b>Details of Metering Unit</b>			
<b>CT Details</b>			
<b>Cross section area of each turn of CT winding (in sq mm)</b>			
	Primary winding	To be indicated in separate sheet for each rating	
	Secondary winding		
<b>No of turns</b>			
	Primary winding	To be indicated in separate sheet for each rating	
	Secondary winding		
<b>Winding material</b>			
	Primary winding	To be indicated	
	Secondary winding	To be indicated	
<b>Voltage Transformer Details</b>			
<b>Cross section area of each turn of PT winding (in sq mm)</b>			
	Primary winding	To be indicated	
	Secondary winding	To be indicated	
<b>No of turns</b>			
	Primary winding	To be indicated	
	Secondary winding	To be indicated	
<b>Winding material</b>			

	Primary winding	To be indicated	
	Secondary winding	To be indicated	
<i>Identification/marking of</i>			
	Primary terminals		
	Incoming	RM, YM, BM	
	Outgoing	RL, YL, BL	
	Secondary terminals		
	CT's	1s1- 1s2, 3s1 - 3s2, for single ratio & 1s1- 1s2- 1s3, 3s1 3s2-3s3 etc for multi ratio	
	PTs	r,y,b,n	
<b>Size and material of</b>			
	Primary studs	M12 up to 20A& M16>20A.	
	Secondary studs	M6	
	Secondary chamber shall have double door type& sealing arrangement in both the doors	To be provided	
<b>General</b>			
	Dimensional Drawings, Electrical Drawings		
	Dimension of Terminal Box		
	Mass in kg		
	Dimensions in mm		
	IP Rating	IP44	
	Fittings as per Specifications		
	Drawing of Sample Nameplate		

Name of Tenderer: \_\_\_\_\_

Signature of Tenderer: \_\_\_\_\_

Date: \_\_\_\_\_

## SCHEDULE E: SPECIFICATION REQUIREMENT (CIRCUIT BREAKER MODULE)

ITEM	REQUIREMENTS	UOM	Specified Requirement	Offered
<b>D1 GENERAL</b>				
D1.1	Rated voltage	kV (rms)	12	
D1.2	Nominal system voltage	kV (rms)	11	
D1.3	Lighting impulse withstand voltage	kV (peak)	95	
D1.4	Power frequency withstand voltage (1 -minute) (rms)	kV - min (rms)	28	
D1.5	Rated frequency	Hz	50	
D1.6	Internal arc withstand (3s) (rms)	kA	25	
D1.7	Design fault level (minimum 3s) (rms)	kA	25	
	Short circuit Breaking Current Capacity	kA	21	
	Making Capacity	kA	52.5	
D1.8	Maximum dimensions			
	Number of mechanical operations			
D1.9	Details of protective coating			
D1.10	Serviceable life expectancy (supported with design report)			
D1.11	Country of Manufacture and Testing			
D1.12	Name of Manufacturer			
D1.13	Address of Manufacturer			
<b>D2 BUSBAR SYSTEM</b>				
D2.1	Rated current (rms)	A	630	
D2.2	Rated short - time withstand current (3s) (rms)	kA/time	25/3 second	
<b>D3.0 SWITCH-DISCONNECTOR</b>				
D3.1	Rated normal current (rms)	A	630	
D3.2	Power frequency withstand voltage (1-min) (rms)	kV	28	
D3.3	Lightning impulse withstand voltage	kV (peak)	95	
D3.4	Rated short- time withstand current (3s) (rms)	kA	21	
D3.5	Rated peak withstand current	kA	50	
D3.6	Making capacity (peak)	kA	52.5	
D3.7	Load breaking capacity	A	630	
D3.8	Busbar Current Rating	A	630	
D3.9	Maximum cable sizes supported	-	<ul style="list-style-type: none"> <li>• 11kV 3 core 300 Aluminium XLPE insulated PVC/HDPE sheathed.</li> <li>• 11kV 3 core 240 Copper XLPE insulated PVC/ HDPE sheathed.</li> </ul>	
D3.10	Minimum number of mechanical switching operations at no load	no.		
D3.11	Minimum number of mechanical switching operations at rated normal current (630A)	no.		
D3.12	Minimum number of mechanical switching operations at rated short circuit current.	no.		

D3.13	Padlocking facility provided with minimum padlock hole size (mm)	mm	10mm diameter	
D3.14	Facilities for voltage indication (via Led lamp) and phase concordance provided per 3 - phase	-	Yes	
D3.15	Switchgear main electric circuits degree of protection (IPxx)	-	IP64	
D3.16	Switchgear drive mechanism degree	-		
D3.17	Switchgear MV cable compartment (with access cover closed) degree of protection	-		
<b>D4 EARTH-SWITCH</b>				
D4.1	Earth-Switches are provided for earthing cable	-	Yes	
D4.2	Power frequency withstand voltage (1-min) (rms)	kV	28	
D4.3	Lightening impulse withstand voltage	kV (peak)	95	
D4.4	Rated short-time withstand current (3s)	kA	25	
D4.5	Rated Peak withstand current (3s)	kA	50	
D4.6	Busbar Current Rating	A	630	
D4.7	Stranded earth conductor size		70/150	
D4.8	Minimum number of mechanical switching operations at no load.	no.	1000	
D4.9	Minimum number of mechanical switching operations at rated short circuit current	no.	5	
D4.10	Padlocking facility provided with minimum padlock hole size (mm)	mm	10 mm diameter	

Name of Tenderer: \_\_\_\_\_

Signature of Tenderer: \_\_\_\_\_

Date: \_\_\_\_\_

## SCHEDULE F: SUBMISSION REQUIREMENTS

All tenderers are required to complete and submit a copy of the submission requirements with their bid submissions.

Requirements	Response from Bidders
Completed technical details (schedules A to D) (Yes/No)	
Validity of Bid (120 days required) (Yes/No)	
Payment conditions.	
Delivery Term is DDU	
Bidders company profile outlining financial, technical and production capabilities.	
Detailed reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating.	
Quality management system used in the production of HV switchgears and metering units, attached certificate.	
Health, Safety and Environmental plans.	
Detailed receiving, handling and storage details.	
Minimum warranty period from time of acceptance of HV switchgears and metering units.	
Sample inspection and test plan.	
Typical installation manual for HV switchgears and metering units.	
Operating manual provided	
Disposal method after service life.	
Complete dimensional drawing.	
List of spares (As per Clause 12.4)	
Floor plan for offered HV switchgear	
List of Type test certificates provided. (As per Clause 6.2)	
Sample routine test certificates.	

Name of Tenderer: \_\_\_\_\_

Signature of Tenderer: \_\_\_\_\_

Date: \_\_\_\_\_

## **SCHEDULE G: EFL ENERGY METER SPECIFICATIONS & MANUAL**

EFL energy meter manual is provided as a separate attachment/pdf file.

# SCHEDULE H: EXISTING SUBSTATION BUILDING DIMENSIONS

