Tender No **TPSODL/OT/2024-25/018**

Package Name **Rate Contract for power supply to 3MVA Load for charging of E-Bus operation project near bus terminal, Haladiapadar, Berhampur**

Sr. No.	Detailed Reference to TPSODL Technical Document. Please specify Document No / Clause No / Page No	Description as per Bid Document	Remarks - Query / Clarification	TPSODL Response
1	2	3	4	5
1	Part-B : Supply of 33KV 4 way RMU			
2	BOQ Sl.No-1	RMU 33KV 4W 630A LLVV (2ISO+2BKR)+ AUX.PT	Please share the Technical specification of RMU	The technical specification of RMU is attached.

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1012

Specification Name : Specification for 33KV RMU Motorised Outdoor Type

Vijender Goyal	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPNODL	TPCODL	TPWODL	TPSODL	TPSODL
13-12-2022	13-12-2022	13-12-2022	14-12-2022	14-12-2022	14-12-2022

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 33 KV motorized Ring Main Units with all accessories for trouble free & efficient performance .

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured. and tested in accordance with latest editions of the following IEC/IS Standards and shall conform to the regulations of local statutory authorities.

IEC 62271-200	HV switchgear and control gear-AC Metal Enclosed switchgear and control gear for voltages above 1 kV and upto and including 52kV .
IEC 62271-1	Common specifications for high voltage switchgear and control gear standards
IEC 62271-102	HV switchgear and control gear-Alternating current disconnectors and earthing switches
IEC 62271-103	High voltage switches — Part 1: Switches for rated voltages above 1 kV and less than 52 kV
IEC 60529.	Degrees of protection provided by enclosures (1P Code)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK Code)
IEC 60060	High-voltage test techniques
IEC 60947 /IS 13947	Low voltage switchgear and control gear
IEC 60439-1	Low-voltage switchgear and control gear assemblies- Type tested and partially type tested assemblies
IEC 60255-151	Electrical relays - Part 3: Single input energizing quantity measuring relays with dependent or independent time.
IEC 60044-1 / IS 2705	Current Transformers
IEC 60044-2 / IS 3156	Voltage Transformers
IEC 60376	Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment
IEC 61958	High-voltage prefabricated switchgear and control gear assemblies - Voltage presence indicating system

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	100%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120

7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has **heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph**. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS

Sr. No	Descriptions	As Specified By TPCODL/TPNODL/TPSODL/TPWODL
1	RMU Category-Motorised with Inbuilt Battery charger & Battery	3 Way Motorised (1 CB + 2 LBS) 4 Way Motorised (2 CB + 2 LBS)
2	RMU Application	Outdoor
3	Dielectric Medium	SF6
4	Interrupting Medium	SF6 / Vacuum
5	System Frequency	50 Hz
6	Rated voltage	36Kv
7	Service Voltage	33Kv
8	Rated Current-Line Switches	630A
9	Rated Current –CB	630A
10	Rated Short time Current Withstand	25KA for 1 Sec / 20KA for 3 Sec
11	Internal ARC (1 Sec)	25KA
12	Rated Short time Making Capacity	50kA
13	Rated Cable charging Interrupting current incomer load break switch	25A
14	Rated Load Interrupting Line Current	630A
15	Rated Magnetizing Interrupting Current of Line switch.	10A
16	No. Of Operations at rated Short Circuit Current on line Switches Earthing Switches and CB	5 close

17	i. Mechanical endurance for Isolator & earth switch	Min 1000 Operations
	ii. Mechanical endurance for circuit breaker	Min 2000 Operation
	CTs for Protection:	To be Finalised during Detailed Engineering if applicable
	Material : Epoxy resin cast/	
	Burden : 2.5VA	
	Ratio : 100-50/1 A	
	Accuracy Class : 5P20	
18	Electrical Operations of Isolator & E/Switch at rated current	To be Provided By Bidder
19	Temp Rise	Maximum permissible temperature for bus bar shall not be 105 deg C an ambient temperature not exceeding 50 deg C, as per IEC 60694 And IEC 62271. However, the temperature rise for accessible enclosures and covers shall not exceed 30K and in case, they are not required to be touched during normal operation, the limit shall be raised by 10K
20	Min Gas Pressure	0.05 Bar G
21	SF6 Gas Pressure Indicator	To be Provided by Bidder
22	SF6 Gas leakage Detector	1 per 20 RMUs Subject to Minimum One Number
23	Guaranteed SF6 Leakage per Annum	Less than 0.1%
24	Degree Of Protection	IP 67 for the tank and IP2X for the front cover/mimic board and IP55 for Outdoor RMUs .The RMU metal parts shall be 2.0 mm thickness high tensile steel which must be shot blasted, spray galvanised with minimum thickness of 30 micron and subsequently powder coated. The overall Paint thickness shall be 125 microns (No negative tolerance is allowed)
25	Internal arc test	25kA 1 Sec
26	Lightning Impulse withstand Phase to Earth	170kVp
27	Power frequency withstand for 1Minutes	70kVrms
28	SF6 tank design	Hermetically sealed unpainted stainless steel enclosure with SF6 Gas. Sealed pressure system by Laser welding so that no refilling of gas is required for 30 years. No gas work to prevent access to live parts. No gasket shall be used, No bolts Shall be provided
29	Earth Bus Bar Material & Size	To be provided by Bidder

30	Earthing of main CCT cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open.	To be provided by Bidder
31	Incomer load break switch shall be SF6 type with least maintenance and shall have at least 3 positions, Open, Close & earth with Natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock.	To be provided by Bidder
32	Circuit Breaker Preferably SF6 type with minimum maintenance and shall have at least 2 positions i.e. open & close, manual operation & fitting of motor at site shall be possible if required.	To be provided by bidder
33	Protection Relay –Without Auxiliary Power & shall include 3 toroid transformer in trans. Tee-off bushing, electronics relay, low energy release & fast on test receptacle for protection testing.	Self powered O/C+E/F IDMT characteristics with 0.05 Sec TMS.
34	Make of Relay	TPCODL/TPNODL/TPSODL/TPWODL Odisha –ABB ,Ashida, Schneider, Siemens
35	Flag indication for CB Trip on fault in relaymechanical or Electrical	To be Provided By bidder
36	Testing of cable-without opening the doors.If doors are opened then earth switch shall be in closed position and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate ,Isolator, E/switch or CB through interlocks	To be confirmed. If separate test bushing are provided, it Shall be covered with suitable antitheft covers with anti vandal screws.

37	Protection against Theft	Design Of RMU shall be tamper & arc proof. And vandal Screws shall be provided. Cable covers shall be pad lockable. All live parts / test Bushing etc. Shall be covered with antitheft covers.
38	Doors	Outer enclosure should be hinged main door with padlock provision. Cable chamber door should not be hinged type. It should be arc proof with bolted arrangement. Note: RMU shall be inside the enclosure.
39	Voltage indicator box shall be fixed type- This device shall be in compliance with IEC 61958 standard.	Capacitive dividers type which will supply low voltage to power the lamps and 3 inlets can be used to check phase sequence.
40	Phase comparator	1 per RMU
41	Cable Clamps	HDPE
41.1	Cable Termination	
41.2	Type	Heat/Cold shrinkable (Raychem/3M Make only)
41.3	Size (To be finalized in detailed Engineering Stage)	Suitable for 3C x 400 Sqmm/ 1CX400Sqmm / 1CX630Sqmm
42	Height	Minimum 1200mm above GL
43	Earth fault passage indicator	One Per RMU with as a part of RMU
44	Operating handle	To be provided by bidder as part of RMU
45	MIMIC Diagram in Front of panel	To be provided by bidder
45.1	Bus bar	
45.2	Material	Copper
46	Cross Section	To be specified by bidder
47	Opening & Closing times (Max)	Opening Time: 2.5 Cycle Closing Time: 3 Cycles
47.1	Current Transformer	Shall be epoxy resin and are mounted around the cable outside SF6 gas compartment. The CTs around the cables shall be supported on the sheet steel bracket base sized for CTs .CTs shall not be kept hanging or put on base frame directly
48	CT Dimension	Suitable for 3C x 400 Sqmm/ 1CX400Sqmm / 1CX630 Sqmm

49	SCADA Compatibility- Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	As per specification
50	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	As per specification
51	Guarantee- From date of taking over by TPL	48 Months from the date of commissioning or 60 months from the date of supplies made under the contract whichever is later
52	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder
53	Total weight	To be provided by bidder
54	Paint	TPL Blue PANTON E 2727C
55	Power Supply	24VDC for Control Circuit from Battery & Battery Charger 15AH Input Supply to Battery Charger : 220VAC Aux PT 3300/√3 / 220 VAC, 500VA (Optional and to be quoted Separately)
56	Motor	Coupled type DC operated motors shall be suitable for the installation on the indoor type RMU's on the isolator function and to be flitted in/from the LV compartment side. There shall be provision to fit the motor on Circuit breaker also Motor Voltage: 24 VDC Operating Time:4-8 Sec Rating: To be submitted by Bidder
57	Auxiliary contacts (spare numbers to be provided)	LBS (4NO+4NC) Earth Switch (2NO+2NC) CB (4NO+4NC) CB Disconnector (2NO+2NC) CB earth switch (2NO+2NC)

Type of Ring Main Units shall be as under:

3 Way/4 Way Non Extensible Type (For Outdoor application):
3 Way Motorised (1 CB + 2 LBS) with Self powered O/C & E/F Relay and 1 FPI
4 Way Motorised (2 CB + 2 LBS) with Self powered O/C & E/F Relay and 1 FPI

5. GENERAL CONSTRUCTIONS

5 GENERAL CONSTRUCTION FOR RMU

5.1.1 The switchgear and bus bar shall be contained in a stainless steel tank filled with SF6 gas and the outer body shall be made of minimum CRCA of 2mm or GI high tensile steel 2mm thick with thick gland plates of 3mm. The sheet steel shall have surface treatment of 7 tank process With powder coating of minimum 70 microns. The tank shall have SS sheet of 1 minimum 2mm thickness with internal Arc Type tested and meet the "sealed pressure system" criteria in accordance with the IEC 62271-200. This is a system for which no handling / refilling of gas shall be required throughout the expected operating life, i.e. 30 years. Sealed pressure systems are completely assembled, filled and tested in the factory. The maximum leakage rate of SF6 gas shall be lower than 0.1 % of the total initial mass of SF6 gas per annum. The filling pressure for the switchgear shall be just above the atmospheric pressure so as to reduce the tendency to leak. SF6 gas used for the filling of the RMU shall be in accordance with .IEC 376. It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. The degree of protection for RMU tank (Indoor/Outdoor) shall be IP 67. The mimic board shall be provided with IP2X /IP3X degree of protection for Indoor RMUs and protection for Outdoor RMUs shall be minimum IP 54

The RMU shall be suitable for mounting on plinth with provision for cabling through gland plate in the base and trench below, The RMU shall be designed so that the position of the different devices is visible to the operator on the front and operations are also visible. The RMU shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics. The RMU shall be designed to be tamper proof so as to prevent access to all live parts during operation without the use of tools.

5.1.2 The RMU shall be completed with all connection and electrolyticcopper bus bar with continuous current carrying capacity of 630A at 50 Deg C ambient. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank. There shall be continuity between the metallic parts of the RMU and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The earth bus bar shall be preferably enclosed in an enclosure to prevent theft/tampering.

5.1.3. All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short-circuit making capacity in compliance with IEC 62271-102. Circuit breaker shall not be closed in case Earth Switch is closed. The earth switch shall be fitted with its own operating mechanism and manual closing shall be driven, by a fast-acting mechanism, independent of operator action. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when cable is charged.

5.1.4 Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure limiting device provided in the rear part of the tank. Gas shall be released to the rear of the RMU away from the operator. Bidder shall provide type test report to prove compliance to the 'Internal fault IAC AFLR as per IEC 62271-200. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earth switch. All manual operations shall be carried out on the front of the RMU. The instrument transformers (CT/PT) shall be required and to be incorporated in the drawing for discussion at the final stage.

5.1.5 **Circuit Breaker for Transformer Local Feeder Control**

The circuit breakers shall be of the maintenance free. The position of the power and earthing contacts shall be clearly visible on the front of the RMU. The circuit breakers shall have at least 2 positions: Open-disconnected and closed and shall be constructed in such a way that natural interlocks prevent all unauthorized operations. They shall be fully mounted and inspected in the factory. Breaker operation counter should be provided.

An operating mechanism can be used to manually close the circuit breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping by, an integrated push button. There will be no automatic re-closing. The operating mechanism shall be compatible for remote/SCADA operation. The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include three toroid transformers incorporated in the transformer tee-off bushings, an electronic self powered relay, a low energy release, and a "fast-on" test receptacle for protection testing (with or without CB tripping).

The protection system shall ensure circuit breaker tripping as of a minimum operating. current which is the rated current of the underground network to be protected. The CT settings shall be adjustable and CT ratio to be decided during detailed engineering as per site requirement. Protection core CT complete details should be furnished (Burden, class, ALF).

The circuit breaker shall be provided with Phase protection of Definite time/ IDMT element for overcurrent and earth fault with minimum PSM-0.05, Tsm-0.01 having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The Earth Fault Protection shall be provided of. Definite time/ IDMT element having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The "Time Multiplier" with minimum set point of 0.05 TMS shall be available. The breaker shall have the provision of flag Relay for indication of Trip on Fault. High set (DT) for overcurrent and earth fault-min current setting-0.5 In, minimum Time Delay-20 millisecond. The relays shall be suitable numerical relay with necessary elements or any other relay as per the Purchaser's approval.

There' shall be provision for testing of cable without opening the front door by suitable arrangements. In case cables are to be tested with front door open, doors shall have interlocks such that doors can be opened only with earth switch in closed position. Termination boots as approved by the Purchaser's should have a proper opening to facilitate the testing. The opening shall be covered by means of removable protection cap

In case of front door opened, it shall not be possible to operate the breaker. All panel covers shall be provided with anti vandal screw bolts so that opening of panel covers is only possible with special tools, which shall be provided by the Bidder. This is required to prevent pilferage. The cable cover door shall be pad lockable and shall be Tamper and Arc proof. There shall be provision of hinged doors in the RMU. The circuit breaker and earth switch shall be lockable in the open or closed positions by 1 to 3 padlocks. Breaker shall have mechanical endurance of at least 2000 operations.

The circuit breaker shall be compatible for remote operation and can close (ON) and open (OFF) by remote operation.

5.1.6 Incomer Load Break Switches :

The Load break switches shall have positions, open-disconnected closed, and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations
The position indicator shall provide positive contact indication in accordance with IEC 265-1 standard. In addition, manufacturer shall prove reliability of indication in accordance with IEC 129.
The switches shall be fully mounted and inspected in the factory. Manual opening and closing will be driven by a fast-acting mechanism, independent of operator action.
Mechanical Interlock should be provided for Earth switch, If cable is back charged Earth switch should not be closed.
Each switch can be fitted with an electrical operating mechanism in a specially reserved location, without any modification of the operating mechanism and without de-energizing the RMU.
Load break Switch should be operated manually & motorized.

5.1.7 Bushings and Cable terminations:

Each cable compartment shall_ be_ provided_ with three-_ bushings _of adequate _sizes to terminate the incoming and outgoing cables along with a terminal block (TB) located at convenient accessible location so as to wire all inputs & outputs (I0s) up to the terminal block (TB). The bushings shall be conveniently located for proper bend so as to allow easy working and

termination of cables. The cable termination shall be done with Heat shrinkable /Push ON termination method so that adequate clearances are maintained between phases & cable shall be held by HDPE (fire retardant) cleat. 2 runs, of 3CX400 Sq mm, OR 1R of 3 NO. 1CX630 Sq mm shall be used for cable termination.(It shall be finalized during detailed engineering) All the cable secondary Wiring should 'be rooted through marshaling box separately for relay, CT etc.BA should provide bimetallic washer for tightening of cable.

5.1.8 Earthing:

The RMU outdoor metal clad, switchgear,, Distribution Transformer, R.S. Joists, M.S Channels/M.S. angles etc, shall be equipped with an earth bus securely fixed along the base of the RMU. The size of earth busbar of GI Strip (75X12 mm) shall be as per IEC/IS. Provision shall be made on end of RMU for connecting the earth bus to the earth grid by erecting suitable 2 earth pipes of 50mm dia. M.S. rod of 3 meter in Pits. Both the earth pipes are also to be connected in a grid formation. Necessary terminal clamps and connectors shall be included in the scope of supply.

5.1.9 Voltage indicator lamps and phase comparators:

Each function shall be equipped with a fixed type voltage indicator box on the front to indicate whether or not there is voltage in the cables. The capacitive dividers Will supply low voltage power to the lamps. Three inlets can be used to check the synchronization of phases. These devices shall be in compliance with IEC 61958 standard.

5.1.10 Front Cover

The front cover shall provide a clear mimic diagram that indicates the different functions. The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The bidder shall provide a marking plate showing RMU's main electrical characteristics.

5.1.11 Fault Passage Indicators

Fault Passage Indicators shall be installed on the Ring Main Unit. These devices shall be, electronic devices with their own energy source and connected to Single 3 phase Split Core CTs (CBCT) . These shall be provided with bright LED s / flag. Indicators, which shall be clearly visible in the day time. These shall have the following resetting facilities:

-Manual reset

-Resetting after a set time duration

-Electrically reset from remote with at least 2-spare potential free Contacts.

FPI should be communicable type with remote resettable functionality.

The unit shall have Short Circuit and Earth fault adjustable to different settings with separate Current transformer. They shall be fully field-programmable and shall have at least 16 settings for Earth Fault + 4 settings for Phase-Phase. It shall be possible to Test these indicators at site thru "Test" push button. The Fault Passage Indicators shall also be provided with a SCADA output contact. These shall confirm to the following standards:

IEC 60068-2-6, IEC 60068-2-9	: Environmental testing — For Vibration, solar
IEC 60950	radiations :Information Technology equipment - Safety
IEC 1000-2	: Electromagnetic compatibility for low-frequency conducted disturbances and signaling in public low power supply systems
IEC 1000-4	: EMC - Testing & Measurement
IEC 1000-6	: EMC- Immunity for Residential, Commercial and light industrial environments

5.1.12 Remote Control of the RMU:

Remote operation of the RMU line switches shall be possible using pre- fitted motors to the operating mechanism for both line switch and circuit-breaker functions. All the necessary accessories shall be supplied separately, to stores.

Auxiliary contacts for remote indication of switch status are also required.

The fitting of the motors to the mechanism must not in any _way impede or interfere with the manual operation of the switches. An auxiliary contact to prevent motorized operation of the mechanism while the operating handle is inserted into the operating point shall also be provided.

Preferred Communication protocol for FRTU shall IEC-60870-5-104

Signal requirement for field RTU (which shall be mounted near RMU) is attached (refer Annexure1). Bidder shall quote the cost of field RTU (FRTU) separately with all technical details for acquisition of the signal as described in Annexure-1.

5.1.13 Paint

All paint shall be applied on clean dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The overall paint thickness shall be be 125 microns. (No negative tolerance is allowed). The paint shall not scale off or crinkle or be removed by abrasion during normal handling. The enclosure of the RMU shall be painted with shade Dark Gray, i.e., BS381C or RAL 7032. Sufficient quantity of touch-up paint shall be furnished for application at site.

6. MARKING

All the components and operating devices of the RMU shall be provided with durable and legible nameplates containing all technical parameters. Name plates shall be suitably embossed with" PO no. with date", "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL & PO Number along with the following information. A Danger plate of appropriate size shall also be provided on the enclosure.

a) Manufacturer's Name
b) Month and year of supply
c) PO Number
d) Rated Voltage
e) System Frequency
f) Rated Short time withstand current for 'I sec
g) Rated Impulse withstand Voltage
h) Degree of Protection
i) Type Designation or Serial no.
j) Year of manufacture
k) Applicable Rated values
l) Mass of unit
m) SF6 gas filling pressure

7. TESTS

7.0 TESTS FOR RMU

All the Routine and acceptance tests shall be carried out in accordance with the relevant IS/IEC standards. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components within the RMU enclosure shall have been tested for Routine/acceptance and Type tests as per the relevant standards. All Type tests as per latest IS / 1EC shall have been carried out on the RMU as a whole

as per relevant IS/IEC. Following tests shall be necessarily conducted on the equipment and its components in addition to others specified in the IS/IEC:

Type Test

a) Power Frequency test
b) Mechanical operation test and checking of interlocks
c) Dielectric test on main and control circuits.
d) Temperature Rise test.
e) Internal Arc withstand test,
f) Degree of Protection test.
g) Test to check the capability of main and earthing circuits subjected to rated peak and short time withstand current.
h) Test to check the total time taken to clear the faults (relay pick up+ Trip coil pick up + breaker trip) for instantaneous & time delay modes.under various settings of relay and trip coil thru secondary current injection.
i) Salt Spray Test

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.
The above tests must not have been conducted on the equipment within time frame as per latest CEA Guidelines In case of any change in design/type of Breaker already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

Routine test:

Following routine tests are to be done on 100% of the lot quantity

1.
2. Dimensional & Visual Checks
3. Operational & Interlock Tests of breaker & isolator switches
4. Measurement of Circuit Resistance
5. Sf-6 chamber pressure withstands/leakage test.
6. HV withstand test across isolator distance.
7. HV withstand test of control and auxiliary circuits.
8. Voltage Indication Tests.
9. Breaker Contact Resistance Test
10. Total Trip Time Check Test through Current Injection in primary.
11. IR Value.

Below routine test has to be provided on cable Boot for cable termination:
a) Visual inspection of the final finished product.
b) Intactness with Bushing.
c) Insulation Test.
d) AC HV test.

Acceptance test:

All the tests specified under Routine Test Clause above shall be carried out as acceptance test on random samples as per sampling plan under IEC/IS for each lot.
Bidder should have all the requisite testing equipment's to carry out routine and acceptance test mentioned above including:
a. Facility for primary current injection up to 1000amp.
b. Facility to check total trip timing of breaker along with breaker main contacts through primary current injection

8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates of the 33 KV RMU for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI or any other International Laboratory as per the relevant standards. Type tests shall have been conducted in CPRI or any other International Laboratory during the period not exceeding time span as per CEA guidelines. In the event of any discrepancy in the test reports, i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

9.0 PRE-DISPATCH INSPECTION

Equipment shall be subjected to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the option bf the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to. rejection. Supplier shall grant free access to the places of manufacture to TPCODL/TPNODL/TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or it's authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL. Following documents shall be sent along with material

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
h) Other Documents applicable)

10.0 INSPECTION AFTER RECEIPT AT STORE

The material received at TPCODL/TPNODL/TPSODL/TPWODL Store will be inspected for acceptance and shall be liable for rejection if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11.0 GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 48 months from the date of commissioning or 60 months from the date of last supplies made under the contract whichever is later, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the " Security cum Performance Deposit" as the case may be.

Bidder shall further be responsible for 'free replacement for another period of **THREE** years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12.0 PACKING

Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit

13.0 TENDER SAMPLE

Not applicable.

14.0 QUALITY CONTROL

The bidder shall submit with the offer, assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

15.0 TESTING FACILITIES

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16.0 MANUFACTURING ACTIVITIES

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage with quantity. This bar chart shall be in line with the Quality Assurance Plan, submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17.0 SPARES, ACCESSORIES & SPECIAL TOOLS/GAUGES

Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document. Bidder 'shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall give a minimum of 12 months notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.

Any spare apparatus, parts or tools shall be subject to the same specification, tests and conditions as similar material supplied under the Contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the plant and must be suitably marked and numbered for identification.

18.0 DRAWINGS & DOCUMENTS

Following drawings and documents shall be prepared based on TPCODL/TPNODL/TPSODL/TPWODL specifications and statutory requirements and shall be submitted with the bid:

a) Completely .filled in Technical Particulars
b) General description of the equipment and all components including brochures.
c) General arrangement for RMU
d) Power flow diagram
e) Foundation plan
f) Bill of material
g) Experience List
h) Type test certificates

Drawings / documents to be submitted after the award of the contract are as under:

Sl. No.	Description	For Approval	For Review/Information	Final Submission
1	General Technical Particulars	✓		✓
2	General Arrangement drawings	✓		✓
3	Schematic Diagram	✓		✓
4	Bill of materials	✓	✓	✓
5	Foundation Plan & loading details		✓	✓
6	Installation Instructions		✓	✓
7	Instruction for Use		✓	✓
8	Transport/ Shipping dimension drawing	✓	✓	✓
9	QA & QC Plan	✓	✓	✓
10	Test Certificates			

All the documents &drawings shall be in English language.
After the receipt of the order, the successful bidder will be required to furnish five copies of all relevant drawings for TPCODL/TPNODL/TPSODL/TPWODL approval.
Instruction Manuals: Bidder shall furnish two softcopies (CD) and four (4) hard copies of nicely bound manuals (In English language) covering erection and 'maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19. GUARANTEED TECHNICAL PARTICULARS

Sr. No	Descriptions	As Specified By TPCODL/TPNODL/TPSODL/TPWODL	Bidders Response
1	RMU Category-Motorised with Inbuilt Battery charger & Battery	3 Way Motorised (1 CB + 2 LBS/ 2CB + 1LBS) 4 Way Motorised (2 CB + 2 LBS/ 3CB + 1LBS)	
2	RMU Application	Outdoor	
3	Dielectric Medium	SF6	
4	Interrupting Medium	SF6 / Vacuum	
5	System Frequency	50 Hz	
6	Rated voltage	36Kv	
7	Service Voltage	33Kv	
8	Rated Current-Line Switches	630A	
9	Rated Current –CB	630A	
10	Rated Short time Current Withstand	25KA for 1 Sec / 20KA for 3 Sec	
11	Internal ARC (1 Sec)	25KA	

12	Rated Short time Making Capacity	50kA	
13	Rated Cable charging Interrupting current incomer load break switch	25A	
14	Rated Load Interrupting Line Current	630A	
15	Rated Magnetizing Interrupting Current of Line switch.	10A	
16	No. Of Operations at rated Short Circuit Current on line Switches Earthing Switches and CB	5 close	
17	i. Mechanical endurance for Isolator & earth switch	Min 1000 Operations	
	ii. Mechanical endurance for circuit breaker	Min 2000 Operation	
	CTs for Protection:	To be Finalised during Detailed Engineering	
	Material : Epoxy resin cast/		
	Burden : 2.5VA		
	Ratio : 100-50/1 A		
	Accuracy Class : 5P10		
18	Electrical Operations of Isolator & E/Switch at rated current	To be Provided By Bidder	
19	Temp Rise	Maximum permissible temperature for bus bar shall not be 105 deg C an ambient temperature not exceeding 50 deg C, as per IEC 60694 And IEC 62271. However, the temperature rise for accessible enclosures and covers shall not exceed 30K and in case, they are not required to be touched during normal operation, the limit shall be raised by 10K	
20	Min Gas Pressure	0.05 Bar G	
21	SF6 Gas Pressure Indicator	To be Provided by Bidder	

22	SF6 Gas leakage Detector	1 per 20 RMUs Subject to Minimum One Number	
23	Guaranteed SF6 Leakage per Annum	Less than 0.1%	
24	Degree Of Protection	IP 67 for the tank and IP2X for the front cover/mimic board and IP55 for Outdoor RMUs .The RMU metal parts shall be greater than 2.0 mm thickness high tensile steel which must be shot blasted, spray galvanised with minimum thickness of 30 micron and subsequently powder coated. The overall Paint thickness shall be not less than 70 microns.	
25	Internal arc test	25kA 1 Sec	
26	Lightning Impulse withstand Phase to Earth	170kVp	
27	Power frequency withstand for 1Minutes	70kVrms	
28	SF6 tank design	Hermetically sealed unpainted stainless steel enclosure with SF6 Gas. Sealed pressure system by Laser welding/TIG & MIG welding so that no refilling of gas is required for 30 years. No gas work to prevent access to live parts. No gasket shall be used, No bolts Shall be provided	
29	Earth Bus Bar Material & Size	To be provided by Bidder	
30	Earthing of main CCT cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open.	To be provided by Bidder	
31	Incomer load break switch shall be SF6 type with least maintenance and shall have at least 3 positions, Open, Close & earth with Natural interlocks. Fitting of motor at site shall be possible & shall	To be provided by Bidder	

	have mechanical interlock. The electrical interlock for preventing manual closing of earth switch under cable charged condition to be provided.		
32	Circuit Breaker Preferably SF6 type with minimum maintenance and shall have at least 2 positions i.e. open & close, manual operation & fitting of motor at site shall be possible if required.	To be provided by bidder	
33	Protection Relay – Without Auxiliary Power & shall include 3 toroid transformer in trans. Tee-off bushing, electronics relay, low energy release & fast on test receptacle for protection testing.	Self powered O/C+E/F IDMT characteristics with 0.05 Sec TMS.	
34	Make of Relay	SEG-WIP1 or Schneider-VIP 300 or REJ 603 or any other as per TPCODL/TPNODL/TPSODL/TPWODL Approval.	
35	Flag indication on CB for trip on fault	To be Provided By bidder	
36	Testing of cable-without opening the doors.If doors are opened then earth switch shall be in closed position and cable test rod shall be provided which can be fixed on terminations for testing purpose AND if doors are opened it shall not	To be confirmed. If separate test bushing are provided, it Shall be covered with suitable antitheft covers with anti vandal screws.	

	be possible to operate ,Isolator, E/switch or CB		
37	Protection against Theft	Design Of RMU shall be tamper & arc proof. And vandal Screws shall be provided. Cable covers shall be pad lockable. All live parts / test Bushing etc. Shall be covered with antitheft covers.	
38	Doors	Hinged doors shall be provided. the hinges for the doors need to be riveted and shall not have any access from outside. Bolted hinges shall not be acceptable.	
39	Voltage indicator box shall be fixed type- This device shall be in compliance with IEC 61958 standard.	Capacitive dividers type which will supply low voltage to power the lamps and 3 inlets can be used to check phase sequence.	
40	Phase comparator	1 per RMU	
41	Cable Clamps	HDPE	
41.1	Cable Termination		
41.2	Type	Heat/Cold shrinkable	
41.3	Size (To be finalized in detailed Engineering Stage)	Suitable for 3C x 400 Sqmm/ 1CX400Sqmm / 1CX630Sqmm	
42	Height	Minimum 1200mm above GL	
43	Earth fault passage indicator	One Per RMU with as a part of RMU	
44	Operating handle	To be provided by bidder as part of RMU	
45	MIMIC Diagram in Front of panel	To be provided by bidder	
45.1	Bus bar		
45.2	Material	Copper	
46	Cross Section	To be specified by bidder	
47	Opening & Closing times (Max)	Opening Time: 2.5 Cycle Closing Time: 3 Cycles	

47.1	Current Transformer	Shall be epoxy resin and are mounted around the cable outside SF6 gas compartment. The CTs around the cables shall be supported on the sheet steel bracket base sized for CTs .CTs shall not be kept hanging or put on base frame directly	
48	CT Dimension	Suitable for 3C x 400 Sqmm/ 1CX400Sqmm / 1CX630 Sqmm	
49	SCADA Compatibility- Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	As per specification	
50	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	As per specification	
51	Guarantee- From date of taking over by TPL	48 Months from the date of commissioning or 60 months from the date of supplies made under the contract whichever is later	
52	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder	
53	Total weight	To be provided by bidder	
54	Paint	TPL Blue PANTON E 2727C	
55	Power Supply	24VDC for Control Circuit from Battery & Battery Charger 15AH Input Supply to Battery Charger : 220VAC +Aux PT	
56	Motor	Coupled type DC operated motors shall be suitable for the installation on the indoor type RMU's on the isolator function and to be flitted in/from the LV compartment side. There shall be provision to fit the motor on Circuit breaker also Motor Voltage: 24 VDC	

		Operating Time:4-8 Sec Rating: To be submitted by Bidder	

20. SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above

Seal of the Company:

Signature

Designation

ANNEXURE – 1
SIGNAL LIST FOR AUTOMATION

Description	Analog Inputs(AI)					Status(DI)		
Type	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power factor	Switch close	Switch Open	Reset Element
RMU Switch *	0	0	0	0	0	1	1	
Breakers *	1	1	1	1	0	0	0	
FPI							1	1
Pressure Gauge (manometer)							1	

FRTU SIGNAL LIST

Description	Analog Inputs (AI)				
Type	Amp. Loading-R ph	Amp. Loading-Yph	Amp. Loading-B ph	Phase Voltage	Power factor
Switch *	0	0	0	0	0
Breakers *	1	1	1	1	1
Fault passage indicator *	0	0	0	0	0

Note: 0 indicate functionality not req. for that element, 1 indicate functionality required for that element

* Denotes the nos of switches/ Breaker s in RMU based on the type of RMU (3way, 4way, 5way & 7way).

Additional IOs

RMU switch Control Command
Earth Sw. 1 Status Input
Earth Sw. 2 Status Input
FPI Reset
FRTU Local/Remote Position
FRTU Door Open
FRTU Battery Charger Faulty
FRTU Battery Faulty
FRTU SwitchGear Supply Off
FRTU Aux Supply Off
FRTU Fault
Relay operation
CB OFF status
CB ON status
CB ON/OFF Command