


Tender No : TPCODL/P&S/1000000108/2020-21												
Package Name : 33KV Control Relay Panel												
Prebid Query and Reply												
Sr. No.	Detailed Reference to TPCODL Tender document. Please specify Document No / Clause No / Page No	Description as per Bid Document	Remarks - Query / Clarification	TPCODL RESPONSE								
1	2	3	4	5								
1	clause 1.1, pg. no. 5/20 of NIT	Scope of work	<table border="1"> <thead> <tr> <th>S. No.</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>33KV Control Panel for IC/OG, Quantity 12 nos</td> </tr> <tr> <td>2</td> <td>CR Panel for TFR Protection for 33KV VCB, Quantity 10 nos</td> </tr> <tr> <td>3</td> <td>CR Panel for FDR Protection 11KV VCB, Quantity 15 nos</td> </tr> </tbody> </table>	S. No.	Description	1.	33KV Control Panel for IC/OG, Quantity 12 nos	2	CR Panel for TFR Protection for 33KV VCB, Quantity 10 nos	3	CR Panel for FDR Protection 11KV VCB, Quantity 15 nos	Complete SITC is the scope
S. No.	Description											
1.	33KV Control Panel for IC/OG, Quantity 12 nos											
2	CR Panel for TFR Protection for 33KV VCB, Quantity 10 nos											
3	CR Panel for FDR Protection 11KV VCB, Quantity 15 nos											
2			Please arrange to share a single line diagram of the project (SLD).	SLD will be shared at the detailed engineering stage								
3	ENG-EHV		The technical specification does not have details of requirement of Control, protection & metering. Please provide the same.	Relay specification to be attached								
4	ENG-EHV		The specification does not contain any bill of material. Please give desired BOM to enable us to quote precisely as per your requirement.	There is no BOM except spare, spare to be considered								
5	ENG-EHV: clause no.16.0	Ethernet Switch	Please confirm the specific requirement viz type & quantity of ports required for 12 Port ethernet switch (i.e. Fibre/copper, 10/100MBPS or 100/1000MBPS/1GB). This is very much required because the price of an ethernet switch varies to a large extent based on such specific requirements. Also please confirm the quantity of switches to be considered per panel as it is not clear from specification.	Automation department may please be consulted for the same.								
6	ENG-EHV: clause no.1.7, point (f)	Qualification Criteria	It has mentioned that the bidder has to quote as per approved make list only but no such list has been given in technical specification, kindly provide the same.	There is no approved make								
7	Annexure II, Clause no 5.4, page no 29	Fuse Failure relay and trip Circuit Supervision relay shall be suitably selected, considering burden and auxiliary voltage	Instead of aux relay for fuse failure and trip circuit supervision, can we consider both in numerical relay.	Provided there are designated inputs for the same, otherwise not. Auxiliary relays will be finalised at the detailed engineering stage								
8	Annexure II		Numerical relay specification for 33KV IC/Trafo Fdr and 11KV Fdr are not available. Please provide.	Relay specification to be attached								
9	Annexure II		Annunciator, Mimic, Semaphore requirement not available. Is it not require.	Not required								
10	Annexure II, Clause no 5.12, page no 36		Please specify the communication protocol for energy meter.	DLMS, RJ11 Port, 230 V AC Supply, TTB Required								
11	Annexure II, Clause no 5.12, page no 36	Supply and Integration of Energy Meters with Software for centralized meter data reading shall be in supplier's scope. Supplied Software shall have independent for meter make or OEM to retrieving the meter data	Please confirm should we supplied centralized meter data software which will be independent of meter make.	The meter integration might to be done with existing MDMS								
12	Annexure II, Clause no 5.12, page no 36	Laying of Communication Cable along with conduit shall be in supplier's scope	Please provide the length & type of cable.	It is cat 6 lan cable along with the conduit to protect it								
13	Clause No:- 1.7 / Pg No. 7 of 20 Qualification Criteria	Bidder need to procure equipment & service from TPCODL approved makes only	Kindly provide list of approved makes	There are no such approved makes								
14	-	-	Kindly provide the Details for Numerical OC & EF Relay & other Electromechanical relays to be supplied	Relay specification to be attached please								

15	-	-	Whether Differential Relay is to be provided or not for Transformer protection panel. Pls confirm	Yes to be provided
16	-	-	Kindly provide the details for Ammeter, Voltmeter	Not required
17	-	-	Kindly confirm the overall dimension of Panel (Height x Width x Depth)	Standard panel scheme attached
18	-	-	Any other equipment's details	Auxiliary relays to be finalised at the detailed engineering stage

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1.0	Scope	The scope of this specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading of IEDs and all other items & tools required for protection of 33Kv and 11kV power system as mentioned in the specification, at site/stores complete with all accessories including supply, installation, testing and commissioning of efficient and trouble free protection system. The specific requirements are covered in the enclosed technical data sheet.
2.0	Applicable Standards	The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with latest revisions of relevant Indian/IEC/other applicable standards shall confirm to the regulations of local statutory authorities.
2.1	IS 9000	Basic Environmental testing procedure for electrical and electronic items
2.2	IS 3231:Part 3:Sec 1	Specification for Electrical Relays for Power System Protection - Part 3 : Requirements for Particular Group of Relays - Section 1 : Non-specified Time or Independent Specified Time Measuring Relays
2.3	IS 3231:Part 3:Sec 2	Specification for Electrical Relays for Power System Protection - Part 3 : Requirements for Particular Group of Relays - Section 2 : Dependent Specified Time Measuring Relays
2.4	IS 3231:Part 3:Sec 3	1987 Specification for Electrical Relays for Power System Projection - Part 3 : Requirements for Particular Group of Relays - Section 3 : Biased (Percentage) Differential Relays
2.5	IEC 60255	Measuring Relays and Protection Equipment
2.6	IS 694-1990	PVC insulated cables for working voltage up to and including 1100V
2.7	IS 2629-1985	Recommended practice for Hot Dip Galvanizing of iron & Steel.
2.8	IS 2633-1986	Test for uniformity of Zinc Coating


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2.9	IEC 60529	Degrees of Protection provided by enclosures (IP Code)
2.10	IEC 62052-11	Electricity metering equipment (a.c.) – General requirements, tests & test conditions
2.11	IEC 62053-22	Static meter for active energy (Class 0.2S and 0.5S)
2.12	IEC 61850	Communication networks and systems in substations (all parts including IEC 61850-8-1, IEC 61850-9-2)
2.13	IEC 61869-9	Digital Interface for Instrument Transformers
2.14	IEC 61869-13	Stand-alone Merging Units
2.15	IEC 61588/IEEE 1588v2	Precision clock synchronization protocol for networked measurement and control systems
2.16	IEC 62351	Power systems management and associated information exchange - Data and communications security
3.0	Climatic Conditions of the Installations	<p>The service conditions shall be as follows:</p> <ol style="list-style-type: none"> 1. Maximum altitude above sea level 1,000m 2. Maximum ambient air temperature 50°C 3. Maximum daily average ambient air temperature 35°C 4. Minimum ambient air temperature 0°C 5. Maximum relative humidity 95% 6. Average number of thunderstorm days per annum (isokeraunic level) 70 7. Average number of rainy days per annum 120 8. Average annual rainfall 150cm

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		<p>9. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g</p> <p>10. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)</p> <p>11 .Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr. environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere</p>
4.0	General Technical Requirements	
4.1	General Requirements from the Business Associates	<ul style="list-style-type: none"> • The supplier should have at least 30 years of experience in design and supply of control and protection systems for electricity transmission and distribution applications. • The manufacturer, whose protection system is offered, should have designed, manufactured, tested, installed and commissioned such a system for electricity transmission and distribution for at least two decades. The conditions in this document is applicable for a single IED or multiple IED, new commissioning and retrofitting jobs. • The manufacturer needs to submit the proof of completing such tasks with other utilities/concerns and sister utilities as its experience certificate for last 3 years. • The Business Associate can offer an innovative and advanced system. The offer is subjected to an approval from TATA POWER - CODL after a thorough discussion between the BA and TATA POWER - CODL. In case, an approval is not awarded to the BA's offered innovative system, TATA

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		<p>POWER - CODL's existing/desired infrastructure prevails and the BA shall provide the system accordingly.</p> <ul style="list-style-type: none"> The BA should optimize on the cost of software products offered to TATA POWER - CODL considering already available licenses with TATA POWER - CODL. The BA should clearly indicate licensing policy for the software tools offered. The BA should provide necessary training to the personnel recommended by TATA POWER - CODL to maintain the system and troubleshooting reports which is not less than 3 days. The BA should provide the MIB Files of all Numerical Protection IEDs to integrate the SNMP Traps with Network Management System The numerical relay must have an IEC 61850 Edition 1, Edition 2 level A certification from DNVGL / KEMA and Relay shall also support site selectable minimum RSTP.
4.2	General Construction of IED	<p>General built:</p> <p>Protection and control IED should be internal modular in design. By the term internal modularity means the cards of the relay should be housed inside with no exposure. By the term internal modularity it also means that there should be no conjunction with external IO devices by means of any fiber or any other cable or cable bus instead they should be an integral part of the main/ mother device by means of pin to pin configuration. No separate configuration tool will be allowed along with no proprietary communication between the devices. The device shall be flush mounted type with draw out design so that one to one replacement be very easy for operation and regular maintenance of the IEDs. The draw out design should be such that there be no cards left in the relay after the draw out process and CT terminals of the casing gets automatically shorted as soon as the drawing out process is initiated. The IEDs temperature dissipation should be such that no intrusion of insects or any tiny living things is possible by any means. If the construction design is such then OEM needs to provide some additional arrangement to proof the intrusion of any tiny living things or its excretion. Every PCB in the IED should have conformal coating. All PCB used in relays should have harsh environmental coating as per standard IEC 60068 (HEC) to increase the particle repellency and</p>

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		<p>thereby increasing the life of relay. Test report needs to be submitted. IED shall be manufactured using lead-free components.</p> <p>Enclosure protection shall be IP54 from front and IP 20 from rear. All the necessary wirings to be terminated at the back of the relay with sufficient comfortable spacing so that wiring and testing becomes very easy for working personnel. All the terminals should be ring type. No terminals shall be vertically aligned looking from the straight rear of the IED.</p> <p>Equipment shall be designed for a working life of at least fifteen years in the specified environment and application. Components, component ratings and all other factors determining equipment life shall take this into account. Normal routine and breakdown maintenance shall be assumed and it is accepted that certain consumable components and modules may need periodic replacement or adjustment. However, the Bidder shall state in his bid, the expected frequency of such replacement or adjustment and life expectancy.</p> <p>Fascia:</p> <p>The fascia of the IED should have a clear and bright LCD display where SLD can be seen clearly of the respective bay along with following parameters clearly from 1 meter distance</p> <ol style="list-style-type: none"> 1. Name of the bay 2. Date and time running 3. CT ratio 4. All three phase current 5. All three phase voltage in phase to phase basis <p>The display should have minimum 4 pages to cater sequential values (positive, negative and zero) of voltages and current along with other important displayable parameters like total harmonic distortion of electrical parameters. Tactile keypad or navigation keys for browsing and setting the relay menu. There should be user configurable LEDs (minimum 10) in the relay fascia for suitable annunciation configuration as per site suitability. The LED marking style should not be permanent type, there should be LED strip which can be</p>
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		<p>easily changed as per the need of the user. The LED strip required to be printed out (hard copy or software configured) to be provided. There should be a LED in green color to indicate device is working and healthy.</p> <p>The relay fascia also should contain dedicated close and open button for CBs or any other switches which a user wish to control. Minimum number of such switches is 5 including CB which can be configured in the IED.</p> <p>The front fascia of the IED should contain a communication port to get connected with the device. The details of the port feature will be given in the communication part.</p> <p>There should a reset button which by default clears all the LEDs (programmable and non-programmable) and reset all the outputs in one go. If any button can be configured for the same purpose then same feature is also acceptable.</p> <p>Inputs & Outputs:</p> <p>The auxiliary input should be suitable for both 24V and 48V DC. The auxiliary input circuit shall be protected by surge protection device in the relay itself so that no external DC voltage or high AC voltage can damage the delicate PCB components.</p> <p>The quantity of analogue input is 4 for both current and voltage. The current channel should be rated for both 5A and 1A. Necessary selection based on field input (1 or 5) to be made by selection through software. The short time current rating of the current coils to be mentioned by bidder and should not be less than 4 times for 1 sec. Conventionally, analog values are injected directly into the IED through instrument transformers. IEDs combine analog-to-digital conversion of the signals with their analysis (digital filtering) and decision-making algorithms. The sampling frequency should not be less than 32 samples/ cycle.</p> <p>Suitable measures shall be provided to ensure that transients present in CT & VT connections due to extraneous sources in the HV system do not cause</p>
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damage to the numerical and other IEDs. CT saturation shall not cause mal-operation of numerical IEDs.

The voltage inputs shall be such that at least one voltage coil be capable of withstanding phase to phase voltages, so that on need based "SYNC" function can be used.

The digital input shall be suitable for 24V and 48V DC application. The input card in the IED should have necessary surge protection circuit as mentioned above for auxiliary power supply card. The inputs shall be opto-coupler type. There should be minimum 3 number inputs having its own positive and negative terminals i.e. no common negative or positive terminal. There should be feature for digital/ binary input sensing delay in the relay which can be adjusted through the software and relay fascia.

The digital output shall be suitable for 24V and 48V DC application. The outputs shall be free of potential type when they are not subjected any kind of external wiring. There should be minimum 4 power contacts to handle high current rating applications. The current rating of the power contacts to be provided by the bidder. Programming of outputs can be done freely both from software and relay fascia.

The device should have minimum 1 watchdog contact.

Voltage Level	Conventional Substation	
	BCPU	PU
11kV	BI-20 BO-10	BI-20 BO-10
33kV	BI-24 BO-12	BI-16 BO-10

Protection Functions:

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No protection settings will be lost on accidental DC failure or device reboot.

The IED/ relay should have following protection functions with **any settable magnitude** of actuating electrical quantity and lowest time delay of 20 ms. The settings groups can be as much as 4 numbers as minimum.

O/C minimum 4 stages with 2 DT element (Practically any PSM selection and any TMS selection with resolution of 0.001 lowest at 0.01)

E/F minimum 4 stages with 2 DT element (Practically any PSM selection and any TMS selection with resolution of 0.001 lowest at 0.01)

Both over voltage and under voltage protection each of minimum 3 stages

Negative Phase Sequence protection with minimum 2 stages

Breaker failure protection

Broken conductor(I2/I1) with minimum 2 stages

Fault locator (Analogue value, same to be mapped at SCADA)

Fault current (Analogue value, same to be mapped at SCADA for all 4 channels)

Auto reclose feature with minimum 4 shots with adjustable time settings for every shot intervals and shot properties (dead time, reclose time etc)

VT supervision

CT supervision

High impedance protection

Every protection function should have blocking facility

I2T feature to monitor breaker wear and tear

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Sync check

Inrush blocking functions with cross block feature

There should be some alarm generation facility on some protection functions mentioned above in the software so that certain protection functions can be used for logic making for the adaptive functioning of the relay. For example, if a relay senses a certain magnitude of forward power for 1 minute then the relay will change its direction from FORWARD to Non-directional. Here on completion of the protection function of forward power relay should generate an alarm signal which will be used in logic for group change, not for tripping.

The difference between 33 KV IED and 11 KV IED will be, 33 KV device should have directional protection.

Maximum Torque Angle (MTA): Selectable MTA for Directional Relay should cover 1st quadrant in a non-effectively grounded system. Step Size 1°.

Polarizing voltage for 67N: 1V to 67 Volt, Step size 1V.

Transformer Differential Protection Relay

Transformer main protection IED DI/DO details mentioned above, please refer. LED number will be same as mentioned above.

One separate analogue input for SEF protection enablement.

Protection functions shall be as below

Inrush blocking with cross block feature

Current Differential

REF Protection

SEF Protection

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Harmonics

Tx. Troubles

Master trip relay (86)

The relay shall be electrical and hand reset type having operating time not more than 12 ms. The relay should be flush mounting type and having minimum 6 NO and 2 NC contacts shall be suitable to operate in both 24 V and 48 V DC system.

Ports:

The device should have front port serial communication, interface may be anything but RJ45 and USB type are most wanted.

Rear ports shall be redundant in nature with minimum RSTP as requirement for client server communication.

Rear ports should be either of electrical or optical RJ45 type.

All the configuration whether device configuration or system configuration can be uploaded from or downloaded to IED without any system or device configuration change

All configuration are uploading or downloading should be possible any of the relay ports irrespective of IEC 61850 configuration

Relay should communicate all the time independent of default/ control and any other screen

Downloading/ uploading file from any relay ports shall not change its 61850 engineering and device engineering

No port with proprietary communication shall be accepted

SNTP with minimum two number of server to be there in the IED

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SNMP shall be made available in each IED.

The IED should be communicated by remote servers through the gateway configured in the IED.

Web HMI should be made available in the relay so that relay can be accessed from remote from computer browser.

The web HMI should facilitate every possible access which can be done from relay fascia

In the relay front there shall be a must control authority in terms of LOCAL and REMOTE either by lock and key or by any fascia button (which can also be initiated by Binary or digital input) so that on choosing LOCAL it does not accept any remote command.

Diagnosis:

The numerical IEDs shall have continuous self-monitoring & cyclical test facilities. The internal clock of the system shall be synchronized through the GPS Time Synchronizing System to be provided by Owner at later date.

Should tell about the internal and hardware problem by its diagnosis tool. The diagnosis tool may be the software for its configuration or other than configuration software.

Forcing of all kinds of inputs and outputs

Forcing of all kinds of protection functions

Forcing of all Led's

Relay should be reboot from the relay key and through software also

Diagnosis tool/ software to declare pattern of failure or pre failure conditions

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List of frequent failure error codes and their meaning and proper preventive action

Oscillography:

Waveform generation option shall be different (On which functions waveform will be generated shall be selected by user)

What an waveform will show shall be different from above (Including all current channels and voltage channels, digital channels minimum 24)

Transformer differential relay should have all HV and LV analogue channels, biasing current, restraint current.

Phasor with sequential values

Sequential values in any representation (value in A, V or percentage of positive sequences)

With two or more cursor availability in DR software to facilitate clear demarcation of pre fault, fault and post fault behavior.

Transient play back facilities in the IED software

Any configurable protection characteristics

Any program generated output

Any DI & DO

Any program generated input

Store Any waveform even if dc fails.

Any goose sending signals

Any goose receiving signals

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The oscillographic record can be exported to comtrade format. Nature of storage is FIFO minimum 20 sec (configuration should be possible as per user selectable choice like window for the record, number of records etc.)

System Events:

600 Events minimum

Time resolution of 1ms

Can be read from relay fascia as well as from software.

Events of a single change be it bi, bo, program generated IP, op, protection signal, GOOSE signals etc to be either automatically come or user configurable.

Events should be downloadable from front and back ports with out changing a single configuration of the device

All event shall be readable from relay fascia also

Fault events are different than system events and shall be downloadable from relay fascia as well as from software.

Software:


Maximum number of software to interface with relay will be 2 in number to engineer relay from device and IEC 61850 system point of view. These 2 number software required for device configuration, system configuration of IED, waveform uploading/ downloading/ viewing.

Device engineering and IEC 61850 system configuration to be done from the same software

Software to have every function of configuration and parameterization that is available from relay fascia


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		<p>Device to have minimum 3 level of security with user ID and password protection to access device from configuration, parameterization, accessibility, 61850 configuration & event or oscillography downloading</p> <p>Software restart facility for the device</p> <p>Software testing facility for the device (when device is protecting, necessary point to point testing can be done by simulating wanted signals from software.</p> <p>The relays provided should comply with Indian or international standards of cyber security like NERC CIP / BDEW / IEEE 1686 or equivalent for cyber security to provide protection against unauthorized disclosure, transfer, modification, or destruction of information and/or information systems, whether accidental or intentional.</p> <p>There should also be separate logic in IED to cater breaker operation counter on faults only. This counter should not be reset to zero upon device rebooting or accidental relay power off.</p> <p>On resetting the BCPU/PU from SCADA or Locally from relay all the protection signals must be get reset both at SCADA and at relay with relay outputs in one go. If separate logics required to meet the same, then same can be formulized.</p> <p>Device order code of 11kV IEDs (BCPUs & PUs) must have same order codes irrespective of panel types for better IEC61850 project management and one to one replacement. For 11kV panels both BCPU and PU order code will be the same. Device order code of 33kV BCPUs must have same order code for better IEC 61850 project management and one to one replacement.</p> <p>The bidder shall provide Any software licenses for Any the software being used in Protection IED offered for engineering, IED setting uploading and FDR down loading etc. The license shall be provided on a site license basis and shall be valid for the plant / Equipment life cycle. In the case of anti-virus software, the license all include regular updates. The Bidder All guarantee that Any software</p>
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		<p>are defect free and meet the System specifications, and undertake to fix any defects Which may arise during the life of the system at no cost to the Owner.</p> <p>Any software versions in components all be the latest official releases as on the date of shipment from works and all include Any software updates etc. released till that date. A certificate to this effect all be furnished by the bidder at the time of pre-dispatch inspection for each software package. Any new software revisions and/or patch updates that are released before the end of the warranty period which addresses system defects all be implemented on site and the system re-tested to validate system integrity by the bidder at no cost to the owner (This excludes new revisions which provides additional functionality). The bidder all periodically inform the designated officer of the Owner about software updates / new releases that would be taking place after the system is commissioned.</p> <p>Bidder all train our engineers to guide the upgrading procedures of project files with respect to latest releases.</p> <p>Two nos. of communication cords for each type of relay uploading and down loading data from front and rear port of Protection IED all be supplied by the bidder. One no. of Serial to USB Converter to be supplied by bidder.</p> <p>Station Project Files all be ready before raising inspection call & submission of the internal test report by the Bidder.</p> <p>Bidder all submit 2 copies of as built drawings & station project files in soft format in a pen drive.</p> <p>The technical key should be as per provided SLD like 11KVIC2, 33KVIC1, 33KVPTR2 etc. The same shall be elaborated at the stage of detailed engineering and finalization of order code.</p>
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Report control blocks to be configured during initial programming of the relays. The desired signals and their types will be provided in detailed engineering stage.

IP address will be provided along with SNTP sever address at the time of detailed engineering

CT PT ration to be provided at the time of detailed engineering

Successful bidder will ask user on which software platform necessary relay files will be made, it's not in scope of bidder, however bidder may suggest.

All protection functions and control functions to be made off with appropriate settings adopted discussed in detailed engineering stage.

Bidder to propose type of IEDs (like latest released version) they are providing at the time of detailed engineering.

There should be feature for digital/ binary input sensing delay in the relay which can be adjusted through the software and relay fascia.

Transient play back facilities in the IED software

Virtual simulation of all kinds of inputs and outputs (while relay is online and working and in service)

Virtual simulation of all kinds of protection functions (while relay is online and working and in service)

Virtual simulation/ forcing of all Led's (while relay is online and working and in service)

Relay should be reboot from the relay key and through software also

The number of program generated input and output to be framed by bidder. Minimum number for both are 32 respectively.

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		<p>The number of Goose input and output to be framed by bidder, however minimum number for both are 20 respectively.</p> <p>Protection and Control IEDs respond to the signals of currents and voltages measured at certain points of the power system, and assess the state of the protected power system component. The System shall be suitable for operation and monitoring of the complete substation including future extensions and shall works on IEC 61850. The device shall be freely configurable to both IEC 61850 edition 1 and edition 2. The device shall be capable to report to 6 clients minimum. It should be compatible with SCL/SCD files generated by a third-party system.</p> <p>Being new installation or retrofitting activity there should be always presence of OEM engineer though OEM or any party may put in third party for the said job.</p>
4.3	Fibre Optic Cable	<p>Between Control Room and Switchyard/Switchgear Room: 4 Core, 62.5/125µm Multi-mode, Loose tube, Jelly filled, Armoured Fiber Optic Cable</p> <p>Within Control Room: 2 Core, 62.5/125µm Multi-mode Fiber Optic Patch Chord</p>
4.4	CAT – VI	<p>4 Pairs, 23 AWG Solid Bare Copper Conductor, PE Insulation, Unshielded Twisted Pair (UTP) with separator and PVC Outer Jacket</p> <p>It should be designed to the ANSI/TIA-568-C.2 ISO / IEC 11801 Category 6 requirements and transmit data at 1000 Mbps (~1 Gigabit per second) with a frequency of 250 MHz and suitable for 10BASE-T, 100BASE-TX Fast Ethernet and 1000BASE-T / 1000BASE-TX (Gigabit Ethernet).</p>

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4.5	Tests	<p>Factory Acceptance Test: The manufacturing phase of the C&R Panel all be concluded by the factory acceptance test (FAT). The purpose is to ensure that the Contractor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy all be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. If the FAT comprises only a certain portion of the system for practical reason, IED Configuration and Database all be prepared completely as per actual site requirement and it will submit to TPCODL for validation. An integrated-FAT all be conducted as per the TPCODL I-FAT Document (ENG-EHV-1006 Rev. 00 - Annexure-III). If the complete system consists of parts from various suppliers or some parts are already installed on site, in such case supplier will arrange the intra-communication between RTU/DC and such IEDs to meet the requirement.</p> <p>Hardware Integration Tests all be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item all be verified as an integral part of system. Applicable hardware diagnostics all be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system. The equipment expansion capability all also be verified during the hardware integration tests.</p> <p>Integrated System Tests all verify the stability of the hardware and the software. During the tests Any functions all run concurrently and Any equipment all operate a continuous 100 Hours period. The integrated system test all ensure the IEDs is free of improper interactions between software and hardware while the system is operating as a whole.</p>
5.0	Type Test Certificates	Test reports for following type tests all be submitted for the Protection IED along with the Bid

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5.1	Insulation Test	S. No.	Description	Standard
		1	Dielectric Withstand Test	IEC 60255-5 ANSI/IEEE C37.90-1989 2kV rms for 1 minute between Any case terminals connected together and the case earth. 2kV rms for 1 minute between Any terminals of independent circuits with terminals on each independent circuit connected together. 1kV rms for 1 minute across the open contacts of the watchdog IEDs. 1kV rms for 1 minute across open contacts of changeover output IEDs. 1.5kV rms for 1 minute across open contacts of normAnyy open output IEDs.
		2	High Voltage Impulse Test, class III	IEC 60255-5 5kV peak; 1.2/50 μ sec; 0.5J; 3 positive and 3 negative shots at intervals of 5s
5.2	Electrical Environment Tests	S. No.	Description	Standard
		1	DC Supply Interruption	IEC 60255-11 The unit will withstand a 20ms interruption in the auxiliary supply, in its quiescent state, Without de-energizing.
		2	AC Ripple on DC supply	IEC 60255-11 The unit will withstand a 12% ac ripple on the dc supply.
		3	AC voltage dips and short Interruptions	IEC 61000-4-11 20ms interruptions/dips.
		4	High Frequency Disturbance	IEC 60255-22-1, class III At 1MHz, for 2s with 200 ohms \square source impedance:

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			2.5kV peak; 1 MHz; T = 15 μsec; 400 shots/sec; duration 2 sec between independent circuits and independent circuits and case earth. 1.0kV peak across terminals of the same circuit.
	5	Fast Transient Disturbance	IEC 60255-22-4, class IV 4kV, 2.5kHz applied directly to auxiliary supply 4kV, 2.5kHz applied to Any inputs.
	6	Surge Withstand Capability	IEEE/ANSI C37.90.1 (1989) 4kV fast transient and 2.5kV oscillatory applied directly across each output contact, opticAny isolated input and power supply circuit.
	7	Radiated Immunity	C37.90.2: 1995 25MHz to 1000MHz, zero and 100% square wave modulated. Field strength of 35V/m.
	8	Electrostatic Discharge	IEC 60255-22-2 Class 4 15kV discharge in air to user interface, display and exposed metal work. IEC 60255-22-2 Class 3 8kV discharge in air to Any communication ports. 6kV point contact discharge to any part of the front of the product.
	9	Surge Immunity	IEC 61000-4-5: 1995 Level 4 4kV peak, 1.2/50ms between Any groups and case earth. 2kV peak, 1.2/50ms between terminals of each group.
	10	Capacitor Discharge	No change of state or any operation all occur when a capacitor of capacitance shown below, charged to 1.5×Vn volts, is connected between any combination of terminals and any combination of terminals and ground. Master trip circuits - 10 μF

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				Other protection & control circuits - 2 μF Carrier/channel interface - 0,2 μF
5.3	EMC Test	S. No.	Description	Standard
		1	Radio-Frequency Electromagnetic Field, Non-Modulated	IEC 60255-22-2, class III 10 V/m; 27 MHz to 500 MHz
		2	Radio-Frequency Electromagnetic Field, Amplitude Modulated	ENV 50140, class III 10 V/m; 80 MHz to 1000 MHz; 80% AM; 1 kHz
		3	Radio-Frequency Electromagnetic Field, Pulse Modulated	ENV 50140/ENV 50204 10 V/m; 900 MHz; repetition frequency 200 Hz; duty cycle 50 %
		4	Disturbances Induced by Radio Frequency fields, Amplitude Modulated	ENV 50141, class III 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
		5	Power Frequency Magnetic Field	EN 61000-4-8, class IV 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
		6	Interference Voltage, Aux. Voltage	EN 50081-* 150 kHz to 30 MHz


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		7	Interference Field Strength	EN 50081- * 30 MHz to 1000 MHz
5.4	Atmospheric Environment Test	S. No.	Description	Standard
		1	Temperature	IEC 60255-6 Operating –25°C to +55°C Storage and transit –25°C to +70°C IEC 60068-2-1 for Cold IEC 60068-2-2 for Dry heat
		2	Humidity	IEC 60068-2-3 56 days at 93% RH and +40°C
5.5	Mechanical Stress Test	S. No.	Description	Standard
		1	Vibration (during Operation & Transportation)	IEC 255-21-1; IEC 68-2-6 Response Class 2 Endurance Class 2
		2	Shock (during Operation and Transportation)	IEC 255-21-2, class 1, IEC 68-2-27 Shock response Class 2 Shock withstand Class 1 Bump Class 1
		3	Seismic Vibration (during Operation)	IEC 60255-21-3 Class 2
		4	Continuous Shock (during Transportation)	IEC 255-21-2, class 1, IEC 68-2-27
6.0	Pre-Dispatch Inspection	<p>Equipment all be subject to inspection by a duly authorized representative of the Purchaser as detailed at Clause No.6.0. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.</p> <p>Bidder all grant free access to the places of manufacture to Purchaser’s representatives at Any times when the work is in progress. Inspection by the Purchaser or its authorized representatives all not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications</p>		

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		<p>Material all be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser.</p> <p>Following documents all be sent along with material :</p> <ul style="list-style-type: none"> a) Test reports b) MDCC issued by TPCODL c) Invoice in duplicate d) Packing list e) Drawings & catalogue f) Guarantee / Warranty card g) Delivery ChAnyan h) Other Documents (as applicable)
7.0	Inspection after receipt at Stores	<p>Equipment/material received at TATA POWER-CODL's store all be inspected by Stores Department and all be liable for rejection, if found different from Pre-Dispatch Inspection Report.</p> <p>One copy of the Inspection Report all be sent to the Plant Engineering and Protection & Testing Departments.</p>
8.0	Guarantee/ Warranty Details	<p>Bidder all stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the 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 Company up to a period of 84 months from the date of commissioning supplier all be liable to undertake to replace/rectify such defects at his own costs within the mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover Any such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.</p> <p>Bidder all 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 Company</p>
9.0	Packing	<p>Bidder all ensure that Any equipment covered by this specification all be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit.</p>

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10.0	Tender Sample	Not Applicable
11.0	Training	<p>The successful Bidder all provide training for relay configuration with goose messaging at supplier's works/ users location - 4 persons 3 days minimum to Engineers before dispatch. Venue of the training all be Bidders works or TATA POWER - CODL Office and same all be finalized by TATA POWER - CODL at the time of project closure/completion of SAT. The training all cover Engineering configuration of the IED, IED setting calculations, uploading/downloading, secondary injection testing on computerized IED testing kit, checking of DC logic etc. No extra charges all be payable for training However, lodging/boarding/transportation of trainees all be borne by TATA POWER - CODL.</p> <p>Supplier personnel who are experienced instructors and who speak understandable English all conduct training. The Supplier all arrange on its own cost Any hardware training platform required for successful training and understanding in India at manufacturer's work. The Supplier all provide Any necessary training material including configuration document in advance. Each trainee all receive individual copies of Any technical manuals and Any other documents used for training. Class materials, including the documents sent before the training courses as well as class handouts, all become the property of Employer. Employer reserves the right to copy such materials, but for in-house training and use only. Hands-on training all utilize equipment identical to that being supplied to Employer. For Any training courses, the travel (e.g., airfare) and per-diem expenses will borne by the participants. The schedule, location, and detailed contents of each course will be finalized during Employer and Supplier discussions.</p>
12.0	Quality Control	The bidder all submit with the offer, quality 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 all be furnished. The

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		purchaser's engineer or its nominated representative all have free access to the manufacturer/sub-supplier's works to carry out inspections.
13.0	Minimum Testing Facilities	The Bidder all have in house testing facilities for carrying out Any routine tests and acceptance tests as per relevant international/Indian standards.
14.0	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 all be in line with the Quality assurance plan submitted with the offer. The bar chart will have to be submitted within 15 days from the release of the order.
15.0	Spares, Accessories and Tools	<p>Bidder need to furnish the expected life of IEDs While submitting the performance reports of the concerned IEDs. Bidders need to provide life cycle support and supplies to ensure Necessary support in terms of services and spares for next 15 years regarding discontinuation OEM must need to follow clauses 3.15 & 6 of IEC 61850-4. The example cases should be taken as reference.</p> <p>Bidder need to provide life cycle support and supplies to ensure necessary support in terms of services and spares for next 15 years from date of Purchase Order. Bidder all provide expected life of IEDs in writing.</p> <p>Bidder all conform to the following guideline to mitigate failure. To provide immediate support in case of failure of IED. The Bidder all always maintain 2 Nos. of IEDs as spare at their India office/ TATA POWER - CODL office.</p> <ul style="list-style-type: none"> • Bidder all report to site within 48 hours of receipt of reporting of the failure occurrence. • Bidder all provide replacement of the faulty IEDs within 7 days after confirmation of the fact that the IED can't be repaired at site. • Bidder all provide detailed root cause analysis report of the faulty IEDs within 30 days from the date of the IED receipt.

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- Any spare IED replacement, testing and its commissioning to be done by Bidder only without any cost implications. Any equipment, any software or any hardware to test the IEDs to be borne by Bidder only.
- Any up gradation in application software and IED (except hardware) will be informed to us and necessary up gradation to be carried out by Bidder without any cost implications.

Spares for Project job for New Grids / Bay Extension

**Same MLFB No/ Order Code across 11kV Board including PU.
BCPU MLFB No / Order Code all remain same across 33kV Board.**

Relays for 11kV panels

Total No. of (main & backup) relays in Panel board to be supplied	No. of Spare relays
1-10	1
11-20	2
21-30	3
31-40	4

33kV panel

No. of Panels	No. of Spare Relays		Bus Differential applicable for 33kV AIS	
	BCPU	Line PU	Transformer PU	
2 Line, 2 Trafo, 1 B/C	1	1	1	1
4 Line, 2 Trafo, 1 B/C	1	1	1	1
4 Line, 3 Trafo, 1 B/C	2	1	1	1
6 Line, 3 Trafo, 1 B/C	2	1	1	1
1 line, 1 Trafo, 1 B/C	1	1	1	1
2 line, 1 Trafo, 1 B/C	1	1	1	1

Master Trip Relay (86) common for 33kV and 11kV

No. of relays in Panels	No. of Spare relays
1-10	1

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11-20	2							
21-30	3							
31-40	4							
16.0	Drawings and Documents	<p>Following drawings and documents all be prepared on Purchaser’s specifications and statutory requirements and all be submitted with the bid:</p> <ol style="list-style-type: none"> 1. Completely filled in Technical Particulars 2. General description of the equipment and Any components including brochures 3. Bill of material 4. Type test certificates 5. Hardware Specification 6. Sizing Calculations of various component 7. Standard Drawings 8. ICD/CID Cite (IED capability description file) 9. SCD file (substation configuration description) 10. MIB Files of IEDS 						

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		<p>After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipment in detail all be forwarded for approval and all subsequently provide four (4) complete sets of final drawings, one of which all be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (pen drive) of Any the drawing, GTP, Test certificates all be submitted after the final approval of the same to purchaser.</p> <p>Any the documents & drawings all be in English language.</p> <p>Instruction Manuals: Bidder all furnish two softcopies (pen drives) covering erection and maintenance instructions and Any relevant information and drawings pertaining to the main equipment as well as auxiliary devices.</p>
17.0	Guaranteed Technical Particulars	Bidder all submit separate sheet showing compliances on Any other clauses of the specification

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21.0 SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH THE BID)

Any deviations from this specification all be set out by the Bidders, clause by Clause in this schedule. Unless specificAny mentioned in this Schedule, the tender all 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:

Designation

Signature

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1.0	Scope	The scope of this specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading of Panels as mentioned in the specification, at site/stores complete with all accessories including supply, installation, testing and commissioning of efficient and trouble-free control and relay panel. The specific requirements are covered in the enclosed technical data sheet.
2.0	Applicable Standards	The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with latest revisions of relevant Indian/IEC/other applicable standards shall conform to the regulations of local statutory authorities.
2.1	IS 9000	Basic Environmental testing procedure for electrical and electronic items
2.2	IS 694-1990	PVC insulated cables for working voltage up to and including 1100V
2.3	IS 2629-1985	Recommended practice for Hot Dip Galvanizing of iron & Steel.
2.4	IS 2633-1986	Test for uniformity of Zinc Coating
2.5	IEC 60529	Degrees of Protection provided by enclosures (IP Code)
2.6	IEC 62052-11	Electricity metering equipment (a.c.) – General requirements, tests & test conditions
2.7	IEC 62053-22	Static meter for active energy (Class 0.2S and 0.5S)
2.8	IEC 61850	Communication networks and systems in substations (all parts including IEC 61850-8-1, IEC 61850-9-2)
2.9	IEC 61869-9	Digital Interface for Instrument Transformers
2.10	IEC 61869-13	Stand-alone Merging Units

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2.11	IEC 61588/IEEE 1588v2	Precision clock synchronization protocol for networked measurement and control systems
2.12	IEC 62351	Power systems management and associated information exchange - Data and communications security
3.0	Climatic Conditions of the Installations	<p>The service conditions shall be as follows:</p> <ol style="list-style-type: none"> 1. Maximum altitude above sea level 1,000m 2. Maximum ambient air temperature 50°C 3. Maximum daily average ambient air temperature 35°C 4. Minimum ambient air temperature 0°C 5. Maximum relative humidity 95% 6. Average number of thunderstorm days per annum (isokeraunic level) 70 7. Average number of rainy days per annum 120 8. Average annual rainfall 150cm 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) 11. Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr. environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in

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		exposed, heavily polluted, salty, corrosive and humid coastal atmosphere
4.0	General Technical Requirements	
4.1	General Requirements from the Business Associates	<ul style="list-style-type: none"> • The supplier should have at least 10 years of experience in design and supply of control and protection systems for electricity transmission and distribution applications. • The manufacturer, whose protection system is offered, should have designed, manufactured, tested, installed and commissioned such a system for electricity transmission and distribution for at least two years. • The manufacturer needs to submit the proof of completing such tasks with other utilities/concerns as its experience certificate. • The Business Associate can offer an innovative and advanced system. The offer is subjected to an approval from TPCODL after a thorough discussion between the BA and TPCODL. In case, an approval is not awarded to the BA's offered innovative system, TPCODL's existing/desired infrastructure prevails and the BA shall provide the system accordingly. • The BA should optimize on the cost of software products offered to TPCODL considering already available licenses with TPCODL. The BA should clearly indicate licensing policy for the software tools offered. • The BA should provide necessary training to the personnel recommended by TPCODL to maintain the system and troubleshooting reports
4.2	General System Design	Protection and Control IEDs respond to the signals of currents and voltages measured at certain points of the power system, and assess the state of the protected power system component. The System shall be suitable for operation and monitoring of the complete substation including future extensions and shall works on IEC 61850.

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		Conventionally, analog values are injected directly into the IED through instrument transformers. IEDs combine analog-to-digital conversion of the signals with their analysis (digital filtering) and decision-making algorithms.
4.3	Fibre Optic Cable	Between Control Room and Switchyard/Switchgear Room: 4 Core, 62.5/125µm Multi-mode, Loose tube, Jelly filled, Armoured Fiber Optic Cable Within Control Room: 2 Core, 62.5/125µm Multi-mode Fiber Optic Patch Chord
4.4	CAT – VI	4 Pairs, 23 AWG Solid Bare Copper Conductor, PE Insulation, Unshielded Twisted Pair (UTP) with separator and PVC Outer Jacket It should be designed to the ANSI/TIA-568-C.2 ISO / IEC 11801 Category 6 requirements and transmit data at 1000 Mbps (~1 Gigabit per second) with a frequency of 250 MHz and suitable for 10BASE-T, 100BASE-TX Fast Ethernet and 1000BASE-T / 1000BASE-TX (Gigabit Ethernet).
5.0	General Construction of CRP	Switchgear panel construction is governed by individual specification in minimum. For 33KV/ 11KV control and relay panel following features to be ensured.
5.1	Simplex Panel	Simplex panel with dust proof design shall consist of a vertical front panel with equipment mounted thereon and having wiring access from rear for control panels & either front or rear for relay panels. In case of panel having width equal to or more than 800mm, double leaf-doors shall be provided. Doors shall have handles with either built-in locking facility or will be provided with pad-lock.
5.2	Constructional Features	Control and Relay Board shall be of panels of simplex type design as indicated in bill of quantity. It is the responsibility of the BA to ensure that the equipment specified and such unspecified complementary equipment

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		<p>required for completeness of the protective/control schemes is properly accommodated in the panels without congestion and if necessary, provide panels with larger dimensions. No price increase at a later date on this account shall be allowed. However, the width of panels that are being offered to be placed in existing switchyard control rooms, should be in conformity with the space availability in the control room. Panels shall be completely metal enclosed and shall be dust, moisture and vermin proof. The enclosure shall provide a degree of protection not less than IP-54 in accordance with IS: 2147. Panels shall be free standing, floor mounting type and shall comprise structural frames completely enclosed with specially selected smooth finished, cold rolled sheet steel of thickness not less than 3 mm for weight bearing members of the panels such as base frame, front sheet and door frames, and 2.0mm for sides, door, top and bottom portions. There shall be sufficient reinforcement to provide level transportation and installation. All doors, removable covers and panels shall be gasketed all around with synthetic rubber gaskets Neoprene/EPDM generally conforming to provision of IS 11149. However, XLPE gaskets can also be used for fixing protective glass doors. Ventilating louvers, if provided shall have screens and filters. The screens shall be made of either brass or GI wire mesh.</p> <p>Design, materials selection and workmanship shall be such as to result in neat appearance, inside and outside with no welds, rivets or bolt head apparent from outside, with all exterior surfaces true and smooth. Panels shall have dual exhaust fan at its rear end for dissipation of heat.</p> <p>Panels shall have base frame with smooth bearing surface, which shall be fixed on the embedded foundation channels/insert plates. Anti-vibration strips made of shock absorbing materials that shall be supplied by the contractor, shall be placed between panel & base frame. Cable entries to the panels shall be from the bottom. Cable gland plate fitted on the bottom of the panel shall be connected to earthing of the panel/station through a flexible braided copper conductor rigidly.</p>
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		Relay panels of modern modular construction would also be acceptable.
5.3	Mounting	<p>All equipment on and in panels shall be mounted and completely wired to the terminal blocks ready for-external connections. The equipment on front of panel shall be mounted flush. Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent devices and are readily accessible without use of special tools. Terminal marking-on the equipment shall be clearly visible.</p> <p>The BA shall carry out cut out, mounting and wiring of the free issue items supplied by others which are to be mounted in his panel in accordance with the corresponding equipment manufacturer drawings. Cut outs if any, provided for future mounting of equipment shall be properly blanked off with blanking plate.</p> <p>The centre lines of switches, push buttons and indicating lamps shall be not less than 750mm from the bottom of the panel. The centre lines of relays, meters and recorders shall be not less than 450mm from the bottom of the panel.</p> <p>The centre lines of switches, push buttons and indicating lamps shall be matched to give a neat and uniform appearance. Likewise the top lines of all meters, relays and recorders etc. shall be matched.</p> <p>No equipment shall be mounted on the doors. At existing station, panels shall be matched with other panels in the control room in respect of dimensions, colour, appearance and arrangement of equipment (centre lines of switches, push buttons and other equipment) on the front of the panel.</p>
5.4	Panel Internal Wiring	<p>Panels shall be supplied complete with interconnecting wiring provided between all electrical devices mounted and wired in the panels and between the devices and terminal blocks for the devices to be connected to</p>

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		<p>equipment outside the panels. When panels are arranged to be located adjacent to each other all inter panel wiring and connections between the panels shall be furnished and the wiring shall be carried out internally, this is in the BA's scope.</p> <p>All wiring shall be carried out with 1100V grade, single core, stranded copper conductor wires with PVC insulation. The minimum size of the multi-stranded copper conductor used for internal wiring shall be as follows:</p> <p>Internal wiring to be connected to external equipment shall terminate on terminal blocks.</p> <p>The terminal blocks for CTs VTs shall be provided with test links and isolating facilities. The CT terminal blocks shall be provided with short circuiting and earthing facilities.</p> <p>Shall have 20% terminals as spare terminals in each panel. All equipment mounted on front of the panels shall have individual name-plates with equipment designation engraved. Each panel shall also have circuit/feeder designation name plate.</p> <p>All wiring shall be with 660/1100 V grade, single core, PVC insulated stranded copper conductor.</p> <p>Wires shall be vermin proof. Minimum size of conductor shall be 2.5 sq. mm in general, but for CT & VT circuits it shall be 4 sq.mm. CT VT wiring will be colored as per standard sign color configuration including neutral and neutral CT wiring. Rest wiring will be in grey color and earthing will be done by green colored control cable.</p> <p>Contractor shall be solely responsible for completeness and correctness of all the wiring, and for proper functioning of the connected equipment.</p> <p>Specification for Auxiliary relays/ MCB's</p>
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		<ul style="list-style-type: none"> • Fuse Failure relay and trip Circuit Supervision relay shall be suitably selected, considering burden and auxiliary voltage. External circuitry like compensating resistances will not be accepted. • Auxiliary contact multiplier relays should be of reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level must be accounted for (+/-) 10% continuously. • DC MCB's should not be substituted by AC MCB's for DC Distribution, irrespective of manufacturer's individual multi usage Recommendations. • DC Fail Supervision relay (80) shall be provided on all control and IED panels. • Suitable contactor arrangement to be made in 33 KV line incomer panel/ 11 KV incomer panel so that in case of station DC failure the power pack driven by PT circuit powers up the relay and tripping circuits and keeps protection in service. <p>Spare I/Os wiring shall be brought upto terminal block for future use.</p> <p>All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Wiring gutters & troughs shall be used for this purpose.</p> <p>Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided near the top of the panels running throughout the entire length of the panels.</p> <p>Wire termination shall be made with solder less crimping type and tinned copper lugs, which firmly grip the conductor. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall</p>
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		<p>off when the wire is disconnected from terminal blocks. All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red colored unlettered ferrule.</p> <p>Longitudinal troughs extending throughout the run length of the panel shall be preferred for inter panel wiring. Inter-connections to adjacent panel shall be brought out to a separate set of terminal blocks located near the slots of holes meant for taking the inter-connecting wires.</p> <p>BA shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.</p>
5.5	Terminal Blocks	<p>All internal wiring to be connected to external equipment shall terminate on terminal blocks. Terminal blocks shall be 11.00 V grade and have 10 Amps. Continuous rating, moulded piece, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts. Markings on the terminal blocks shall correspond to wire number and terminal numbers on the wiring diagrams. All terminal blocks shall have shrouding with transparent unbreakable material.</p> <p>Disconnecting type terminal blocks for AC/DC, current transformer and voltage transformer secondary leads shall be provided. Also current transformer secondary leads shall be provided with short circuiting and earthing facilities.</p> <p>At least 20% spare terminals shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks.</p> <p>Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of external cable on each side</p> <ul style="list-style-type: none"> • All CT & PT circuits: minimum of two of 4 sq. mm copper. • AC/DC Power Supply Circuits: One of 6 sq. mm Copper. • All other circuits: minimum of one of 2.5 sq. mm Copper.

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		<p>There shall be a minimum clearance of 250 mm between the first row of terminal blocks and the associated cable gland plate or panel side wall. Also the clearance between two rows of terminal blocks edges shall be minimum of 150mm.</p> <p>Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal blocks is run in parallel and close proximity along each side of the wiring-duct to provide for convenient attachment of internal panel wiring. The side of the terminal block opposite the wiring duct shall be reserved for the Owner's external cable connections. All adjacent terminal blocks shall also share this field wiring corridor. All wiring shall be provided with adequate support inside the panels to hold them firmly and to enable free and flexible termination without causing strain on terminals.</p> <p>The number and sizes of the TPCODL's multi core incoming external cables will be furnished to the BA after placement of the order. All necessary cable terminating accessories such as gland plates, supporting clamps & brackets, wiring troughs and gutters etc. (except glands & lugs) for external cables shall be included the scope of supply.</p>
5.6	Painting	<p>All sheet steel work shall be phosphate in accordance with the IS: 6005 "Code of practice for phosphate iron and steel". It should follow the seven tank process. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water rinsing with a slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoved type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. Thereafter an established painting procedure like electrostatic painting followed for</p>

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		powder coating the panel. The colour shade shall be Siemens grey RAL 7032.
5.7	Miscellaneous Accessories	<p>Plug Point: 240V, Single phase 50Hz, AC socket with switch suitable to accept 5 Amps and 15 Amps pin round standard Iridian plug, shall be provided in the interior of each cubicle with ON-OFF switch.</p> <p>Interior Lighting: Each panel shall be provided with an LED: lighting fixture rated for 240 Volts, single phase, 50 Hz supply for the interior illumination of the panel controlled by the respective panel door switch.</p> <p>Switches and Fuses: Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breakers (MCB). Selection of the main and sub-circuit MCB rating shall be such as to ensure selective clearance of sub-circuit faults. MCBs shall conform to IS: 13947. Each MCB shall be provided with one potential free contact and the same shall be wired for annunciation purpose. However voltage transformer circuits for relaying and metering shall be protected by fuses. All fuses shall be HRC cartridge type conforming to IS: 13703 mounted on plug-in type fuse bases.. Fuse carrier base as well as MCBs shall have imprints of the fuse 'rating' and 'voltage'.</p> <p>Space Heater: Each panel shall be provided with a space heater rated for 240V, single phase, 50 Hz Ac supply for the internal heating of the panel to prevent condensation of moisture. The fittings shall be complete with switch unit.</p>
5.8	Earthing	All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radiation interference for earth systems under various switching conditions of isolators and breakers. The material and the sizes of the bus bar shall be at least 25 X 6 sq. mm perforated copper with threaded holes at a gap of 50mm with a provision of bolts and nuts for

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		<p>connection with cable armors and mounted equipment etc for effective earthing. When several panels are Mounted adjoining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply of the Contractor. Provision shall he made for extending the earth bus bars to future adjoining panels on either side.</p> <p>Provision shall be made on each bus bar of the end panels for connecting Substation earthing grid. Necessary terminal clamps and connectors for this purpose shall be included in the scope of supply of BA.</p> <p>All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by copper wires of size not less than 2.5 sq. mm. The colour code of earthing wires shall he green.</p> <p>Looping of earth connections, which would result in loss of earth connection to other devices when the loop is broken, shall not be permitted. However, looping of earth connections between equipment to provide alternative paths to earth bus shall he provided.</p> <p>VT and CT secondary neutral or common lead shall be earthed at one place only at the terminal blocks where they enter the panel. Such earthing shall be made through links so that earthing may be removed from one group without disturbing continuity of earthing system for other groups.</p>
5.9	Switches	<p>Control and instrument switches shall be rotary operated type with escutcheon plates clearly marked to show operating position and circuit designation plates and suitable for flush mounting with only switch front plate and operating handle projecting out.</p> <p>The selection of operating handles for the different types of switches shall be as follows:</p> <ul style="list-style-type: none"> • Breaker, Isolator: Pistol grip, black control switches

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		<ul style="list-style-type: none"> • Selector switches: Oval or knob, black • Instrument switches: Round, knurled, black <p>The control switch of breaker and isolator shall be of spring return to neutral type. The switch shall have spring return from close and trip positions to "after close" and "after trip" positions respectively.</p> <p>Instrument selection switches shall be of maintained contact (stay put) type. Ammeter selection switches shall have make-before-break type contacts so as to prevent open circuiting of CT secondary when changing the position of the switch. Voltmeter transfer switches for AC shall be suitable for reading all line- to-line and line-to-neutral voltages for non-effectively earthed systems and for reading all line to line voltages for effectively earthed systems.</p> <p>Lockable type of switches which can be locked In particular positions shall be provided when specified. The key locks shall be fitted on the operating handles.</p> <p>The contacts of all switches shall preferably open .and close with snap action to minimize arcing. Contacts of switches shall he spring assisted and contact faces shall be with rivets of pure silver or silver alloy. Springs shall not be used as current carrying parts</p> <p>The contact combination and their operation shall be such as to give completeness to the interlock and function of the scheme.</p> <p>The contact rating of the switches shall be as follows:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Description (Contact rating in Amps)</th> <th style="text-align: center;">24VDC</th> <th style="text-align: center;">50VDC</th> <th style="text-align: center;">240VAC</th> </tr> </thead> <tbody> <tr> <td>Make and Carry</td> <td style="text-align: center;">10</td> <td style="text-align: center;">10</td> <td style="text-align: center;">10</td> </tr> <tr> <td>Continuously Make and Carry for 0.5 sec</td> <td style="text-align: center;">30</td> <td style="text-align: center;">30</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Break for resistive load</td> <td style="text-align: center;">20</td> <td style="text-align: center;">20</td> <td style="text-align: center;">7</td> </tr> </tbody> </table>	Description (Contact rating in Amps)	24VDC	50VDC	240VAC	Make and Carry	10	10	10	Continuously Make and Carry for 0.5 sec	30	30	30	Break for resistive load	20	20	7
Description (Contact rating in Amps)	24VDC	50VDC	240VAC															
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		Inductive Load with L/R = 40ms	0.2
5.10	Indicating Lamps	<p>Indicating lamps shall be of cluster LED type suitable for panel mounting with rear terminal connections. Lamps shall be provided with series connected resistors preferably built in the lamp assembly. Lamps shall have translucent lamp covers to diffuse lights colored red, green, amber, dear white or blue as specified The lamp cover shall be preferably of screwed type, unbreakable and moulded from heat resisting material.</p> <p>The lamps shall be provided with suitable resistors. Lamps and lenses shall be interchangeable and easily replaceable from the front of the panel. Tools, if required for replacing the bulbs and lenses shall also be included in the scope of the supply.</p> <p>The indicating lamps with resistors shall withstand 120% of rated voltage on a continuous basis.</p> <p>Red – Breaker ON</p> <p>Green – Breaker OFF</p> <p>White – Spring Charged</p> <p>Amber – 86 operated</p> <p>Blue – Breaker in test</p> <p>Blue – Breaker in service</p> <p>Dear white – TCS1 fail</p> <p>Dear white – TCS2 fail</p>	
5.11	Dust Proof Environment	All the panels in the control room and switchgear room have to be in a dust proof environment. Civil works have to be taken care in the same directions.	

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5.12	Energy Meters	<p>The Energy Measurements should be preferably done as per 3 wattmeter method. It shall use Potential Transformer and the Metering Core of the respective Current Transformers. The desired Metering class accuracy of 0.2s is expected for metering functions.</p> <ul style="list-style-type: none"> • Supply and Integration of Energy Meters with Software for centralized meter data reading shall be in supplier's scope. Supplied Software shall have independent for meter make or OEM to retrieving the meter data. • Laying of Communication Cable along with conduit shall be in supplier's scope • Supply and Installation of RJ11 Splitters shall be in supplier's scope • Supply, Installation and Configuration of TCP/IP to Serial Converter shall be in supplier's scope if required. • Software configuration for integration of energy meters (at centralized meter data acquisition system) shall be in supplier's scope. Supplier shall have ensured the data communication. <p>The basic metering functions should be additionally supported by following:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>S. No.</th> <th>Description</th> <th>Requirement</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">01</td> <td>Type of the Meter</td> <td>3 Phase 4 Wire, CT/PT Operated Static Meters</td> </tr> <tr> <td style="text-align: center;">02</td> <td>Accuracy Class of the Meter</td> <td>Active Energy – Will be informed at detailed engineering stage Reactive Energy – 2 or better</td> </tr> <tr> <td style="text-align: center;">03</td> <td>Basic Current (I_b) & rated Max. Current (I_{max})</td> <td>When I_b=1A; I_{max}=2A When I_b=5A; I_{max}=10A</td> </tr> <tr> <td style="text-align: center;">04</td> <td>Rated Secondary Current</td> <td>1A or 5A for 66/33kV (balanced and</td> </tr> </tbody> </table>	S. No.	Description	Requirement	01	Type of the Meter	3 Phase 4 Wire, CT/PT Operated Static Meters	02	Accuracy Class of the Meter	Active Energy – Will be informed at detailed engineering stage Reactive Energy – 2 or better	03	Basic Current (I _b) & rated Max. Current (I _{max})	When I _b =1A; I _{max} =2A When I _b =5A; I _{max} =10A	04	Rated Secondary Current	1A or 5A for 66/33kV (balanced and
S. No.	Description	Requirement															
01	Type of the Meter	3 Phase 4 Wire, CT/PT Operated Static Meters															
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03	Basic Current (I _b) & rated Max. Current (I _{max})	When I _b =1A; I _{max} =2A When I _b =5A; I _{max} =10A															
04	Rated Secondary Current	1A or 5A for 66/33kV (balanced and															

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		(I _b)	unbalanced load), 5A for 11kV (balanced and unbalanced load)
	05	Reference conditions for testing the performance of the meter	V _{ref} = 110V ± 1% Freq = 50Hz ± 0.3% Temperature = 27°C ± 2°C
	06	Operating Voltage	110V (P-P), Meter shall be operational with required accuracy from 0.6 V _{ref} to 1.2V _{ref}
	07	Operating Frequency	50Hz ± 5%
	08	Power Consumption	Voltage Circuit: Max. 1.5W and 10VA, Current Circuit: Max. 1VA
	09	Starting Current	0.1% of I _b
	10	Short time over current	The meter shall be able to carry for 0.5s a current equal to 20 times the max. current
	11	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20k with an ambient temperature at 45oC
	12	Rated Impulse withstand voltage	6kV (Shall be applied ten times with one polarity & then repeated with the other polarity and minimum time between each impulse to be 3s)
	13	AC withstand voltage for 1 min	4kV
	14	Insulation resistance between	Frame & current, voltage circuits connected together: 5MΩ Each current circuit (and voltage circuit) & each and every other: 50MΩ
	15	Mechanical Requirements	Meter shall be in compliance with clause 12.3 of IS 14697

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		16	Resistance to Heat and Fire	The terminal block, terminal cover and Meter case shall ensure safety against spread of fire. They should not be ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 14697. Fire retardant material shall be used.
		17	Protection against penetration of dust and water	Degree of Protection: IP 51, but without suction in the meter
		18	Resistance against Climatic influence	Meter shall be in compliance with clause 12.6 of IS 14697
		19	Electromagnetic Compatibility (EMC)	Meter shall be in compliance with clause 12.8 of IS 14697
		20	Accuracy requirements	Meter shall be in compliance with clause 11.0 of IS 14697
		21	Power Factor Range	Zero lag to Zero lead
		22	Energy Measurement	Fundamental energy +Energy due to Harmonics. Energy meters shall preferably record. Total Harmonics distortion (THD) in voltage and current for at least 30 days
		23	Connection Diagram	The connection diagram for the system shall be provided on terminal cover
		24	Self-Diagnostic Feature	Self-diagnostic for calendar, RTU, Battery, all display segments and NVM.
		25	Initial startup of meter	Meter shall be fully functional within 5s after reference voltage is applied to the meter terminals
		26	Internal diameter of the terminal holes and Depth	5.5mm (min), 25mm

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			of terminal hole	
		27	Clearance between adjacent Terminals	10mm (min)
		28	Display	Backlit LCD, Scrolling, 10s for each parameter
		29	History requirements	<p>The meter shall be capable of recording the last two months data for following parameters, at the end of every month at 24:00 hrs:</p> <ul style="list-style-type: none"> • Active demand (MW), import • Apparent demand (MVA), import • Reactive energy (MVAh) lag, import • Reactive energy (MVAh) lead, import • Active energy (MWh), import • Apparent energy (MVAh), import • Active demand (MW), export • Apparent demand (MVA), export • Reactive energy (MVA) lag, export • Reactive energy (MVAh) lead, export • Active energy (MWh), export • Apparent Energy (MVAh), export
		30	Security feature	Programmable facility to restrict the access to the information recorded at

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				different security level such as read communication, write communication, etc.
		31	Software and Communication compatibility	The BCS and CMRI Software shall be supplied by the bidder for free of cost. Training for the use of the software shall also be provided by the bidder
		32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means.
		<p>Aux. Supply of Serial to TCP/IP Converter should be on Station DC Supply and usage of power converters are not allowed.</p> <p>There should be PT selection scheme in line panel for selection of BUS-PT and Line PT for metering purpose.</p> <p>In transformer panel PT selection scheme in the transformer panel is also required based on bus isolation selection.</p>		
6.0	Name Plate & Marking	<p>All equipment mounted on front and rear side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. Also on the top of each panel on front as well as rear side, large and bold nameplates shall be provided for circuit/feeder designation.</p> <p>All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.</p> <p>Each IED and meter shall be prominently marked. All relays- and other devices shall be clearly marked with manufacturer's name, manufacturer's</p>		

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		<p>type, serial number and electrical rating data.</p> <p>Name Plates shall be made of anodized aluminium. Name plates shall be black with white engraving lettering.</p> <p>Each switch shall bear clear inscription identifying its function e.g. 'BREAKER"52A`, "SYNCHRONISING" etc. Similar inscription shall also be provided on each device whose function is not other-wise identified. If any switch device does not bear this inscription separate name plate giving its function shall be provided for it. Switch shall also have clear inscription for each position Indication e.g. "Trip- Neutral-Close", "ON-OFF", "R-Y-B-OFF" etc.</p> <p>All the panels shall be provided with name plate mounted inside the panel bearing PO No & Date, Name of the Substation & feeder and reference drawing number.</p>
7.0	Tests	<p>Factory Acceptance Test: The manufacturing phase of the C&R Panel shall be concluded by the factory acceptance test (FAT). The purpose is to ensure that the Contractor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. If the FAT comprises only a certain portion of the system for practical reason. An integrated-FAT shall be conducted as per the TPCODL I-FAT Document (ENG-EHV-1006 Rev. 00 - Annexure-III). If the complete system consists of parts from various suppliers or some parts are already installed on site, in such case supplier will arrange the intra-communication between RTU/DC and such IEDs to meet the requirement.</p> <p>Hardware Integration Tests shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the</p>

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		<p>factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system. The equipment expansion capability shall also be verified during the hardware integration tests.</p> <p>Integrated System Tests shall verify the stability of the hardware and the software. During the tests all functions shall run concurrently, and all equipment shall operate a continuous 100 Hours period. The integrated system test shall ensure the IEDs is free of improper interactions between software and hardware while the system is operating as a whole.</p>		
8.0	Type Test Certificates	Test reports for following type tests shall be submitted for the Protection IED along with the Bid		
8.1	Insulation Test	S. No.	Description	Standard
		1	Dielectric Withstand Test	IEC 60255-5 ANSI/IEEE C37.90-1989 2kV rms for 1 minute between all case terminals connected together and the case earth. 2kV rms for 1 minute between all terminals of independent circuits with terminals on each independent circuit connected together.
		2	High Voltage Impulse Test, class III	IEC 60255-5 5kV peak; 1.2/50 µsec; 0.5J; 3 positive and 3 negative shots at intervals of 5s
8.2	Electrical Environment Tests	S. No.	Description	Standard
		1	DC Supply Interruption	IEC 60255-11 The unit will withstand a 20ms interruption in

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			the auxiliary supply, in its quiescent state, Without de-energizing.
	2	AC Ripple on DC supply	IEC 60255-11 The unit will withstand a 12% ac ripple on the dc supply.
	3	AC voltage dips and short Interruptions	IEC 61000-4-11 20ms interruptions/dips.
	4	High Frequency Disturbance	IEC 60255-22-1, class III At 1MHz, for 2s with 200 ohms ² source impedance: 2.5kV peak; 1 MHz; T = 15 μsec; 400 shots/sec; duration 2 sec between independent circuits and independent circuits and case earth. 1.0kV peak across terminals of the same circuit.
	5	Fast Transient Disturbance	IEC 60255-22-4, class IV 4kV, 2.5kHz applied directly to auxiliary supply 4kV, 2.5kHz applied to all inputs.
	6	Surge Withstand Capability	IEEE/ANSI C37.90.1 (1989) 4kV fast transient and 2.5kV oscillatory applied directly across each output contact, optically isolated input and power supply circuit.
	7	Radiated Immunity	C37.90.2: 1995 25MHz to 1000MHz, zero and 100% square wave modulated. Field strength of 35V/m.
	8	Electrostatic Discharge	IEC 60255-22-2 Class 4 15kV discharge in air to user interface, display and exposed metal work. IEC 60255-22-2 Class 3 8kV discharge in air to all communication ports. 6kV point contact discharge to any part

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				of the front of the product.
		9	Surge Immunity	IEC 61000-4-5: 1995 Level 4 4kV peak, 1.2/50ms between all groups and case earth. 2kV peak, 1.2/50ms between terminals of each group.
		10	Capacitor Discharge	No change of state or any operation shall occur when a capacitor of capacitance shown below, charged to 1.5×Vn volts, is connected between any combination of terminals and any combination of terminals and ground. Master trip circuits - 10 µF Other protection & control circuits - 2 µF Carrier/channel interface - 0,2 µF
8.3	EMC Test	S. No.	Description	Standard
		1	Radio-Frequency Electromagnetic Field, Non-Modulated	IEC 60255-22-2, class III 10 V/m; 27 MHz to 500 MHz
		2	Radio-Frequency Electromagnetic Field, Amplitude Modulated	ENV 50140, class III 10 V/m; 80 MHz to 1000 MHz; 80% AM; 1 kHz
		3	Radio-Frequency Electromagnetic Field, Pulse Modulated	ENV 50140/ENV 50204 10 V/m; 900 MHz; repetition frequency 200 Hz; duty cycle 50 %

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		4	Disturbances Induced by Radio Frequency fields, Amplitude Modulated	ENV 50141, class III 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
		5	Power Frequency Magnetic Field	EN 61000-4-8, class IV 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
		6	Interference Voltage, Aux. Voltage	EN 50081-* 150 kHz to 30 MHz
		7	Interference Field Strength	EN 50081-* 30 MHz to 1000 MHz
8.4	Atmospheric Environment Test	S. No.	Description	Standard
		1	Temperature	IEC 60255-6 Operating -25°C to +55°C Storage and transit -25°C to +70°C IEC 60068-2-1 for Cold IEC 60068-2-2 for Dry heat
		2	Humidity	IEC 60068-2-3 56 days at 93% RH and +40°C
8.5	Mechanical Stress Test	S. No.	Description	Standard
		1	Vibration (during Operation & Transportation)	IEC 255-21-1; IEC 68-2-6 Response Class 2 Endurance Class 2
		2	Shock (during Operation and Transportation)	IEC 255-21-2, class 1, IEC 68-2-27 Shock response Class 2 Shock withstand Class 1 Bump Class 1

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		3	Seismic Vibration (during Operation)	IEC 60255-21-3 Class 2
		4	Continuous Shock (during Transportation)	IEC 255-21-2, class 1, IEC 68-2-27
9.0	Pre-Dispatch Inspection	<p>Equipment shall be subject to inspection by a duly authorized representative of the Purchaser as detailed at Clause No.6.0. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.</p> <p>Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its 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 the Purchaser.</p> <p>Following documents shall be sent along with material :</p> <ul style="list-style-type: none"> a) Test reports b) MDCC issued by TPCODL c) Invoice in duplicate d) Packing list e) Drawings & catalogue f) Guarantee / Warranty card g) Delivery Challan h) Other Documents (as applicable) 		
10.0	Inspection after receipt at Stores	<p>Equipment/material received at TPCODL store shall be inspected by Stores Department and shall be liable for rejection, if found different from Pre-Dispatch Inspection Report.</p> <p>One copy of the Inspection Report shall be sent to the Plant Engineering and Protection & Testing Departments.</p>		
11.0	Guarantee/ Warranty	<p>Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and</p>		

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	Details	<p>intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning supplier shall be liable to undertake to replace/rectify such defects at his own costs within the mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.</p> <p>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 Company</p>
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	Quality Control	The bidder shall submit with the offer, quality 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 engineer or its nominated representative shall have free access to the manufacturer/sub-supplier's works to carry out inspections.
14.0	Minimum Testing Facilities	The Bidder shall have in house testing facilities for carrying out all routine tests and acceptance tests as per relevant international/Indian standards.
15.0	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. The bar chart will have to be submitted within 15 days from the release of the order.

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16.0	Ethernet Switches	S. No.	Guaranteed Technical Particular	Bidder Response												
		1	19" Rack Mountable with Power Socket and Ports at rear side													
		2	Compliance to IEC 61850-3, IEEE 1613 Standards													
		3	Port Speed: 10Mbps/100Mbps for Station Bus and 1Gbps for Process Buss													
		4	Should have minimum of 12 Ports, number of switches minimum 2													
		5	LED indicators for link establishment and data transfer for each port													
		6	Should support remote user setting configuration.													
		7	Should own separate maintenance/console port													
		8	Should support SNMP Server v1.0/v2.0/v3.0													
		9	Auxiliary Power Supply: 48 VDC or 24VDC (depending upon the Station DC Voltage) with $\pm 15\%$ tolerance, Dual Power Supply													
		10	All the cards/modules of the Switch must have conformal coating for protection against harsh and polluted environment													
16.0	Spares, Accessories and Tools	Spares for Project job for New Grids / Bay Extension <table border="1" style="margin: 10px auto;"> <thead> <tr> <th colspan="2" style="text-align: center;">Master Trip Relay (86) common for 66kV/33kV and 11kV</th> </tr> <tr> <th style="text-align: center;">No. of relays in Panels</th> <th style="text-align: center;">No. of Spare relays</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1-10</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">11-20</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">21-30</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">31-40</td> <td style="text-align: center;">4</td> </tr> </tbody> </table> <p>20% spare material required for every item like TNC switch and other switches, indicating lamps, terminal blocks and any other auxiliary relays, if used.</p>			Master Trip Relay (86) common for 66kV/33kV and 11kV		No. of relays in Panels	No. of Spare relays	1-10	1	11-20	2	21-30	3	31-40	4
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No. of relays in Panels	No. of Spare relays															
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17.0	Drawings and Documents	<p>Following drawings and documents shall be prepared on Purchaser's specifications and statutory requirements and shall be submitted with the bid:</p> <ol style="list-style-type: none"> 1. Completely filled in Technical Particulars 2. General description of the equipment and all components including brochures 3. Bill of material 4. Type test certificates 5. Hardware Specification 6. Sizing Calculations of various component 7. Standard Drawings <p>After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser.</p> <p>All the documents & drawings shall be in English language.</p> <p>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.</p>
18.0	Guaranteed Technical Particulars	Bidder shall submit separate sheet showing compliances on all other clauses of the specification

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19.0 SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH THE 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:

Designation

Signature

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