

Amendment no . 1 dtd 25.03.11 - SCADA/DMS Model technical specification (MTS) under R-APDRP

SNO	MTS clause reference	Present description	Amended description
1	SEC 3 CHAPTER 1 CLAUSE 1.2 (i)	i) As the SCADA/DMS system will use public domain such GPRS/CDMA etc, therefore it mandatory to guard the data/ equipment from intrusion/damage/breach of security & shall have SSL/VPN based security.	Deleted
2	SEC 3 CHAPTER 1 CLAUSE 1.2j changed to i	(j) Shall have SNMP	(i) Shall have SNMP or network status/ diagnostics through IEC protocol
3	SEC 3 CHAPTER 1 CLAUSE 1.3 (Last bullet)	▪ SSL/VPN ,NERC/CIP complaint	▪ VPN ,NERC/CIP or international equivalent standard compliance
4	SEC 3 CHAPTER 1 CLAUSE 1.3 (Last para –Last sentence )	FRTUs & FPIs shall be communicating to SCADA/DMS Master control using IEC60870-5-104 /101 protocol over GPRS/CDMA/Radio .	Deleted
5	SEC 3 CHAPTER 1 CLAUSE 1.5 (First para ,last sentence)	The sensing voltage shall not exceed 48Vdc.	The sensing voltage shall not exceed 48Vdc (for48vdc supply )/ 24Vdc( for 24VDC supply) .
6	SEC 3 CHAPTER 1 CLAUSE 1.9 ((Para 3 , 1 <sup>st</sup> sentence )	Each control output shall consist of one set of potential free NO contact. The output contacts shall be rated for atleast 0.2 Amp. at 48 Vdc.	Each control output shall consist of one set of potential free NO contact. The output contacts shall be rated for atleast 0.2 Amp. at 48 Vdc(for48vdc supply )/ 24Vdc( for 24VDC supply).
7	SEC 3 CHAPTER 1 CLAUSE 1.14((Para 1 & point a )	The RTU will be powered from a 48 V DC power supply system. The RTU shall not place additional ground on the input power source. The characteristics of the input DC power supply shall be	The RTU will be powered from a 48 V DC/24VDC power supply system. The RTU shall not place additional ground on the input power source. The characteristics of the input DC power supply shall be:  a) Nominal voltage of 48 Vdc with variation between 40.8

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		(a) Nominal voltage of 48 Vdc with variation between 40.8 and 57.6 Vdc.(i.e. 48(+20%/-15%)	and 57.6 Vdc.(i.e. 48(+20%/-15%) or Nominal voltage of 24 Vdc with variation between 20.4 and 28.8 Vdc.(i.e. 24(+20%/-15%).
8	SEC 3 CHAPTER 2 CLAUSE 2.2 (i)	(l) Shall have SNMP	(i) Shall support SNMP or network status/diagnostics through IEC protocol
9	SEC 3 CHAPTER 2 CLAUSE 2.3 (Last bullet)	<ul style="list-style-type: none"> <li>FRTU shall have one port for connecting the portable configuration and maintenance tool for FRTU. SSL/VPN ,NERC/CIP complaint</li> </ul>	<ul style="list-style-type: none"> <li>FRTU shall have one port for connecting the portable configuration and maintenance tool for FRTU. VPN ,NERC/CIP or international equivalent standard compliance</li> </ul>
10	SEC 3 CHAPTER 2 CLAUSE 2.5 (First para ,last sentence)	The sensing voltage shall not exceed 48 Vdc/220VAC.	The sensing voltage shall not exceed 24vdc (for 24vdc supply/48 Vdc (for 48vdc supply) /220VAC.
11	SEC 3 CHAPTER 2 CLAUSE 2.7 (Last para ,2 <sup>nd</sup> sentence)	Each control output shall consist of one set of potential free NO contact. The output contacts shall be rated for atleast 0.2 Amp. at 48 Vdc.	The output contacts shall be rated for atleast 0.2 Amp. at 48 Vdc./24vdc
12	SEC 3 CHAPTER 2 CLAUSE 2.8 (2 <sup>nd</sup> para)	The relays shall be DC operated, self reset type. The rated voltage for relay operation shall be on 24/48/110/220V DC depending on the station DC supply. The relay shall be able to operate for +/-20% variation from nominal voltage	The relays shall be DC operated, self reset type. The rated voltage for relay operation shall be on 24/48/110/220V DC depending on the RMU/SECTIONLIZER DC supply. The relay shall be able to operate for +/-20% variation from nominal voltage.
13	SEC 3 CHAPTER 2 CLAUSE 2.11 ((Para 1 & point a )	The FRTU will be powered from a 48 V DC power supply system. The RTU shall not place additional ground on the input power source. The characteristics of the input DC power supply shall be  (a) Nominal voltage of 48	The FRTU will be powered from a 48/24 V DC power supply system. The RTU shall not place additional ground on the input power source. The characteristics of the input DC power supply shall be  (a) Nominal voltage of 48 Vdc with variation between 40.8 and

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		Vdc with variation between 40.8 and 57.6 Vdc.(i.e. 48(+20%/-15%)	57.6 Vdc.(i.e. 48(+20%/-15%) /24 Vdc with variation between 20.4 and 28.8 Vdc.(i.e. 24(+20%/-15%)				
14	SEC 3 CHAPTER 2 CLAUSE 2.14 point a	shall be pole/ wall mounted compact size cabinet. The size shall be preferably in the order of 400 mm.	shall be pole/ wall mounted compact size cabinet. The size shall be sufficient to accommodate the FRTUs & associated equipment required for telemetry & control and shall be desined according to the site requirement/locations at the time of design /engineering				
15	SEC 3 CHAPTER 3 Heading	Transducer & Weather Sensor Requirements	Transducer , Weather Sensor Requirements & Modem				
16	SEC 3 CHAPTER 3 Clause 3.0 1 <sup>st</sup> sentence	All transducers including weather sensor shall use a 48 Vdc auxiliary power supply as provided for the RTU/FRTU.	All transducers including weather sensor shall use a 48/24 Vdc auxiliary power supply as provided for the RTU/FRTU.				
17	SEC 3 CHAPTER 3 Clause 3.1 Para 4 (1 <sup>ST</sup> Sentence)	Multi function transducers shall accept nominal 48 V DC as auxiliary power supply.	Multi function transducers shall accept nominal 48 V /24VDC as auxiliary power supply.				
18	Sec 3 Clause 3.5 (new)		<p>3.5 Modems</p> <p>3.5.1 Common features for GSM/CDMA Modems :-</p> <table border="1"> <tr> <td>1.</td> <td>The modem shall have suitable interface facility to connect with the meter by using the RS232 /485cable.</td> </tr> <tr> <td>2.</td> <td>The offered modems should be</td> </tr> </table>	1.	The modem shall have suitable interface facility to connect with the meter by using the RS232 /485cable.	2.	The offered modems should be
1.	The modem shall have suitable interface facility to connect with the meter by using the RS232 /485cable.						
2.	The offered modems should be						

				<p>capable of operating on Three phase supply drawn from the FPI input itself. Auxiliary Power supply will not be acceptable form Modem at FPI The operating voltage range for the modem should be 90 V ac P-P to 440 V ac P-P. How ever the modem should also be capable of operating on single phase 230 V, 50 Hz power supply. The modem shall be suitably protected against voltage surges. Modem at FRTU locations should be capable of operating on 24V/48Vdc</p> <p>The offered Modem should be capable to transfer the entire data as per the data update requirement of FRTU/FPI at control centre.</p> <p>3. The offered Modem should be supplied with power cable, antenna with co-axial cable of suitable length, RS 232 /485connecting cable, mounting adopter etc. and should be complete in all respects.</p> <p>4. <b>Sealing :-</b> The modem cover and</p>
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				<p>body should have arrangement for sealing. In addition to this, the SIM card holder cover should also have arrangement for sealing.</p>
			<p>5.</p>	<p><b>Antenna :-</b> The Modem should have flexible external antenna to enable placement of the antenna at the location of strongest signal inside the Metering Cubicle. Bidders are requested to quote separately for multiple gain antenna, such as 0dBi/3dBi/10dBi with screw mount / Wall mount arrangement. The actual requirement of these Modem Antennas of various gains may vary as per the requirement at site. Bidder will be required to supply the exact requirement as per site conditions and will be paid as per the separate unit rated quoted for different Gain Antennas.</p> <p>Before supply of GSM/CDMA modem, the bidder is requested to ensure the availability of appropriate signal and operation of GSM/CDMA Modem in all the areas to be covered by making physical survey or otherwise. Before making the actual supply of Modems for FPI &amp; FRTU locations , the Bidder is requested to assess the exact requirement and should supply a high gain antenna or any other suitable alternate communication network for</p>

				<p>collecting data in such area.</p>
			6.	<p><b>Outage Notification :-</b></p> <p>In the event of an outage, the modem should be able to initiate separate call or send SMS to predefined number to notify the outage event with data and time of occurrence and restoration.</p>
			7.	<p><b>Other requirements:-</b></p> <p>A) The Modem should act a completely transparent channel i.e. the Commands received from SCADA/DMS Control centre should be conveyed to FRTU/FPI and data from FRTU/FPI should be conveyed to SCADA/DMS control centre without any changes in the modem.</p> <p>B) Data collection from FRTU/FPI should take place only after connection is established between Control centre and FRTU/FPI. Data should not reside in the modem before the time of transmission to Control</p>

			<p>centre, to avoid chances of tampering of data at Modem end.</p> <p>C) The Modem should be capable of operating with SIMs of local GSM/CDMA Service provider in the area.</p> <p>D) Data enabled SIM card will be provided by the utility and monthly SIM charges will be borne by the utility. Modem should be capable for continuous working for 24 hours every day under field conditions</p> <p><b>3.5.1.1 GSM /GPRS/EDGE Modems and SIM cards -</b></p> <table border="1"> <tr> <td data-bbox="1293 951 1335 1247">1</td> <td data-bbox="1335 951 1923 1247">GSM Modem shall be suitable for long duration data transmission and shall be protected from external interference of systems working at different bands.</td> </tr> <tr> <td data-bbox="1293 1247 1335 1412">2</td> <td data-bbox="1335 1247 1923 1412"><b>Mechanical Specifications :-</b> Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic</td> </tr> </table>	1	GSM Modem shall be suitable for long duration data transmission and shall be protected from external interference of systems working at different bands.	2	<b>Mechanical Specifications :-</b> Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic
1	GSM Modem shall be suitable for long duration data transmission and shall be protected from external interference of systems working at different bands.						
2	<b>Mechanical Specifications :-</b> Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic						

				<p>enclosure. The modem should comply with IP55 degree of protection for FPI locations &amp; IP41 for FRTU as the same shall be housed in the FRTU panel.</p>
			3	<p><b>Environmental Specifications :-</b>                  The Modem shall meet the following environmental specifications : -</p> <ul style="list-style-type: none"> <li>➤ Storage Temperature : -20 degrees to +70 degree Celsius</li> <li>➤ Operating Temperature: -10 degrees to +60 degree Celsius</li> <li>➤ Humidity:- 95% RH ( Non - Condensing)</li> </ul>
			4	<p><b>Communication Capabilities: -</b></p> <ul style="list-style-type: none"> <li>➤ Modem should be Dual Band modem capable of operating at 900 and 1800 MHz GSM transmission.</li> <li>➤ Modem should support both Data and SMS transmission. It should have both GSM and GPRS/EDGE features.</li> </ul>
			5	<p><b>Interface :-</b></p>



				<ul style="list-style-type: none"> <li>➤ Modem should have an RS232 Interface through a 9 pin or 15 pin D type Connector for connection to FRTU/FPI.</li> <li>➤ The SIM interface should be a 3 V Interface in accordance with GSM 11.12 phase 2 with an retractable SIM cardholder, which should be fully inserted inside the modem. The holder opening should have a sliding cover with provision for sealing after placing of the SIM card. The modem shall accept the standard SIM Card.</li> <li>➤ Modem should have a SMA Antenna connector</li> </ul>
			6	<p><b>Power :-</b></p> <ul style="list-style-type: none"> <li>➤ Maximum Power Output should be 2 W at 900 MHz (Class 4) and 1W at 1800 MHz (Class 1).</li> <li>➤ The RF functionalities should comply with the GSM phase II/II+ compliant, EGSM 900/GSM 1800 recommendation.</li> <li>➤ VA Burden of the Modem should not exceed 3.5 VA during data communication.</li> </ul>

			<p>7 <b>Sensitivity :-</b> GSM 900 : &lt;-100 dBm</p> <p>GSM 1800 : &lt;-100 dBm</p> <hr/> <p>8 <b>Data Features: -</b></p> <ul style="list-style-type: none"> <li>▪ Modem should use standard AT Command set (GSM 07.05, GSM07.07) for settings of the modem.</li> <li>▪ TCP/IP stack access via AT commands</li> <li>▪ Internet Services : TCP, UDP, HTTP, FTP, SMTP, POP3</li> <li>▪ Max. Baud Rate: for GSM Operation - 9600 bits/sec,</li> </ul> <p><b>CSD Data transmission features :-</b></p> <ul style="list-style-type: none"> <li>▪ Data circuit asynchronous, and non transparent upto 14.4 Kb/s</li> <li>▪ V.110</li> <li>▪ USSD Support</li> </ul> <p><b>GPRS Data transmission features :-</b></p>
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				<ul style="list-style-type: none"> <li>▪ GPRS Class B Multi slot class 12 or class B Multi slot class 10</li> <li>▪ Packet channel support : PBCCH</li> <li>▪ Coding Schemes: CS1 to CS4 compliant with SMG32 (Release97)</li> </ul> <p><b>EDGE Data transmission features :-</b></p> <ul style="list-style-type: none"> <li>▪ EDGE (EGPRS) Multi slot class 12 or Multi slot class 10</li> <li>▪ Mobile station Class B</li> <li>▪ Modulating and coding schemes : MCS 1 to 9</li> <li>▪ Packet channel support : PBCCH</li> </ul>
			9	<p><b>SMS Features: -</b></p> <ul style="list-style-type: none"> <li>▪ Text and PDU</li> <li>▪ Point to point (MT/MO)</li> <li>▪ Cell broadcast</li> </ul>
			1	<p><b>Operational Indicator :-</b> The Modem should have LED indications for transmit data, received data,</p>

			<p>carrier detects and Power ON, etc. to indicate Power on position and to indicate the availability of signal at the place of installation.</p>						
			<p><b>3.5.1.2 CDMA Modems :-</b></p> <table border="1"> <tr> <td data-bbox="1299 607 1562 1000">Communication Capabilities</td> <td data-bbox="1562 607 1923 1000">Modem should be Dual Band modem capable of operating at 800 and 1900 MHz CDMA transmission. Modem should support both Data and SMS transmission.</td> </tr> <tr> <td data-bbox="1299 1000 1562 1133">Power Supply</td> <td data-bbox="1562 1000 1923 1133">Input Power (90V~310V A.C.) with 6KV Surge tested AC Power supply</td> </tr> <tr> <td data-bbox="1299 1133 1562 1422">Mechanical Specifications</td> <td data-bbox="1562 1133 1923 1422">Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic enclosure. The modem should comply with IP55 degree of protection</td> </tr> </table>	Communication Capabilities	Modem should be Dual Band modem capable of operating at 800 and 1900 MHz CDMA transmission. Modem should support both Data and SMS transmission.	Power Supply	Input Power (90V~310V A.C.) with 6KV Surge tested AC Power supply	Mechanical Specifications	Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic enclosure. The modem should comply with IP55 degree of protection
Communication Capabilities	Modem should be Dual Band modem capable of operating at 800 and 1900 MHz CDMA transmission. Modem should support both Data and SMS transmission.								
Power Supply	Input Power (90V~310V A.C.) with 6KV Surge tested AC Power supply								
Mechanical Specifications	Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic enclosure. The modem should comply with IP55 degree of protection								

					<p>for FPI locations &amp; IP41 for FRTU locations.</p> <p>Modem shall be suitable for long duration data transmission and shall be EMI/EMC tested for protection from external interferences.</p>
				Environmental Specifications	<p>The Modem shall meet the following environmental specifications : -</p> <ul style="list-style-type: none"> <li>➤ Storage Temperature : -20 degrees to +70 degree Celsius</li> <li>➤ Operating Temperature: - 10 degrees to +60 degree Celsius</li> <li>➤ Humidity:- 95% RH ( Non - Condensing)</li> </ul>

				Interface	<ul style="list-style-type: none"> <li>▪ RS-232 Serial supporting remote control by AT Commands</li> <li>▪ SMA Antenna connector,</li> <li>▪ RUIIM SIM Card Holder</li> </ul>
				Packet Data Features	CDMA2000 1xRTT, up to 153.6K bps forward & reverse channels
				Circuit Switched Data	IS-95A, IS-95B up to 14.4K bps
				Data features	Data circuit Asynchronous and non transparent up to 14.4 kbps auto baud rate
				Operating Frequencies	<ul style="list-style-type: none"> <li>▪ TX:824-849 MHz,RX:869-894 MHz for 800 MHz CDMA</li> <li>▪ TX:1850-1910 MHz,RX:1930-1990 MHz for 1900 MHz CDMA</li> </ul>

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				RF Power	<ul style="list-style-type: none"> <li>▪ 600mW (EIRP Nom.) for 800 MHz CDMA</li> <li>▪ 400mW (EIRP Nom.) for 1900 MHz CDMA</li> </ul>
				Maximum TX Power:	+23.0dBm Min.
				Receiver Sensitivity	>-104dBm
				Frequency Stability	< ± 2.5 PPM
				SMS features	<ul style="list-style-type: none"> <li>▪ Supports Text and PDU mode</li> <li>▪ Point to Point &amp;</li> <li>▪ Cell Broadcast</li> </ul>
				LED Indications	Visual LED display for Power, Rx/Tx and Network
				SIM Connector	Standard 3V SIM receptacle
				Antenna	Flexible Antenna options
19	Sec 4 Clause 4.0 Para1 , 3 <sup>rd</sup> sentence	The components of Auxiliary Power Supply system are Uninterruptible Power Supply (UPS), 48V DC power supply (DCPS), the batteries for		The components of Auxiliary Power Supply system are Uninterruptible Power Supply (UPS), 48V/24V DC power supply (DCPS), the batteries for UPS and DCPS.	

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		UPS and DCPS.	
20	Sec 4 Clause 4.0 Para 3, 1 <sup>st</sup> sentence	All equipment except Batteries shall be designed for an operating life of not less than 15 years, however, batteries shall have a minimum expected operating life of 5 years under normal operating conditions or 1200 charge/discharge cycles (which ever is earlier).	All equipment except Batteries shall be designed for an operating life of not less than 15 years, however, batteries shall have a minimum expected operating life of 5 years for under normal operating conditions for 2v cells / 3 years for 12V Monoblocks at normal operating conditions or 1200 / 400 Charge / discharge cycles for 2v /12 V monoblock (which ever is earlier).
21	Sec 4 Clause 4.3 Para 1, 1 <sup>st</sup> sentence	The DC Power Supply system shall be capable of meeting the load requirements for various Telecom equipments, RTUs and other associated equipment located at indoor, i.e. at the substations, the control centers and customer care system.	The DC Power Supply system shall be capable of meeting the load requirements for various Telecom equipments, RTUs/FRTUs and other associated equipment located at indoor/ outdoor, i.e. at the substations, the control centers, FRTU locations.
22	Sec 4 Clause 4.3.1 Para 1	SMPS based DC power supply system is to be used in Auto Float-cum-Boost Charge mode as a regulated DC Power source. DCPS system is to be installed indoors and shall be provided with IP21 panels.	SMPS based DC power supply system is to be used in Auto Float-cum-Boost Charge mode as a regulated DC Power source. DCPS system is to be installed indoors in RTU panels & outdoor in FRTU/RMU panels or separately and shall be provided with IP21 panels in case the same are housed in RMU/FRTU Panel , In case of separate panel the same shall comply to IP54 . The System shall consist of the following:
23	Fig 4-2	As per Annex 1	As per Annex 1a
24	Sec 4 Clause 4.3.10 Para 2	The number of SMPS modules to be provided in the DCPS system shall be provided in N+2 configuration, where N is the number of SMPS modules to meet the battery charging current (10% of C <sub>10</sub> AH Capacity) of the offered battery plus the load requirement stipulated in the BOQ. The current rating of each module shall be considered as output current of the SMPS module at nominal voltage (48V).	The number of SMPS modules to be provided in the DCPS system shall be provided in N+1 configuration, where N is the number of SMPS modules to meet the battery charging current (10% of C <sub>10</sub> AH Capacity) of the offered battery 10 hours for 2V Cells /(10% of C <sub>20</sub> AH Capacity) 20 hours for 12V Monoblocs rate of discharge. plus the load requirement stipulated in the BOQ. The current rating of each module shall be considered as output current of the SMPS module at nominal voltage (48V/24V).



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25	Sec 4 Clause 4.3.11 .1 title of sub clause (new)		4.3.11.1 For RTUs
26	Sec 4 Clause 4.3.11.2 (new)		<p>4.3.11.2 For FRTUs</p> <p>Panel (Enclosure) shall be freestanding type of design. Cable entry shall be from the bottom/top of the enclosures (to be finalized during detailed engineering). The enclosures doors shall be hinged with locking as per standard design of the manufacturer. Keyed locking is required with identical keys for all enclosures. The size of enclosure shall be such so that that the same can be easily placed in the FRTU/RMU /Sectionalizer panel . The thickness of the structural frames and load bearing members shall be minimum 2.0 mm and for others shall be minimum 1.5 mm. The panels/boards shall be equipped with necessary cable gland plates/entry ducts. The Contractor shall state the type, size, and weight of all enclosures and indicate the proposed manner of installation.</p> <p>Wiring within panel shall be neatly arranged and securely fastened to the enclosure by non-conductive fasteners. Wiring between all stationary and moveable components, such as wiring across hinges or to components mounted on extension slides, shall allow for full movement of the component without binding or chafing of the wire. Conductors in multi conductor cables shall be individually colour coded, and numbered at both ends within enclosures.</p> <p>The enclosures shall be painted inside and outside. The finish colour of all enclosures shall be an aesthetically pleasing and shall be approved by the owner. Further, finish colour of external surfaces shall be preferably of same colour for all enclosures/panels.</p> <p>Maintenance access to the hardware and wiring shall</p>

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			<p>be through lockable, full height, from doors.</p> <p>Each panel shall be supplied with 240 VAC, 50Hz single-phase sockets with switch and lighting lamp for panel illumination.</p> <p>The manufacturer so as to ensure the uninterrupted use of the equipment shall do proper thermal engineering of hardware design. The Panel shall be designed to allow cooling preferably by natural convection &amp; shall be operating in the specified ambient conditions</p>
27	Sec 4 Clause 4.3.12 1 <sup>st</sup> para, last sentence	The input voltage shall be single phase (Nominal 240V) varying from 190V to 265V	The input voltage shall be single phase (Nominal 240V) varying from 190V to 265V for power supply for RTU & FRTU
28	Sec 4 Clause 4.3.13 point (a)	(a)The float voltage shall be continuously adjustable & pre-settable at any value in the range of -48 to -56V either at the module or may be set from the common controller configuration. Further, the prescribed float voltage setting shall be based on recommendations of the VRLA battery supplier.	(a) The float voltage shall be continuously adjustable & pre-settable at any value in the range of -48 to -56V(FOR 48v) / -24 to -28v(FOR 24v) either at the module or may be set from the common controller configuration. Further, the prescribed float voltage setting shall be based on recommendations of the VRLA battery supplier.
29	Sec 4 Clause 4.3.14 1 <sup>st</sup> para, last sentence	The float/boost charge current limiting shall be continuously adjustable between 50 to 100% of rated output current for output voltage range of -44.4 volts to -56 Volts.	The float/boost charge current limiting shall be continuously adjustable between 50 to 100% of rated output current for output voltage range of -44.4 volts to -56 Volts for 48VDC / -22.2 Volts to -28volts for 24VDC.
30	Sec 4 Clause 4.3.19.1 2 <sup>nd</sup> para,	In case output DC voltage exceeds -57V or as per the recommendations of the manufacturer of batteries, the over voltage protection circuit shall operate & shut off the faulty module. A tolerance of $\pm 0.25V$ is permitted in this case.	In case output DC voltage exceeds -57V (48VDC) /-28.5V(24VDC) or as per the recommendations of the manufacturer of batteries, the over voltage protection circuit shall operate & shut off the faulty module. A tolerance of $\pm 0.25V$ is permitted in this case.

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31	Sec 4 Clause 4.3.28 last para,	Potential free Contacts in two numbers for each of the above remote monitoring alarms (one for remote alarm interfaced through RTU and one redundant for local monitoring at suitable location) shall be provided. All these potential free contacts are to be wired and terminated at the suitable location for termination to RTU.	Potential free Contacts in two numbers for each of the above remote monitoring alarms (one for remote alarm interfaced through RTU /FRTUand one redundant for local monitoring at suitable location) shall be provided. All these potential free contacts are to be wired and terminated at the suitable location for termination to RTU/FRTU.
32	Sec 4 Clause 4.3.29 last three sentences	The open circuit voltage range shall be settable between 2.1V/cell to 2.2V/cell. The increase in output voltage due to decrease in temperature has been taken care of by the tripping of the unit due to output voltage high (57V) protection. Failure of temperature compensation circuit including sensors shall create an alarm and shall not lead to abnormal change in output voltage.	The open circuit voltage range shall be settable between 2.1V/cell to 2.2V/cell or as specified by the battery manufacturer. The increase in output voltage due to decrease in temperature has been taken care of by the tripping of the unit due to output voltage high (57V for 48vdc /28.5v for 24vdc) protection. Failure of temperature compensation circuit including sensors shall create an alarm and shall not lead to abnormal change in output voltage.
33	Sec 4 Clause 4.4 para 1 Last sentence	In all cases the battery is normally not allowed to discharge beyond 80% of rated capacity (80% DOD) at 10 hours rate of discharge.	In all cases the battery is normally not allowed to discharge beyond 80% of rated capacity (80% DOD) at 10 hours for 2V Cells for UPS, DCPS at RTU ,/20 hours for 12V Monoblocs rate of discharge at DCPS at FRTU only.
34	Sec 4 Clause 4.4 para 2	The contractor supplying the cells/batteries as per this document shall be responsible to replace/repair free of charge, the battery/cell becoming faulty, owing to defective workmanship or material as per the provisions of the bid document.	The contractor supplying the cells/12V Monoblocs batteries as per this document shall be responsible to replace/repair free of charge, the battery/cell becoming faulty, owing to defective workmanship or material as per the provisions of the bid document.
35	Sec 4 Clause 4.4.1	The design of battery shall be as per field	The design of battery shall be as per field proven

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		<p>proven practices. Partial plating of cells is not permitted. Paralleling of cells externally for enhancement of capacity is not permitted. Protective transparent front covers with each module shall be provided to prevent accidental contact with live module/electrical connections. It shall be possible to easily replace any cell of the battery at site in normal working condition.</p>	<p>practices. Partial plating of cells is not permitted. Paralleling of cells externally for enhancement of capacity is not permitted. Protective transparent front covers with each module shall be provided to prevent accidental contact with live module/electrical connections for 2v Cell . It shall be possible to easily replace any cell/ 12V Monoblock of the battery at site in normal working condition. The cell/12V Monoblocks terminals shall be closed with flap on terminal which will avoid accidental shocks during their service.</p>
36	Sec 4 Clause 4.4.2 3 <sup>rd</sup> last sentence	Cell shall not show any deformity or bulge on the sides under all working conditions.	2V Cell/ 12v monoblock shall not show any deformity / bulge on the sides under all working conditions.
37	Sec 4 Clause 4.4.3 1 <sup>st</sup> sentence	The cell covers shall be made of suitable material compatible with the container material and permanently fixed with the container.	The cell/12v monoblock covers shall be made of suitable material compatible with the container material and permanently fixed with the container.
38	Sec 4 Clause 4.4.5	Each cell shall be provided with a pressure regulation valve. The valve shall be self re-seal able and flame retardant. The valve unit shall be such that it cannot be opened without a proper tool. The valve shall be capable to withstand the internal cell pressure specified by the manufacturer.	Each cell shall be provided with a pressure regulation valve. The valve shall be self re-seal able and flame retardant. The valve unit of 2v cell shall be such that it cannot be opened without a proper tool . The valve shall be capable to withstand the internal cell pressure specified by the manufacturer.
39	Sec 4 Clause 4.4.6 , 1 <sup>st</sup> sentence	Both the +ve and –ve terminals of the cells shall be capable of proper termination and shall ensure its consistency with the life of the battery.	Both the +ve and –ve terminals of the 2Vcells/ 12V Monoblock shall be capable of proper termination and shall ensure its consistency with the life of the battery.
40	Sec 4 Clause 4.4.7 , 1 <sup>st</sup> para	Where it is not possible to bolt the cell terminals directly to assemble a battery, separate non-corroding lead or copper	Where it is not possible to bolt the 2V cell / 12v Monoblock terminals directly to assemble a battery, separate non-corroding lead or copper connectors of

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		connectors of suitable size shall be provided to enable connection of the cells. Copper connections shall be suitably lead coated to withstand corrosion due to sulphuric acid at a very high rate of charge or discharge.	suitable size shall be provided to enable connection of the cells. Copper connections shall be suitably lead coated to withstand corrosion due to sulphuric acid at a very high rate of charge or discharge for 2v cell only..
41	Sec 4 Clause 4.4.7 , last para	All inter cell connectors shall be protected with heat shrinkable silicon sleeves for reducing the environmental impact including a corrosive environment.	All inter cell connectors for 2v cell /cables for 12 v monoblock shall be protected with heat shrinkable silicon sleeves(in case of 2V Cells only) for reducing the environmental impact including a corrosive environment.
42	Sec 4 Clause 4.4.8	Each cell shall be equipped with a Flame Arrestor to defuse the Hydrogen gas escaped during charge and discharge. Material of the flame arrestor shall not affect the performance of the cell.	Each 2V cell shall be equipped with a Flame Arrestor to defuse the Hydrogen gas escaped during charge and discharge. Material of the flame arrestor shall not affect the performance of the cell. Equivalent mechanism shall also be considered in 12 V monoblock as per manufacturer standard.
43	Sec 4 Clause 4.4.10	When the battery is discharged at 10-hour rate, it shall deliver 80% of C (rated capacity, corrected at 27°Celsius) before any of the cells in the battery bank reaches 1.85V/cell.  All the cells in a battery shall be designed for continuous float operation at the specified float voltage throughout the life. Float voltage of each cell in the string shall be within the	When the battery is discharged at 10-hour rate, it shall deliver 80% of C (rated capacity, corrected at 27°Celsius) before any of the cells in the battery bank reaches 1.75V/cell or 10.5V / 12V Monoblocks battery(for 20hrs rate)  All the cells/12V Monoblocks battery in a battery shall be designed for continuous float operation at the specified float voltage throughout the life. Float voltage of each cell in the string shall be within the

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		<p>average float voltage/cell <math>\pm 0.05V</math> band.</p> <p>The capacity (corrected at 27°C) shall also not be less than C and not more than 120% of C before any cell in the battery bank reaches 1.75V/cell. The battery voltage shall not be less than the following values, when a fully charged battery is put to discharge at C/10 rate:</p> <ul style="list-style-type: none"> <li>(a) After Six minutes of discharge : 1.98V/cell</li> <li>(b) After Six hours of discharge : 1.92V/cell</li> <li>(c) After 8 hours of discharge : 1.85V/cell</li> <li>(d) After 10 hours of discharge : 1.75V/cell</li> </ul> <p>Loss in capacity during storage at an average ambient temperature of 35°C for a period of 6 months shall not be more than 60% and the cell/battery shall achieve 85% of its rated capacity within 3 charge/discharge cycles and full rated capacity within 5 cycles, after the</p>	<p>average float voltage/cell <math>+0.05V</math> band.</p> <p>The capacity (corrected at 27°C) shall also not be less than C and not more than 120% of C before any cell in the battery bank reaches 1.75V/cell. Or 10.5v in case of 12v monoblock The battery voltage shall not be less than the following values, when a fully charged battery is put to discharge at C/10 rate for 2v cell , C/20 rate for 12v monoblocks:</p> <ul style="list-style-type: none"> <li>(a) After Six minutes of discharge : 1.98V/cell, 12v /module</li> <li>(b) After Six hours of discharge : 1.92V/cell, 11.9V/Module</li> <li>(c) After 8 hours of discharge : 1.85V/cell, 11.0V /Module</li> <li>(d) After 10 hours ( 2v cell) /20 hours (12V monoblock) hours of discharge : 1.75V/cell, 10.5 V /Module</li> </ul> <p>Loss in capacity during storage at an average ambient temperature of 35°C for a period of 6 months shall not be more than 60% and the 2v cell/12 v Monoblock battery shall achieve 85% of its rated capacity within 3 charge/discharge cycles and full rated capacity within 5 cycles, after the storage period</p>
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		<p>storage period of 6 months. Voltage of each cell in the battery set shall be within 0.05V of the average voltage throughout the storage period. Ampere-hour efficiency shall be better than 90% and watt-hour efficiency shall be better than 80%.</p>	<p>of 6 months. Voltage of each cell in the battery set shall be within 0.05V of the average voltage throughout the storage period. Ampere-hour efficiency shall be better than 90% and watt-hour efficiency shall be better than 80%.</p>
44	Sec 4 Clause 4.4.11	<p>The battery shall be capable of giving more than 1200 charge/discharge cycles at 80% Depth of discharge (DOD) at an average temperature of 27° Celsius. DOD (Depth of Discharge) is defined as the ratio of the quantity of electricity (in Ampere-hour) removed from a cell or battery on discharge to its rated capacity. The battery sets shall have a minimum expected operational life of 5 years at normal operating conditions or 1200 charge / discharge cycles (whichever is early).</p>	<p>The battery shall be capable of giving more than 1200 charge/discharge cycles at 80% Depth of discharge (DOD) at an average temperature of 27° Celsius &amp; 400 charge/discharge cycles at 80% Depth of discharge (DOD) at an average temperature of 27° Celsius in case of 12V Monoblocks. DOD (Depth of Discharge) is defined as the ratio of the quantity of electricity (in Ampere-hour) removed from a cell or battery on discharge to its rated capacity. The battery sets shall have a minimum expected operational life of 5 years for 2v cell &amp; 3years for 12v monoblockat normal operating conditions or 1200 charge / discharge cycles for 2v cell , 400 charge/discharge cycles in case of 12v monoblock (whichever is early).</p>
45	Sec 4 Clause 4.4.12 a,b	<p>For routine maintenance of battery system, the contractor shall supply 1 set of following tools:</p> <ul style="list-style-type: none"> <li>a. Torque wrench.</li> <li>b. Tool for opening /closing of pressure regulation</li> </ul>	<p>For routine maintenance of battery system, the contractor shall supply 1 set of following tools:</p> <ul style="list-style-type: none"> <li>a Torque wrench. (Not required for 12v Monoblock)</li> <li>b Tool for opening /closing of pressure regulation valve of battery. (Not required</li> </ul>

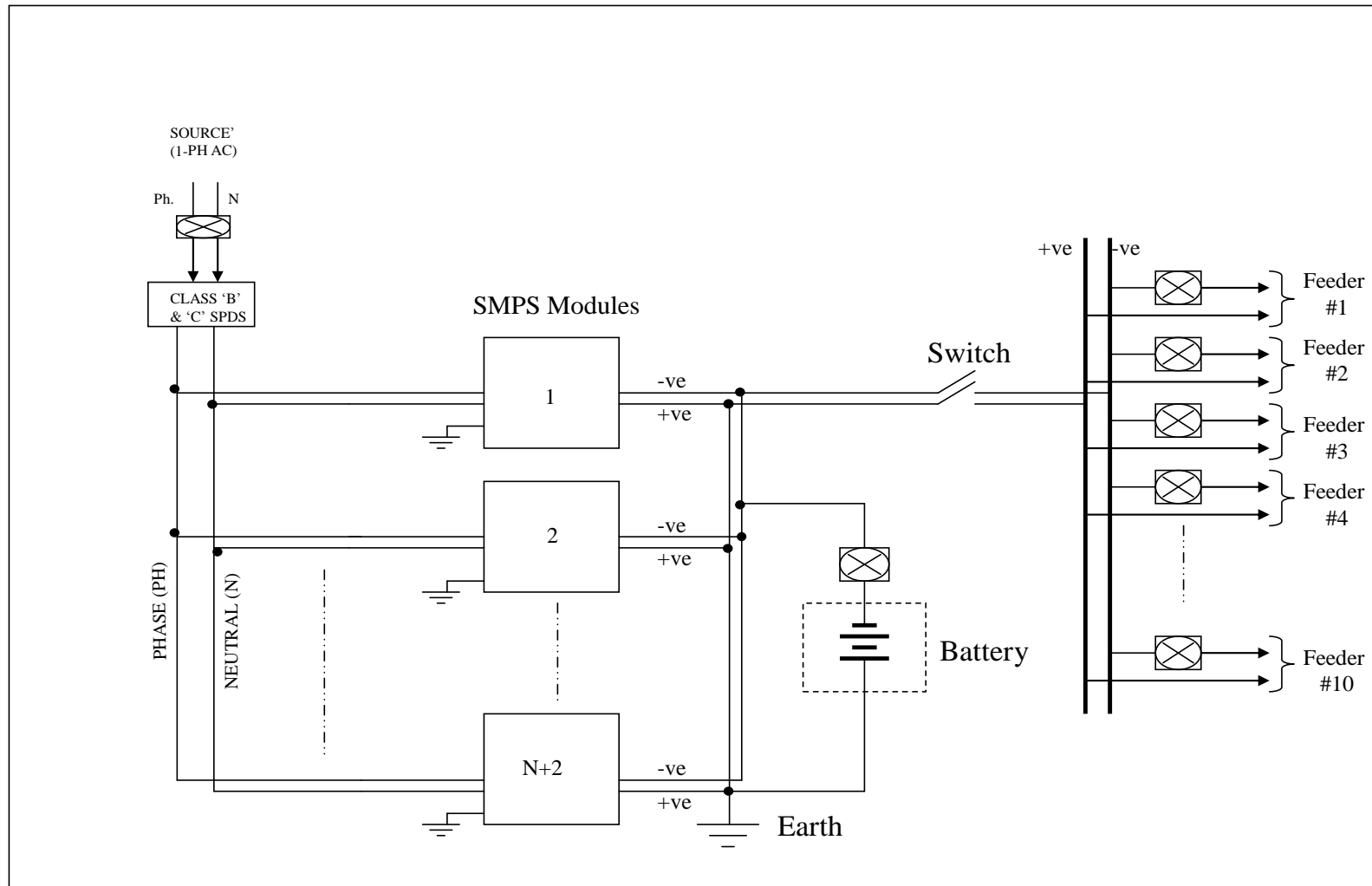
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		valve of battery.	for 12v Monoblock)
46	Sec 4 Clause 4.4.13 - 2 <sup>nd</sup> sentence	The contractor shall supply type tested battery as required for DCPS and UPS system. The Contractor shall submit the Battery type test reports of earlier conducted tests on the same make, model, type & rating as offered as per the IEC 60896 or equivalent IS/EN/BS standards .	The Contractor shall submit the Battery type test reports of earlier conducted tests on the same make, model, type & rating as offered as per the IEC 60896 or equivalent IS/EN/BS standards .
47	Sec 4 Table 4.2 sno 2 , Test column	2) C/10 Capacity test on the cell	2) C/10 FOR 2VCELL OR C/20 FOR 12V MONOBLOCK Capacity test on the cell
48	Sec 4 clause 4.6 1 <sup>st</sup> & 2 <sup>nd</sup> sentence	Two KVA UPS shall be supplied for bill collection centres as per the quantity specified in the BOQ. The technical particulars of these UPS shall be as mentioned below:	Two KVA UPS shall be supplied for remote VDU locations as per the quantity specified in the BOQ. The 12v monoblock battery can be used. The technical particulars of these UPS shall be as mentioned below:
49	Sec 4 clause 4.6 -Note	<b>Note</b> : Battery shall be sized to deliver rated load for specified duration after charging for 12 hours from fully discharged state of battery(1.75V for VRLA).	<b>Note</b> : Battery shall be sized to deliver rated load for specified duration after charging for 12 hours from fully discharged state of battery(1.75V for 2v cell /10.5 v for 12V monoblock VRLA).



Annex1

**FIG. 4-2 : CONCEPTUAL CONFIGURATION OF DC POWER SUPPLY (DCPS) SYSTEM**



Annex1a

**FIG. 4-2 : CONCEPTUAL CONFIGURATION OF DC POWER SUPPLY (DCPS) SYSTEM**

