

Addendum No. 1

Preamble

This addendum No. 1 to the above tender is being issued pursuant to the clarifications sought by some of the prospective Bidders, followed by the pre-bid meeting held on 12th and 13th January 2023 for Lot 1 and Lot 2 respectively at BPSO Conference Hall in Thimphu, as well as to address other inconsistencies based on BPSO's own assessment of the same and other changes to the tender documents.

The replies to the queries raised by the Bidders, received till January 9, 2023 (including the queries furnished by the Bidders prior to, during, and post pre-bid meeting) are enclosed as Appendix to the Main Text of this Addendum. *All the amendments to the tender documents are listed in this Main Text of this Addendum and other than those listed in this Main Text, there are no changes to the tender documents. The **Appendix - I** covering the replies to Bidder's queries shall not be construed as any modifications to the tender documents, unless such modification or change is listed in this Main Text. In case of any discrepancies between the Appendix to this Addendum and the Main Text herein, the provisions of the Main Text will govern. Bidders are also advised to note that only those changes / modifications as indicated in this Main Text represent all changes to the Bidding documents, notwithstanding any modifications / additional provisions that the Appendix may inadvertently suggest.*

Some of the main points of the original tender stipulations are reiterated in this Addendum to particularly *draw the attention of the Bidders. Bidders are advised to note the same and ensure compliance to the tender requirements.*

A. Summary of Clarifications / Amendments

1. The deadline for submission and opening of the Bid is extended till **March 20, 2023**. The Venue and Time of the Bid opening shall remain same as mentioned in Clause 28.1, Section II, Volume I.
2. Since the employer has existing system in place, the Lot 1 and Lot 2 projects can be considered independent without much dependency between the two. Accordingly, the employer will make necessary arrangements, which can be decided during the detailed engineering, for successful Commissioning and Testing and handing taking of the systems of the each lots at the respective project timelines.
3. Some of the clauses in technical specifications are modified to ensure easy implementation and price segregation without any ambiguity. While there is no change to the overall intent of the original tender stipulations due to this, these changes are considered appropriate to be incorporated.
4. In order to have seriousness during the entire AMC period by the contractor, the total AMC charges quoted by the bidder should not be less than **25% of the Total Contract price**. If the Contractor has quoted less than this threshold, the employer will have the right to deduct the remaining amount, which will be discussed and decided during the project kick-off meeting.

This deducted amount will be evenly adjusted for entire duration of AMC and released along with the AMC clauses.

5. The Price Schedule have also been revised to take into account some items, which have been inadvertently missed out or decided after the Pre-bid meeting discussions. Bidders shall use only the revised price schedule provided along with this Addendum and also in the excel format.

Bidders shall note that no changes to the description or the quantities shall be made by the Bidder and the Bidders shall fill in only the relevant prices or rates. **Any changes made to the description and / or quantities / units, made by the Bidders, may result in rejection of the Bid.** Further, even if such changes made by the Bidder are inadvertently overlooked by the Employer during the Bid Evaluation resulting in award of the Contract to the Bidder, the provisions of the price schedule as furnished by BPSO would be considered binding on the Bidder and non-acceptance of the same by the Bidder would result in forfeiture of the Bid Security.

Specific to Lot 1:

1. The redundancy requirement of servers or any other main equipment, if needed, will be decided during the detailed engineering and accordingly the employer will adjust the quantity.

Specific to Lot 2:

1. The Proposed Network Diagram has been revised to take into account the missing fiber distance between the new lines and to indicate the packet fabric capacity required at each node.
2. Technical Requirement sheet has also been revised to consider some specifications, which have been inadvertently missed out or decided after the Pre-bid meeting discussions.
3. Bill of Quantity and Price Schedule has been revised.
4. Existing relay details of Transmission Substations and Generating Stations have been attached as Appendix-J.
5. 48VDC power supply system needs to be supplied as per technical specification attached as Appendix-K.
6. Requirements related to Differential Protection are removed.
7. Requirements for RACKs/Cabinets to house the supplied equipment have been added. During parallel operation at the implementation phase, the space in the existing racks may not be sufficient. Therefore, additional racks may be required depending on size and number of equipment to be supplied.

B. Details of Amendments

The Tender documents stand amended to reflect changes in the relevant clauses, irrespective of whether or not the same are specifically covered in the details indicated below:

I. Volume – I : Commercial Bid

- 1) Notice Inviting Tenders (NIT), Clause 3.0

The following were the changes in the clause:

"Bidding Documents shall be available from: From 19th December 2022 to 17th March 2023 on all working days from 09:00hrs to 17:00hrs"

*"Bid receipt date & time: Up to **20th March 2023** by 14:00hr"*

*"Bid opening date & time: **20th March 2023** at 15:00hrs at BPSO conference Hall"*

- 2) NIT, Clause 7.0

The validity of Bid security is extended as below:

*"... valid till **20th July 2023.**"*

- 3) Section II – Bid Data Sheet (BDS), Instruction to Bidder (ITB) Clause 20.1

The clause is replaced with:

"The Currencies of Bid shall be: Bhutanese Ngultrum or Indian Rupees. However, the necessary supporting document from BPSO if required shall be provided for converting Bhutanese Ngultrum (BTN) to US Dollar (USD)"

- 4) Section II – BDS, ITB Clause 22.1 and 22.4

The validity of Bid Security is extended as below:

*"... valid up to **20th July 2023.**"*

- 5) Section II – BDS, ITB Clause 33.2 (e)

The clause is replaced as below:

"In addition to the requirements specified in ITB 16.1, the following qualifying requirement shall be met by the Bidder:

A. Experience and Technical Capability

(i) Aggregate size of each similar work or size of the largest similar work executed by the Bidder in the last seven years shall be one project which should have been in satisfactory operation till date.

(ii) The bidder must submit manufacturer's Authorization

B. Financial Capacity

Additional item:

Or

(iii) The Bidder must have the following credit facilities:

Line of Credit (LC) limits: equivalent to Nu. 45,000,000.00 (Bhutanese Ngultrum forty five Million only) each for Lot 1 and Lot 2.

6) Section V, Special Conditions of Contract (SCC) Clause 1.2.6 (a)

This clause is replaced with:

*"The applicable Incoterms edition shall be of: **DDP 2020**. However, the unloading at the destination and the necessary insurance has to be done by the Contractor"*

7) Section V, SCC Clause 5.1.1

The clause related to Key Personnel is replace with:

"Key Personnel: Refer Table below

	Lot 1: Revamp of SCADA/EMS system	Lot 2: Revamp of Telecommunication System
<i>5.1.1 Key Personnel</i>	<i>One Project Manager and one Technical Expert. The technical expert must provide the certificate of experience in implementation of the main product.</i>	<i>One Project Manager and two Technical Expert. The technical expert must provide the certificate of experience in implementation of proposed main product.</i>

"

8) Section IV – General Condition of Contract (GCC) 13.2 and 13.3

The Advance Payment and Terms of Payment clause shall be understand as follows.

"Supply of products as per BoQ:

- i. 10% advance against the bank guarantee as per Clause 13.2.1*
- ii. 75% after delivery of product at site.*
- iii. 10% as retention which shall be paid at the end of project*
- iv. 5% shall be paid after successful testing, installation and commissioning of the product.*

Services as per BoQ:

- i. 10% advance against the bank guarantee as per Clause 13.2.1*
- ii. 90% after successful testing and commissioning as integrated system."*

9) Section IV – GCC 16.1 (f)

The current Covid-19 which fall under pandemic, the employer shall consider the following:

*"Any expenses related to Covid-19 protocol in the country such as Covid-19 tests, quarantine charges shall be reimbursed as per actual. However, cost escalation due to pandemic outside Bhutan **shall not** be considered."*

II. Volume – II: Technical Specifications

Lot 1: Revamp of SCADA/EMS Systems

1. Part A, Section 1, Clause 1.10

Add the following paragraph at the end of this clause:

“Operating philosophy

This section shall give guidelines for operation of the Main and Backup National Load Dispatch Center. Both the Main NLDC and the Backup NLDC systems shall acquire real time data from the field directly and shall be operational during normal circumstances. However, the NLDC operators will be seated at Main NLDC. In normal course, Control Centre at Thimphu shall be running all the functions of Main NLDC and Control Centre at Jigmeling shall be functioning as Backup NLDC. Main NLDC shall update the Backup NLDC automatically. Main NLDC shall be primary control center for operations at all times, when available. The update/backup time of data at Backup NLDC shall be as follow:

- *Real time data shall be updated every minute*
- *ISR data shall be updated every hour*
- *All other data (e.g. development database/displays etc.) updated at least once a day.*

In case of failure of the Main NLDC, the Backup NLDC shall takeover NLDC operations and functions. When Main NLDC recovers from failure, Backup NLDC shall update all data at Main NLDC for the period it was down.

The contractor shall finalize the design for data exchange among control centers under normal and failure conditions. The design need to be flexible to avail available control center/link for data exchange at NLDCs. Data exchange shall also allow other information to be transferred periodically or on demand among NLDC, Backup NLDC, and ERLDC India.

The NLDC System shall maintain backup copies of all databases at Backup NLDC without requiring any manual intervention, so that system operations transition can be achieved in the event of Main NLDC failure with minimal loss of continuity. The backup databases shall be maintained in such a manner as to be protected from corruption due to Server and device failure. Backup databases shall be preserved for system input power disruptions of any duration. Bidder shall clearly bring out the information that cannot be maintained in the Backup NLDC.

Both the Main NLDC and Backup NLDC shall monitor each other’s availability every 600 seconds by communicating to each other. An alarm shall be generated when a failure of the other control center is detected. The user shall manually takeover the operation of control center. Contractor shall provide detailed procedure for the same.”

2. Part A, Section 1, Clause 1.11

Add the following details at the end of this clause:

*"The layouts of Main and Backup CC rooms and Auxiliary Power Supply room are provided in **Attachment 1**.*

The supplied capacity of the heavy-duty Air Conditioner must be minimum of 2.2 Tons with the following specifications:

Supply, delivery, installation and commissioning of the (Cool) Split Type Air Conditioning Units with wall mounted decorative Type Indoor Unit with complete set of mandatory accessories. Reputed Equivalent is preferred.

Note: *Air Conditioner Unit model must be mentioned and Technical Brochure"*

3. Part A, Section 2, Clause 2.0.7

Replace this clause with the following:

"The employer's personnel shall be given a short-term training/refresher course annually after the completion of the one-year defect liability period until the end of AMC. This training shall be mainly focused on Sl. No. 1 and Sl. No. 4 (one week each) of Table-1. This training shall be conducted at the employer's premise, at a mutually agreed date, by the Contractor personnel who are experienced instructors. "

4. Part A, Section 2, Table - 1

Replace the Table – 1 with the following:

"Table – 1 Training Requirements

Sl. No.	Category	Total No. of Trainees	Duration in Weeks	
			Bhutan	Contractor's facility
1	Overview of SCADA/EMS systems, design process, and implementation *	5	2	-
2	SCADA/EMS Systems (Database & Display, Applications Software, Historian, and DTS)	5	5	4
3	Computer System Software and Hardware	5	3	-
4	NMS and Cyber Security	5	1	1
5	Operator Applications Trainings	20	3	2
6	Auxiliary Power Supply Systems	3	1	0
		43	15	7

** This training must be conducted soon after the contract award and before the design engineering phase so that the project personnel are familiar about the system.*

Note: *The training may need to be conducted in two batches/sessions and the same shall also be applicable for Training during AMC."*

5. Part A, Section 3, Annexure – II is replaced with the following Annexure:

Sl. No.	Task Name	Project Implementation Schedule (in months)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Site Survey and Detailed Engineering	█	█	█	█														
2	Database Development		█	█	█	█	█												
3	FAT of equipment				█	█	█	█											
4	Supply of equipment & delivery at sites				█	█	█	█	█	█	█								
5	Installation and Commissioning										█	█	█	█	█				
6	Site Acceptance Test											█	█	█	█	█			
7	System Availability Test and taking over													█	█	█	█	█	█

6. Part A, Section 4, Clause 4.2

Replace the first paragraph with the following:

*“The period of maintenance support shall be the **one year** Warranty period or Defect Liability Period (DLP) commencing from Operational Acceptance and **Five year** Maintenance period, also known as Annual Maintenance Contract (AMC), thereafter. The Employer shall reserve full authority to discontinue anytime or extend the AMC for another two years at the discretion of the owner, with 5% annual increment from the 5th year AMC rate. All other terms and conditions will remain same during this extended period.*

The nature of maintenance support required for the different type of systems and components are described in the Table 4.2.1 below:”

7. Part A, Section 4, Clause 4.3.2.3

Replace the last paragraph with the following:

“The contractor shall carry out the Annual Security Audit from a third party certified Auditors for the complete systems under this project until the end of AMC period and accordingly submit the satisfactory report to the employer.”

8. Part A, Section 4, Clause 4.4.2

Replace the first paragraph with the following:

"The contractor shall ensure the availability of service, spare, and expansion parts for SCADA/EMS hardware for a period of 6 years from Operational Acceptance by the Employer. This is irrespective of the change in Clause 4.2, Section 4, Part A, Volume - II.

In case supplied hardware declared end of life/sale/service the Contractor shall ensure that functionally equivalent hardware is available which is compatible with all software delivered with the system. If Employer chooses to purchase said functionally equivalent hardware, any software modifications necessary to maintain complete functional compatibility with all software delivered by Contractor shall be made at no cost to Employer. In the event the modified software is not found compatible with functional equivalent hardware, the Contractor shall make suitable corrections to this modified software & install this corrected software at no cost to Employer."

9. Part B, Section 1, Clause 1.5.3

The starting paragraph **"A Business Tool ..."** is amended as:

"A Historical Reporting Tool (which is one of the features of Historian System) shall be ..."

10. Part B, Section 2, Clause 2.3.10

Add the following information at the end of Clause 2.3.10

2.3.10.4 Power Plants information

Following Table is provided for information:

Sl. No.	Name of the power plant	Capacity (MW)	Remarks
1	Basochhu (2x12 MW) + (2X20 MW)	64	Existing Power plants
2	Chukha (4X84 MW)	336	
3	Dagachhu (2X63 MW)	126	
4	Kurichhu (4X15 MW)	60	
5	Mangdechhu (4X180 MW)	720	
6	Tala (6X170 MW)	1020	
7	Nikachhu (2x59 MW)	118	Upcoming Power plants
8	Punatsangchhu-I (6X200 MW)	1200	
9	Punatsangchhu-II (6X170 MW)	1020	

11. Part B, Section 4, Clause 4.4

The whole paragraph under this Clause is amended as follows:

"The network software includes software for network communication, network security and network services. The network software shall be provided for each type of network node connection supplied with the initial system and shall be licensed for the quantities and types of nodes defined for the system configuration. It should be able to generate reports for a defined period regarding availability of communication links. In case any communication link

*is DOWN/OUT/Failure then a pop-up should come up for it. For the Network Communication, the **software shall use a standard network protocol such as TCP/IP.***

12. Part B, Section 5, Clause 1.14

The last two bullet points under Workstation desk stand **DELETED**

*“Adjustable (Height) Desks (sit-and-stand with step-less automatic height adjustment) **and** Independent electronic powered height adjustment of monitors’ platform and work space”*

13. Part B, Section 8, Clause 8.1

The first sentence of the first paragraph is replaced as:

*“These Applications are to be performed with due consideration for cyber security standards as per **ISO 27001**”*

14. Part B, Appendix C, Table 4

The Table 4 should be replaced as:

NAME	DESIGN CAPACITY	EXECUTION RATE
<i>Function and Data Access Security Operating jurisdictions</i>	16	
<i>User Interface Environment</i>		
<i>Layers</i>	8	
<i>Tag Placement & Removal</i>	4	
<i>Tag Types Tags per device</i>	4	
<i>TREND (Online) in SCADA</i>		
<i>a) Trend files</i>	<i>For each data points as defined in Appendix-F</i>	
<i>b) Variables per trend viewport/window</i>	8	
<i>c) Samples per trend variable</i>	10,000	
<i>d) Configurable Sampling rate</i>		<i>2 sec, 10 sec, 30 sec, 1 min, 10 min, 30 min, 60 minutes</i>
<i>e) Time period of trend</i>	<i>At least 1 week</i>	
ALARMS		
<i>Alarm priority levels</i>	10	
<i>Alarm Message Recording on auxiliary memory</i>	50,000	
<i>EVENTS Event Message Recording on Auxiliary memory - events</i>	50,000	
<i>Function & Data Access Security Operating Jurisdictions</i>	16	

15. Part B, Appendix H, 3: Dual TFT Monitor

b. Workstations for DTS. It should be replaced as:

"b. Workstations for DTS/DDS

Sl. No.	Description of the Features	Minimum Quantity of the features	Offer by the Contractor
1.	Manufacturer		
2.	Model No.		
3.	Diagonal Viewable size	30"	
4.	Color support	16.7 million	
5.	On screen control	Required	
6.	Touch and Gesture Friendly	Yes	
7.	Anti-glare & anti-static	Yes	
8.	Tilt, Swivel	Yes	
9.	Aspect ratio	16:9	

16. Part B, Appendix H, 8: Network Attached Storage (NAS)

The Table should be replaced as:

Sl. No.	Description of the Features	Minimum Quantity of the features	Offered by the Contractor
1	Manufacturer		
2	Model No.		
3	Capacity	Minimum usable capacity of 20 TB	
4	Spare HDD	2 Nos.	
5	Expandability	50% Spare Slots	
6	RAID level	5	
7	Hard Drives speed	10000 or more rpm	
8	Hot swappable Hard Drives	Yes	
9	Dual Power Supply	Yes	

17. Part B, Appendix G

The Bill of Quantity for SCADA/EMS system is replaced with the following:

Sl. No.	Item Description	Unit	Quantity		Total Quantity
			Main NLDC	Backup NLDC	
A	MAIN EQUIPMENT				
1	Application Software				
1.1	SCADA applications	Lot	1	1	2
1.2	ICCP Communication	Lot	1	1	2
1.3	Network Management System	Lot	1	1	2
1.4	Historian System (ISR)	Lot	1	1	2
1.5	EMS applications				

a)	- Network Topology	Lot	1	1	2
b)	- State Estimation	Lot	1	1	2
c)	- Optimal Power flow Analysis	Lot	1	1	2
d)	- Bus Load Forecast (BLF)	Lot	1	1	2
e)	- Contingency analysis	Lot	1	1	2
f)	- Interchange Scheduling	Lot	1	1	2
g)	- Hydro Scheduling	Lot	1	1	2
h)	- Load Forecasting	Lot	1	1	2
1.6	Web Server Application	Lot	1	1	2
1.7	Dispatcher Training Simulator (DTS)	Lot	1	-	1
1.8	Centralized Management Console applications	Lot	1	1	2
1.9	Patch Management software	Lot	1	1	2
1.10	Image Backup software	Lot	1	1	2
1.11	Antivirus server software	Lot	1	1	2
2	Computer System Hardware				
2.1	Servers				
a)	SCADA/EMS Server	Nos.	2	2	4
b)	Historian System (ISR) Server	Nos.	2	2	4
c)	ICCP Server	Nos.	2	2	4
d)	Communication Front End (CFE) Sever	Nos.	2	2	4
e)	NMS Server	Nos.	2	2	4
f)	Web/Replica Data/ Antivirus/ Patch Management Server	Nos.	1	1	2
g)	Centralized Management Console / Image Backup	Nos.	1	1	2
h)	Dispatcher Training Simulator Server	Lot	1	-	1
2.2	Dual TFT Monitor				
a)	Operator Workstation console	Lot	5	2	7
b)	Workstation for DTS	Lot	2	-	2
c)	Workstation for DDS	Lot	1	-	1
2.3	Engineering Laptop	Nos.	3	1	4
2.4	Next Generation Firewall (NGFW)				
a)	External NGFW	Nos.	1	1	2
b)	Internal NGFW	Nos.	2	2	4
2.5	LAN switches				
a)	Dual SCADA/EMS LAN	Lot	1	1	2
b)	Dual CFE LAN	Lot	1	1	2
c)	Dual DMZ LAN	Lot	1	1	2
d)	DTS LAN	Nos.	1	-	1
2.6	Auxiliary Storage for Historian	Nos.	1	1	2
2.7	NAS Box	Nos.	1	1	2
2.8	Server Rack With IP based KVM Switch	Nos.	3	3	6
2.9	Multifunction Laser Printer	Nos.	1	-	1
3	Time and Frequency System displays				

3.1	Time & Frequency System (GPS based)	Lot	1	1	2
3.2	Digital display for Day	Nos.	1	1	2
3.3	Digital display for Time	Nos.	1	1	2
3.4	Digital display for Frequency	Nos.	2	2	4
4	ICCP Integration				
4.1	Integration with Indian NLDC	Lot	1	1	2
4.2	Integration with DMS	Lot	1	1	2
5	Furniture	Lot	1	1	2
B	MISCELLANEOUS				
1	Heavy duty Air Conditioner	Lot	-	1	1
2	Uninterruptible Power Supply (UPS)	Lot	1	1	2
3	VRLA maintenance-free Battery	Lot	-	1	1
4	Input ACDB	Lot	1	1	2
5	Output ACDB	Lot	1	1	2
6	Civil works	Lot	1		1
C	TRAINING FOR SCADA/EMS				
1	Training requirements	Lot	1		1
D	SPARES				
1	Servers including all main memory, auxiliary memory, interface cards complete one of each type	Lot	2		2
2	LAN switch one of each type	Lot	2		2
3	Router	Nos.	1		1
E	MAINTENANCE SUPPORT				
1	Annual Maintenance Contract	Lot	1		1
2	Annual Cyber Security auditing	Lot	1		1
3	Annual Refresher Course	Lot	1		1

Lot 2: Revamp of Telecommunication System

1. Section 1, Clause 1.2 (e)

Replace this clause with the following:

“Interoperability or easy transition of data by ethernet drops, from the existing makes of SDH (GE, ABB, Tejas, RAD, and ECI) to proposed MPLS-TP equipment.”

2. Section 1, Clause 1.2 (dd)

Replace this clause with the following:

“Functional and performance test of the complete system concerning and connecting all the MPLS-TP based telecom equipment, compatibility test carrying STM level traffic in supplied MPLS-TP system and NMS.”

3. Section 1, Clause 1.3 Mandatory Qualification Criteria

This clause remains deleted and *Volume I, section II BDS, 33.2 (e), shall govern”.*

4. Section 2, Clause 2.2.1

Add the following sentence at the end of the paragraph:

“Teleprotection shall be applicable for Distance Protection Only.”

5. Section 2, Clause 2.3.2 (a)

Teleprotection Interface Table shall be replaced with the following:

<i>Sl. No.</i>	<i>Description</i>	<i>Capacity</i>
<i>1</i>	<i>Integrated distance teleprotection interface</i>	<i>Yes</i>
<i>2</i>	<i>Addressing of protection commands</i>	<i>Yes</i>
<i>3</i>	<i>Loop test for reassuring delay time</i>	<i>Yes</i>

6. Section 2, Clause 2.3.2 (b)

Interface for Commands Tx/Rx for Distance Protection Scheme Table shall be replaced as below:

<i>Sl. No.</i>	<i>Description</i>	<i>Unit</i>	<i>Capacity</i>
<i>1</i>	<i>Number of independent commands</i>	<i>Number</i>	<i>Min. 4 input and output commands</i>

2	Transmission time max	ms	6
3	Protection commands signals range	V DC	48VDC -250 VDC

7. Section 2, Clause 2.3.3

Replace the sentence starting with **"The contractor shall provide 1+1 redundancy ..."** with the following:

"The contractor shall provide 1+1 redundancy on the power supply cards, controller cards, and optical links."

8. Section 2, Clause 2.3.3

This sentence starting with **"In case the equipment offered by the Bidder does not support the above-mentioned** *"stands DELETED.*

9. Section 2, Clause 2.4.1

Replace this clause with the following:

"The FO Communication equipment to be supplied shall be MPLS-TP providing all the features e.g. protection and performance monitoring. It should have the capabilities to carry and segregate different multi-service Packet Networks like SCADA, Automation, Teleprotection and Legacy applications. This shall be integrated with existing SDH network.

All software and hardware shall support IPv4. The Contractor shall provide connectorized jumpers (patch cords) for FODP-to-equipment and equipment-to-equipment connection."

10. Section 2, Clause 2.4.1(a)

Replace this clause with the following:

"The equipment shall be compact and in composite construction and light weight with suitable size (height and width) for installation in 19" rack. All modules shall be integrated in the same shelf. All connectors shall be accessible from the front and comply with international specifications. However, the mechanical design and construction of each card/unit shall be inherently robust and rigid under all conditions of operation, adjustment, replacement, and storage. The actual dimensions and weight of the equipment shall be furnished by the Contractor."

11. Section 2, Clause 2.4.1(c)

Replace this clause with the following:

"It shall support Packet and Ethernet services, MEF CE2.0 (E-Line, E-LAN, E-Tree, E-Access) which provides interoperable interconnection, management, and performance. It should have minimum interface of 8x10/100/1000Base-T, with the provision to increase to 16x10/100/1000Base-T, 4X10G. Minimum E1 interface requirement is 8XE1. "

12. Section 2, Clause 2.4.1(g)

Replace this clause with the following:

"All software and hardware shall support IPv4."

13. Section 2, Clause 2.4.1(h)

Replace this clause with the following:

"Modules should be Hot swappable for higher availability and recovery of service shall be within 50ms."

14. Section 2, Clause 2.4.1(l)

Replace this clause with the following:

"It should provide Alarm suppression and fault indication with AIS/RDI/CFI, performance monitoring for frame loss and delay with LM/DM/OAM-LB/LT and provide support for Pseudo wire."

15. Section 2, Clause 2.4.1(t)

Replace this clause with the following:

"It should support Circuit emulation services; such as SAToP, CEP and Encapsulation of TDM over MPLS & Ethernet VPWS, VPLS using Pseudo wire. All Ethernet interface shall be configurable as client interface (UNI) and network interface (NNI)."

16. Section 2, Clause 2.4.1(u)

Replace the clause with the following:

"It should support E1 interface over packet."

17. Section 2, Clause 2.4.1(w)

Replace the clause with the following:

"The equipment shall have power supply operating on -48 VDC \pm 15%. It should also have Over-load, Over-voltage and Reverse Polarity Protection."

18. Section 2, Clause 2.4.1(x)

Replace the clause with the following:

"The equipment shall have operating temperature between 0° C to 50° C and humidity of 95% non-condensing."

19. Section 2, Clause 2.4.1dd(2)

The first bullet point sentence starting with **"A command counter (Digital display type) which ..."** stands **DELETED**.

20. Section 2, Clause 2.4.1(ff)

This clause stands **DELETED**.

21. Section 2, Clause 2.4.2.1(b)

Replace this clause with the following:

"Splice loss: Minimum 0.05 dB per splice. One splice shall be considered for every 3 kms."

22. Section 3, Clause 3.1

Replace this sentence starting with **"The Contractor shall supply a single NMS for all the NEs (Network Elements)..."** with the following:

"The Contractor shall supply a single NMS for all the NEs (Network Elements). If Teleprotection system requires a separate NMS server, than a separate physical server shall be allowed. The bidder shall provide details of the offered NMS in the bid."

23. Section 3, Clause 3.7.2

This clause stands **DELETED**

24. Section 4, Clause 4.3.2

Add the following sentence at the end of the paragraph:

*"At locations specified in Table 4.1, it will be contractors' responsibility to supply - 48VDC for the communication equipment as per **Appendix K**."*

Table 4.1: Locations for -48VDC Requirement

<i>Sl. No</i>	<i>Site Location</i>	<i>Load (Amp-DC)</i>	<i>48V Battery AH capacity</i>
1	<i>Jigmeling Control Center</i>	15	200
2	<i>Tsirang</i>	15	200
3	<i>Olakha</i>	15	200

25. Section 4, Clause 4.5

First paragraph starting with the sentence **“All equipment provided under this specification, shall be physically mounted...”** and the second paragraph starting with the sentence **“New panels shall be installed in locations where panel is...”** shall be replaced with the following sentence:

“The panels supplied shall be of height not less than 1.5 meters. The panel should be of appropriate width and breadth to hold the supplied MPLS-TP and teleprotection equipment with enough space for cabling and easy access for maintenance. All cabinet metal shall be thoroughly cleaned and sanded to obtain a clean, smooth finish. All surfaces shall be treated to resist rust and to form a bond between the metal and the paint.

Moving assemblies within the enclosure, such as swing frames or extension slides, shall be designed such that full movement of the assembly is possible without bending or distortion of the enclosure or the moving assembly. Enclosures shall not require fastening to the floor to preclude tipping of the enclosure when the moving assembly is extended. No cables shall be visible, all cables shall be properly clamped, and all entries shall be properly sealed to prevent access by rodents.

The panel should have an exhaust fan to circulate cooling air. Cooling air shall be drawn from the conditioned air within the room. Ducted or directed cooling air to the enclosures will not be supplied by Employer.

All wiring shall use copper conductors. Conductors in multi core cables shall be individually color coded.

Wiring within the enclosures 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.

All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trim shall be made of flame retardant material and shall not produce toxic gasses under fire conditions.

The panel shall have door on both sides.

The finish colors of all enclosures/panels shall be finalized during detailed engineering."

26. Section 4, Clause 4.5.1

This clause stands **DELETED**.

27. Section 5, Clause 5.11

Below the Table- 5.2, add the following sentence:

" This training must be conducted soon after the contract award and before the design engineering phase so that the project personnel are familiar about the system."

28. Section 5, Clause 5.11.1

Replace this clause with the following:

"The employer's personnel shall be given a short-term training/refresher course annually after the completion of the one-year defect liability period until the end of AMC. This training shall be mainly focused on Sl. No. 1 to Sl. No. 3(one week each) of Table 5.2. This training shall be conducted at the employer's premise, at a mutually agreed date, by the Contractor personnel who are experienced instructors. "

29. Appendix B, Table B.1

Table B.1: Bill of Quantity for Communication Systems is replaced as below:

	<i>Item Description</i>	<i>MPLS-TP</i>	<i>Teleprotection Interface</i>
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Sl. No.		Unit	Quantity	Unit	Quantity
A	Supply of Main Equipment				
1	National Load Dispatch Centre (NLDC)	Set	1	Set	-
2	Chubachhu Substation	Set	1	Set	-
3	Olakha Substation	Set	1	Set	1
4	Gidagom Mini-hydel	Set	1	Set	-
5	Jamji Station	Set	1	Set	2
6	Chhukha Hydropower Plant	Set	1	Set	5
7	Gedu 66 kV Substation	Set	1	Set	-
8	Gedu 220 kV Substation	Set	1	Set	2
9	Phuentsholing Substation	Set	1	Set	0
10	Singhigaon Substation	Set	1	Set	2
11	Malbase Substation	Set	1	Set	6
12	Dhamdum	Set	1	Set	2
13	Gomtu	Set	1	Set	0
14	Tala Hydropower Plant	Set	1	Set	4
15	Semtokha Substation	Set	1	Set	2
16	Lobeysa Substation	Set	1	Set	0
17	Basochhu Hydropower Plant	Set	1	Set	2
18	Dharjey	Set	1	Set	2
19	Dagapela	Set	1	Set	1
20	Jigmeling Substation	Set	1	Set	10
21	Backup NLDC, Jigmeling	Set	1	Set	-
22	Mangdechhu (MHP)	Set	1	Set	5
23	Gelephu Substation	Set	1	Set	2
24	Yurmoo Substation	Set	1	Set	2
25	Tintibi Substation	Set	1	Set	3
26	Nganglam Substation	Set	1	Set	3
27	Nangkor Substation	Set	1	Set	3
28	Kurichhu Hydropower Plant	Set	1	Set	2
29	Kilikhar Substation	Set	1	Set	2
30	Corlung Substation	Set	1	Set	2
31	Kanglung Substation	Set	1	Set	2

32	Phuntshothang Substation	Set	1	Set	2
33	Motanga Substation	Set	1	Set	3
34	Deothang Substation	Set	1	Set	2

Sl. No.	Item Description	Unit	Quantity	Remarks
B	Supply of Other Equipment			
I	NMS at NLDC			
1	Software	LOT	1	
2	Work Station / Server	LOT	2	
3	Craft Terminal	Nos.	2	
II	Supplementary Modules for Main Equipment			
1	E1 Interface	Nos.	1	
III	Spares			
1	MPLS-TP	Set	5	
2	Teleprotection Interface	Set	5	
3	Ethernet Cards	Nos.	5	
IV	Miscellaneous			
1	48VDC Power Supply System	Nos.	3	
2	GPS	Set	1	
V	Annual Maintenance Contract			
1	Year 1	LOT	1	
2	Year 2	LOT	1	
3	Year 3	LOT	1	
VI	Training For Communication System			
1	Design, installation and maintenance of Communication equipment	LOT	1	
2	Communication NMS	LOT	1	
3	Teleprotection	LOT	1	

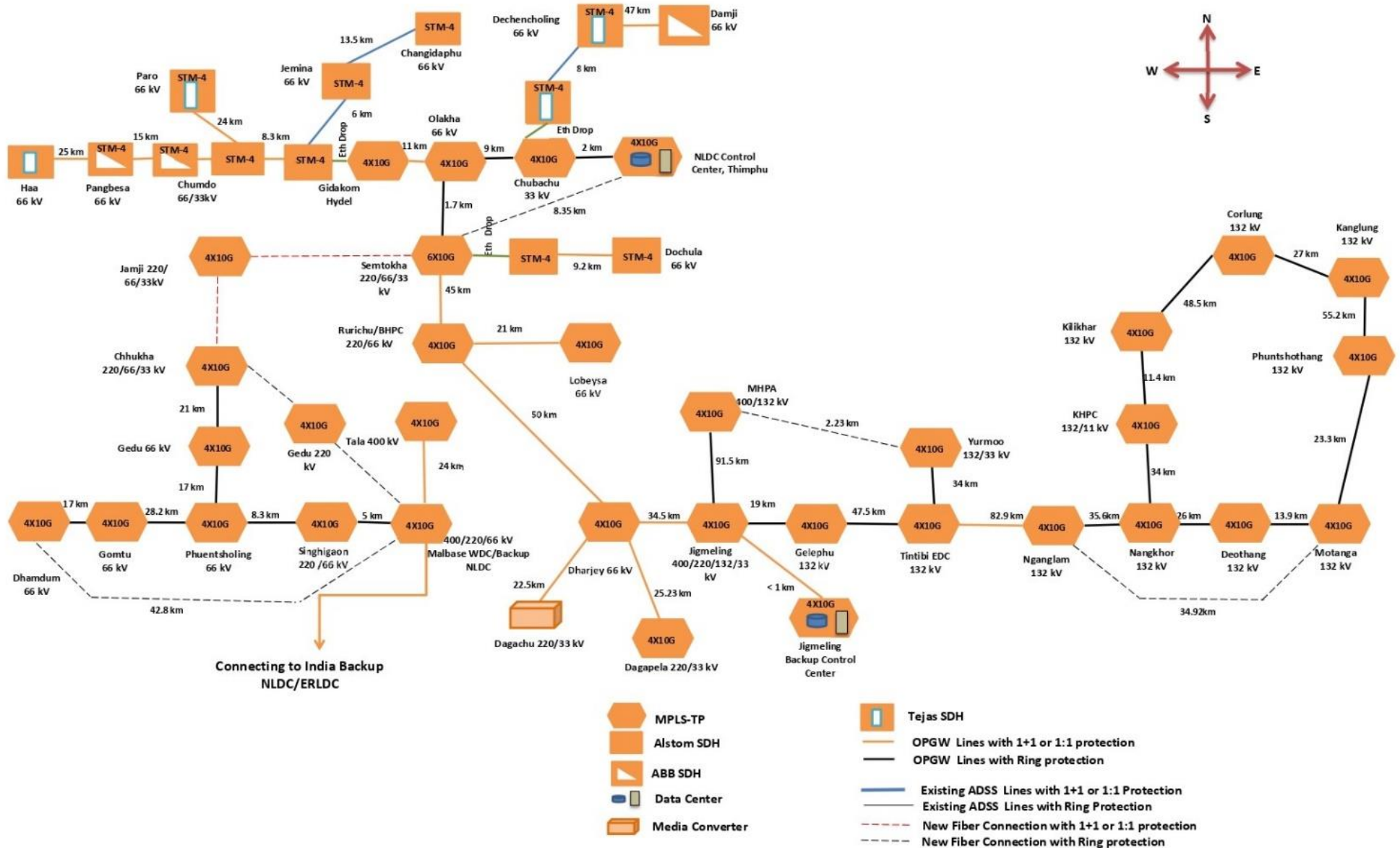
VII	<i>Installation, Testing and Commissioning</i>			
1	<i>Installation, Testing, and Commissioning of the Communication System</i>	LOT	1	

"Note:

*- Each **Set of MPLS-TP** shall include at least main and redundant modules for power supply, optical network cards and controller card to provide access to the configuration of the set and other connected sets in the network. It shall also include SFP (as per optical distance and losses mentioned in Appendix E) and Ethernet module with minimum 8 interfaces. It should incorporate all modules/wiring/cabling and accessories that are mandatory for satisfactory operation at the proposed network node."*

*-Each **Set of Teleprotection** Interface shall include at least main and redundant power supply module, cables connecting protection relays (Main I & II, or Main & Backup as per the Appendix H) and all other necessary accessories for proper functioning of the Teleprotection."*

30. Appendix B, Figure B-2 shall be replaced as below:



31. Appendix C, C-1

Add the following sentence just below the topic C-1. Type Tests on new communication equipment:

“The IEC standard tests mentioned under Appendix C: C-1 can be performed as per IEC/QM-333/TECM or any other relevant international standards”

32. Appendix C, C-1.2 (a)

a) Immunity Test

The lists of Immunity tests specified in Table shall be replaced as below:

Sl. No.	Immunity test	DC Power Supply	Control & Signal	Telecom line	Parameters (Specify Relevant Test Standard)
1	Voltage Fluctuations	Yes	N/A	N/A	
2	Voltage dips and fluctuations	Yes	N/A	N/A	
3	1.2/50 – 8/20 μ S surges	Yes	Yes	N/A	
4	Fast transient bursts	Yes	Yes	Yes	
5	Damped oscillatory waves	Yes	Yes	Yes	
6	Electrostatic discharge				
7	Damped oscillatory magnetic field				
8	Radiated electromagnetic field				

b) Emission Tests

The list of Emission tests specified in Table shall be replaced as below:

<i>Sl.No.</i>	<i>Emission test</i>	<i>DC Power Supply</i>	<i>Control & Signal</i>	<i>Telecom Line</i>	<i>Parameters(Specify Relevant Test Standard)</i>
1.	<i>RF disturbance voltages CISPR 22</i>	<i>Yes</i>	<i>N/A</i>	<i>N/A</i>	
2.	<i>RF disturbance currents CISPR 22</i>	<i>N/A</i>	<i>N/A</i>	<i>Yes</i>	
3.	<i>RF radiated fields CISPR 22</i>	<i>Yes</i>			

33. Appendix D

Appendix D-Technical Requirement Sheet is replaced as:

D-1. MPLS-TP and Teleprotection

<i>Sl. No</i>	<i>Specified Technical Requirements</i>	<i>To be filled by Bidder</i>
1	<i>List of core (common) cards/modules:</i>	
2	<i>Packet and Ethernet Services</i>	
	<i>A</i>	<i>Minimum of 8 Ethernet interface and expandable to 16 Interface (Yes/No):</i>
	<i>B</i>	<i>Minimum support for 2 optical link directions and expandable to 7 optical link directions with 1+1 redundancy support. (Yes/No)</i>
	<i>C</i>	<i>Support VLAN Services (Yes/No):</i>
	<i>D</i>	<i>Ethernet OAM (Yes/No):</i>
	<i>E</i>	<i>Support Spanning Tree (Yes/No):</i>
	<i>F</i>	<i>IPv4 support: (Yes/No):</i>

	G	Adjustable port BW(Auto/Manual) and Transmission (Half/Full Duplex): (Yes/No)	
	H	Channel Segregation capability (Yes/No):	
	I	Channel size allocation capability from minimum 64Kbps (Yes/No):	
	J	Applicable Standards compliance MEF CE 2.0 (Yes/No):	
	K	Please mention applicable standards complied for Ethernet and Packet services:	
	MPLS-TP		
	A	Make: Model: Country of Origin:	
	B	MPLS-TP OAM with functionalities: - Continuity check (CC) & Continuity verification (CV): (Yes/No) - Active and On-demand status (Yes/No): -Traffic Performance; Forwarding performance at scale, including latency and delay variation: (Yes/No)	
	C	Service Scalability -Number of supported LSPs/PWs:	
3	D	Service Quality - Number of supported service levels to meet SLAs:	
	E	MPLS FRR support (Yes/No):	
	F	L2 VPN Support (Yes/No):	
	G	RFC 5654 MPLS-TP or equivalent Requirements (Yes/No)	
	H	RFC 5860 MPLS-TP OAM or equivalent Requirements (Yes/No)	
	I	RFC 5921 MPLS-TP Architecture Framework or equivalent Requirements (Yes/No)	
	J	Please mention applicable standards complied for the MPLS-TP device:	

K	Possible to define CIR/PIR (Yes/No):	
L	Timing and Synchronization. Please mention the supported features: -SyncE with ESMC (Yes/No), - 1588v2 (Yes/No), -External timing 1PPS and TOD (Yes/No), -Internal Stratum 3 clock (holdover state) (Yes/No)	
M	Topologies support (Yes/No): Mesh, dual homing, multi-ring, ring, star, linear.	
N	Supported power supply: (Yes/No): -48VDC	
O	Dual Power Supply (Yes/No):	
P	(If Modular Cards) Hot swappable cards (Yes/ No):	
Q	Rack mountable 19" (Yes/No):	
R	Please mention physical dimensions (W x D x H in inches):	
S	-Environmental Compliances. Please mention standards: -Safety: -EMC/EMI:	
T	Interoperability with different vendors (Yes/No):	
U	Please mention Pluggable SFP/CSFP/SFP+ support:	
V	Please mention Max No. of MSP protected directions:	
W	Please mention No. of plug-in slots available:	
X	Please mention No. of interface on E1 card:	
Y	User Selectable / Automatic Periodical Link Test (Yes/No):	
Z	Link Performance Alarms (Yes/No):	
AA	System Performance Alarms (Yes/No):	
AB	Alarms Logging (Yes/No):	

4	Protection	
	A	Hardware redundancy for Power, Optical link (MSP 1+1), controller cards (Yes/No):
	B	Ethernet Ring Protection (ERPS) (Yes/No):
	C	MPLS TP Linear protection (Yes/No):
	D	Switching time less than 50ms (Yes/No):
	E	Link Aggregation (Yes/No):
	F	Please mention applicable standards complied for the link protection:
5	QoS	
	A	Supports 8 CoS Queuing (Yes/No):
	B	Scheduling Disciplines (Yes/No):
	C	Congestion Management (Yes/No):
	D	Traffic classification based on Port, VLAN, Port + VLAN (Yes/No):
	E	Bandwidth Control (Yes/No):
	F	Please mention complied applicable standards for the QoS:
6	Security	
	A	Port security & mirroring (Yes/No):
	B	Security incorporated for accessing the MPLS-TP device:
	C	MPLS-based Encryption Layer 2.5 (Yes/No):
	D	Access Control list (ACL) (Yes/No):
7	Network Management System	
	A	NMS, SNMPv2/v3 (Yes/No):
	B	System monitoring (Temperature, voltage, power, fans, fiber losses and memory utilization) (Please mention all monitoring parameters):
	C	Remote access for NMS from any network node and from client NMS (Yes/No):

	D	Configuration, Fault, Performance and Security Management:	
	E	Firmware upgradability (Yes/No):	
	F	Command line interface (CLI) / Graphical User Interface (GUI): (Yes/No):	
	G	User access management (Yes/No):	
	H	OS used (Windows or Linux)	
	I	Please mention complied applicable standards for the NMS:	
8	Services		
	A	Support for CES: (SAtOP, or CEP) (Yes/No)	
	B	Encapsulation of TDM & IP over MPLS-TP	
	C	Creation of Pseudowires	
	D	Ethernet services	
	E	E1 Services	
9	Teleprotection		
	A	Make: Model: Country of Origin:	
	B	Support for minimum 4 Number of Input Binary Commands (Yes/No)	
	C	Support for minimum 4 Number of Output Binary Commands (Yes/No)	
	D	Support for Protection Schemes: -Direct Transfer Tripping, (Yes/No) -Permissive Tripping, (Yes/No) -Blocking Tripping (Yes/No)	
	F	Command Combination, AND / OR (Yes/No)	
	F	Command Transfer Time from one relay to other relay < 10ms (Yes/No)	

	H	Supported Command Voltages, User Selectable 48VDC/110V DC / 220V DC (Yes/No)	
	I	Support power supply -please mention whichever is applicable. - 48VDC - 110VDC - 220VDC	
	J	Loop test feature: (Yes/No)	
		Compliance to Teleprotection equipment of power systems - Performance and testing IEC 60834-1 or 60834-1 or equivalent standards: (Yes/No)	
	K	Please mention complied applicable standards for Teleprotection:	
	L	Please mention physical dimensions (W x D x H in inches):	
	M	-Environmental Compliances. Please mention standards: -Safety: -EMC/EMI:	
	N	Interoperability with SDH Technology (Yes/No):	
	O	NMS for equipment: (Yes/No)	
	P	Link Performance Alarms: (Yes/No)	
10	Panel		
	A	Make: Model: Country of Origin:	
	B	Functions for mounting or placement of equipment (Yes/No)	
	C	Floor mounted with front & rear access to hardware and wiring. (Yes/No)	
	D	Cable entry from bottom (Yes/No)	
	E	Internal lighting lamp, with door interlock: (Yes/No)	
	F	Exhaust Fan: (Yes/No)	

	G	All material used in the panel are flame retardant: (Yes/No)	
	H	All Louvers provided with suitable wire mesh: (Yes/No)	
Other Requirements			
11		Environmental Operating Limits -Operation Temperature without damage: -0°C to +50°C (Yes/No): -Storage Temperature: -Humidity up to 95%, Non-condensing (Yes/No): - Operating Elevation up to 3500m (Yes/No):	

D-2. -48Volt DC power supply system

D-2.1 Battery

Sl. No.	Description	To be filled by Bidder
1	Name of the manufacturer**	
2	Type (maintenance free VRLA) & Model no. of offered Battery	
3	Battery AH capacity (in AH) at C10, 27 °C temp	
4	Total number of cells in each UPS/DCPS Battery Bank	
5	Nominal voltage of each cells	
6	Applicable standards	
7	Maximum Boost charging current supported (in % of AH capacity)	
8	Float charging voltages of each cell	
9	Boost charging voltages of each cell	
10	Battery minimum operating lifetime (in years)	
11	Manufacturer's technical catalogues enclosed with the Bid	Yes/No
12	Whether offered battery is type tested as per standards defined in the technical specifications	Yes/No

D-2.2 DCPS system

Sl. No.	Description	To be filled by Bidder
GENERAL		
1	Name of Manufacturer**	
2	Type of DCPS System	

3	Model No. of DCPS systems offered	
4	DC Power Supply Controller details	
5	Rating/Model no. of SMPS module	
6	Applicable Standards	
7	Whether Degree of Protection of DCPS Enclosures/Panel is minimum IP21	Yes/No
8	Whether offered DCPS system is designed for ultimate system capacity	Yes/No
9	MTBF of SMPS module	
10	Maximum Noise generated at full rated capacity measured at a distance of 1 meter and 1.25 meter above floor level from the DCPS system	
11	Whether suitable for operating at ambient temperature from 0°C to 50°C & maximum relative humidity of 95%, non-condensing at full capacity	Yes/No
12	Whether RFI Suppression provided for minimizing the level of conducted & radiated electromagnetic interference	Yes/No
13	Whether dual stud safety earthing provided for DCPS system	Yes/No
14	Whether Temperature Compensated Charging provided in the DCPS system for charging the batteries.	Yes/No
15	Whether Battery Low Voltage Disconnection feature provided	Yes/No
16	Whether DCDB offered is wall mounted or an integral part of DCPS system	
INPUT DATA		
17	Whether the offered DCPS system is type tested as per standards and the levels the requirements specified in specification	Yes/No
18	Whether DCPS is suitable for operation with A.C. input supply specified in Technical Specification.	Yes/No
19	Input voltage range of each module	
20	Sustainable Maximum Input Voltage	
21	Input frequency Range of each module	
22	Max. Input inrush current	
23	Total Harmonic Distortion	
24	Total line harmonic voltage distortion	
25	Total current harmonic current distortion for specified input voltage range for load from 50% to 100% of rated capacity	
26	Efficiency a. At input pf between 0.95 lagging & 0.98 leading at nominal input & output voltage under ambient conditions	

	<i>b. Under extreme temp. conditions of 0° C & 50° C at nominal input and output & full rated load conditions</i>	
27	<i>Input power factor a. At nominal input, output & load 75% to 100% load b. For other specified input and output & load between 25% to 100% conditions</i>	
28	<i>Whether protections for modules from Input supply abnormal variations other than specified limits provided</i>	Yes/No
29	<i>Whether protections at DCPS System level modules from Input supply abnormal variations other than specified limits Provided</i>	Yes/No
30	<i>Whether Surge protection provided at DCPS system level</i>	
31	<i>Whether Auto-Mains changeover unit provided for DC power supply system</i>	
OUTPUT DATA		
32	<i>Nominal Voltage</i>	
33	<i>Output Voltage Range</i>	
34	<i>Output Voltage Regulation in Steady State</i>	
35	<i>Output voltage maximum variation from no-load to full load for full input range of 160 to 265VAC in auto float mode operation</i>	
36	<i>Whether Auto Float cum boost charger module provided</i>	
37	<i>Suitable for Output Voltage for Float Operation mode of Batteries</i>	
38	<i>Suitable for Output Voltage for Boost Charging operation mode of batteries</i>	
39	<i>Over-voltage Protection</i>	
40	<i>Voltage Ripple</i>	
41	<i>Psophometric Noise at full rated load & at nominal AC input</i>	
42	<i>Parallel operation</i>	
43	<i>Current limiting (Voltage droop)</i>	
44	<i>Whether float & boost charge current limit adjustment provided on the front panel of rectifier module</i>	
45	<i>Current Limit Adjustment</i>	
46	<i>Whether fully protection against short circuit provided for modules</i>	
47	<i>Soft Start Feature Available</i>	
CONTROL/MONITORING		
48	<i>Alarms and Indication Lamps</i>	

49	<i>Whether all alarm circuits provided with suitable delay to ensure that they do not operate to transients & all the protections/alarms is within tolerance of 0.25V in case of DC voltage and 1% in case of current</i>	<i>Yes/No</i>
50	<i>Whether every alarm condition is accompanied with an Audio alarm with audio cut off facility</i>	<i>Yes/No</i>
51	<i>Whether potential free contacts two in number (one for alarm and one redundant) provided for the alarms envisaged in the specification</i>	<i>Yes/No</i>

Note:

* Preferred makes:

1. HBL Power Systems Ltd.
2. Amara Raja Power Systems Ltd.
3. Exide Battery Ltd.
4. Vertiv Group Corp.

34. Appendix H, H-1

Table H-1: Substations and Transmission Lines Connectivity Detail will be replaced as below:

Sl. No	Substation	Connected to Substation	TL	Line (km)	Distance Protection	Remarks
	SMD Semtokha					
1	220kV Semtokha	220kV Jamji	S/C		Main I&II	
		220kV Rurichhu	S/C	39.88	Main I&II	
		*66kV Olakha	S/C	1.70	Main & Backup	
2	220kV Jamji	220 kV Chukha	S/C		Main I&II	
		220 kV Semtokha	S/C		Main I&II	
		*66 kV Pangbesa	S/C			
		*66 kV Paro	S/C			
	SMD Phuentsholing					
3	400kV Malbase	400kV THP	S/C	26.90	Main I&II	
		400kV Siliguri	S/C	125.00	Main I&II	
		220kV Gedu	S/C			

		220kV Birpara	S/C	40.77	Main I&II	
		220kV Singhigaon	S/C	1.21	Main I&II	
		220kV Damdum	S/C	43.40	Main I&II	
		*66kV Phuentsholing	S/C	10.20	Main & Backup	
4	220 kV Gedu	220 kV Chukha	S/C		Main I&II	
		220 kV Malbase	S/C		Main I&II	
5	220kV Singhigaon	220kV Malbase	S/C	1.21	Main I&II	
		220kV Damdum	S/C	44.63	Main I&II	
6	220kV Damdum	220kV Malbase	S/C	43.40	Main I&II	
		220kV Singhigaon	S/C	44.63	Main I&II	
		*66kV Gomtu	D/C	17.00	Main & Backup	
	SMD Jigmeling					
7	400kV Jigmeling	400kV MHP-I	D/C	91.00	Main I&II	
		400kV MHP-II			Main I&II	
		400kV MHP-III	D/C	91.50	Main I&II	
		400kV MHP-IV			Main I&II	
		400kV Alipurduar-I	Quad Moose	162.20	Main I&II	
		400kV Alipurduar-II			Main I&II	
		220kV Dharjey	S/C	34.50	Main I&II	
		220kV Dagapela	S/C	57.20	Main I&II	
		132kV Tintibi	S/C	54.60	Main I&II	
		132kV Gelephu	S/C	19.00	Main & Backup	

8	220kV Dagapela	220kV Jigmeling	S/C	57.20	Main I&II	
9	220kV Dharjey	220kV Rurichhu	S/C	52.50	Main I&II	
		220kV Jigmeling	S/C	34.50	Main I&II	
10	132kV Gelephu	132kV Jigmeling	S/C	19.00	Main & Backup	
		132kV Salakati	S/C	50.00	Main & Backup	
11	132kV Tintibi	132kV Jigmeling	S/C	54.60	Main I&II	
		132kV Yurmoo	S/C	34.80	Main & Backup	
		132kV Nganglam	S/C	83.50	Main & Backup	
12	132kV Yurmoo	132kV Tintibi	S/C	34.80	Main & Backup	
		132kV MHP- Nikachhu	D/C	20.48	Main & Backup	
SMD Deothang						
13	132kV Kilikhar	132kV KHP	S/C	13.50	Main & Backup	
		132kV Corlung	S/C	48.50	Main & Backup	
14	132kV Corlung	132kV Kilikhar	S/C	48.50	Main & Backup	
		132kV Kanglung	S/C	55.20	Main & Backup	
15	132kV Kanglung	132kV Corlung	S/C	55.20	Main & Backup	
		132kV Phuntshothan g	S/C	52.20	Main & Backup	
16	132kV Nangkor	132kV KHP	S/C	34.90	Main & Backup	
		132kV Deothang	S/C	26.90	Main & Backup	
		132kV Nganglam	S/C	36.30	Main & Backup	
17	132kV Deothang	132kV Nangkor	S/C	26.90	Main & Backup	

		132kV Motanga	S/C	13.90	Main & Backup	
18	123kV Motanga	132kV Deothang	S/C	13.90	Main & Backup	
		132kV Phuntshothang	D/C	23.30	Main & Backup	
		132kV Nganglam	D/C	35.00	Main & Backup	
		*132kV Rangia	S/C	46.40	Main & Backup	
19	132kV Phuntshothang	132kV Kanglung	S/C	52.20	Main & Backup	
		132kV Motanga	D/C	23.30	Main & Backup	
20	132kV Nganglam	132kV Nangkor	S/C	36.30	Main & Backup	
		132kV Motanga	S/C	35.00	Main & Backup	
		132kV Tintibi	S/C	83.50	Main & Backup	

35. Appendix H, H-2

Table H-2: Generating Plants (GENCOS) Connectivity Detail will be replaced as below:

Sl. No	Generating Plants	Connected to Substation	Transmission Line	Line (km)	Distance Protection	Remarks
1	Chhukha Hydropower Plant (CHP)	220kV Semtokha	S/C	57.33	Main I&II	
		220kV Malbase	S/C	33.68	Main I&II	
		220kV Birpara-I	D/C	36.80	Main I&II	
		220kV Birpara-II			Main I&II	
		*220 kV Jamji				
2	Tala Hydropower Plant (THP)	400kV Siliguri-I	D/C	146.00	Main I&II	
		400kV Siliguri-II			Main I&II	
		400kV Malbase	S/C	26.90	Main I&II	
		400kV Siliguri-IV	S/C	149.40	Main I&II	
3		220kV Semtokha	S/C	39.88	Main I&II	
		220kV Dharjey	S/C	52.50	Main I&II	

	<i>Basochhu Hydropower Plant (BHP)</i>	<i>*66kV Lobeysa</i>	<i>S/C</i>	<i>24.66</i>	<i>Main & Backup</i>	
4	<i>Manggdechhu Hydropower Plant (MHP)</i>	<i>400kV Jigmeling-I</i>	<i>D/C</i>	<i>91.00</i>	<i>Main I&II</i>	
		<i>400kV Jigmeling-II</i>			<i>Main I&II</i>	
		<i>400kV Jigmeling-III</i>	<i>D/C</i>	<i>91.50</i>	<i>Main I&II</i>	
		<i>400kV Jigmeling-IV</i>			<i>Main I&II</i>	
		<i>132kV Yurmoo</i>	<i>D/C</i>	<i>20.48</i>	<i>Main & Backup</i>	
5	<i>Kurichhu Hydropower Plant (KHP)</i>	<i>132kV Kilikhar</i>	<i>S/C</i>	<i>13.50</i>	<i>Main & Backup</i>	
		<i>132kV Nangkor</i>	<i>S/C</i>	<i>34.90</i>	<i>Main & Backup</i>	

Note:

* Teleprotection Interface is not required. However, provision should be kept for future implementation.

36. Appendix I

Below Appendix I-Project Implementation Plan, add Appendix J:

Appendix J-Relay Details

A: For Transmission Substations

Sl. No.	Locations (Substation)	Location Towards	Relay Type	Make	Model No.	Remarks
1	<i>Singhigaon Substation</i>	<i>220kV Malbase</i>	<i>Main1</i>	<i>Siemens</i>	<i>7SD5</i>	
			<i>Main2</i>	<i>Siemens</i>	<i>7SA52</i>	
		<i>220kV Dhamdum</i>	<i>Main1</i>	<i>ABB</i>	<i>REL511</i>	
			<i>Main2</i>	<i>Siemens</i>	<i>Argus 2</i>	

2	Malbase Substation	400kV THP	Main 1	ABB	REL521	
			Main 2	Alstom	P444916B6M07 10M	
		400kV Siliguri	Main 1	ABB	REL521	
			Main 2	Alstom	P444916B6M07 10M	
		220kV Birpara	Main 1	ABB	REL511	
			Main 2	Alstom	P444916B6M07 10M	
		220kV Singhigaon	Main 1	Siemens	7SD5	
			Main 2	Siemens	7SA52	
		220kV Dhamdum	Main 1	ABB	REL511	
			Main 2	Siemens	Argus 2	
	66kV Phuentsholing	Main Relay	Alstom	P14NB		
3	Dhamdum Substation	220kV Malbase	Main 1	ABB	REL670	
			Main 2	ABB	REL670	
		220kV Singhigaon	Main 1	ABB	REL670	
			Main 2	ABB	REL670	
	66kV Gomtu	Main Relay	ABB	REL670		

			<i>Backup Relay</i>	<i>ABB</i>	<i>REF615</i>	
4	<i>Semtokha Substation</i>	<i>220kV Rurichhu</i>	<i>Main 1</i>	<i>ABB</i>	<i>REL511</i>	
			<i>Main 2</i>	<i>ABB</i>	<i>REL316*4</i>	
5	<i>Dharjey Substation</i>	<i>220kV Rurichhu</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA5221</i>	
			<i>Main 2</i>	<i>ABB</i>	<i>REL670</i>	
		<i>220kV Jigmeling</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA5221</i>	
			<i>Main 2</i>	<i>ABB</i>	<i>REL670</i>	
6	<i>Jigmeling Substation</i>	<i>400kV MHP-I</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA522</i>	
			<i>Main 2</i>	<i>Siemens</i>	<i>7SA611</i>	
		<i>400kV MHP-II</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA522</i>	
			<i>Main 2</i>	<i>Siemens</i>	<i>7SA611</i>	
		<i>400kV MHP-III</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA522</i>	
			<i>Main 2</i>	<i>Siemens</i>	<i>7SA611</i>	
		<i>400kV MHP-IV</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA522</i>	
			<i>Main 2</i>	<i>Siemens</i>	<i>7SA611</i>	
		<i>400kV Alipurduar -I</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA522</i>	
			<i>Main 2</i>	<i>Siemens</i>	<i>7SA611</i>	
		<i>400kV Alipurduar -II</i>	<i>Main 1</i>	<i>Siemens</i>	<i>7SA522</i>	

			Main 2	Siemens	7SA611		
		220kV Dharjey	Main 1	Siemens	7SA522		
			Main 2	ABB	REL670		
		220kV Dagapela	Main 1	Siemens	7SA522		
			Main 2	ABB	REL670		
		132kV Tintibi	Main 1	Siemens	7SA522		
			Main 2	ABB	REL670		
			132kV Gelephu	Main 1	Siemens	7SA522	
		Main 2	ABB	REL670			
7	Gelephu Substation	132kV Jigmeling	Main Relay	ABB	REL670		
			Backup Relay	Alstom	CDD		
		132kV Salakati	Main Relay	Alstom	P44291AB6M07 20M		
			Backup Relay	Alstom	CDD		
8	Tintibi Substation	132kV Jigmeling	Main Relay	Alstom	P442916A6M05 50K		
			Backup Relay	Alstom	P14DB16A6C05 40A		
		132kV Yurmoo	Main Relay	Alstom	P442916A6M05 50K		
			Backup Relay	Alstom	P14DB16A6C05 40A		
	132kV Nganglam	Main Relay	Alstom	P442916A6M05 50K			

			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
9	<i>Nganglam Substation</i>	<i>132kV Nangkor</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442916A6M05 50K</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
		<i>132kV Motanga</i>	<i>Main Relay</i>	<i>ABB</i>	<i>REL650</i>	
			<i>Backup Relay</i>	<i>ABB</i>	<i>REF615</i>	
		<i>132kV Tintibi</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442916A6M05 50K</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
10	<i>Nangkor Substation</i>	<i>132kV KHP</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442916A6M05 50K</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
		<i>132kV Deothang</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442916A6M05 50K</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
		<i>132kV Nganglam</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442916A6M05 50K</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
11	<i>Kilikhar Substation</i>	<i>132kV KHP</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P44291AB6M07 20M</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 4A</i>	
		<i>132kV Corlung</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442916A6M05 50K</i>	

			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
12	<i>Corlung Substation</i>	<i>132kV Kilikhar</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442816B6M07 10M</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 70A</i>	
		<i>132kV Kanglung</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P442816B6M07 10M</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 70A</i>	
13	<i>Kanglung Substation</i>	<i>132kV Corlung</i>	<i>Main Relay</i>	<i>Alstom</i>	<i>P44291AB6M07 20M</i>	
			<i>Backup Relay</i>	<i>Alstom</i>	<i>P14DB16A6C05 40A</i>	
		<i>132kV Phuntshot hang</i>	<i>Main Relay</i>	<i>ABB</i>	<i>REL650</i>	
			<i>Backup Relay</i>	<i>ABB</i>	<i>REF615</i>	
14	<i>Phuntshot hang Substation</i>	<i>132kV Kanglung</i>	<i>Main Relay</i>	<i>ABB</i>	<i>REL650</i>	
			<i>Backup Relay</i>	<i>ABB</i>	<i>REF615</i>	
		<i>132kV Motanga</i>	<i>Main Relay</i>	<i>ABB</i>	<i>REL650</i>	
			<i>Backup Relay</i>	<i>ABB</i>	<i>REF615</i>	
15	<i>Motanga Substation</i>	<i>132kV Deothang</i>	<i>Main Relay</i>	<i>ABB</i>	<i>REL650</i>	
			<i>Backup Relay</i>	<i>ABB</i>	<i>REF615</i>	

		132kV Phuntshot hang	Main Relay	ABB	REL650	
			Backup Relay	ABB	REF615	
		132kV Nganglam	Main Relay	ABB	REL650	
			Backup Relay	ABB	REF615	
		132kV Rangia	Main Relay	ABB	REL650	
			Backup Relay	ABB	REF615	
16	Deothang Substation	132kV Nangkor	Main Relay	Alstom	P44291AB6M07 10M	
			Backup Relay	Alstom	P14DB16A6C05 40A	
		132kV Motanga	Main Relay	ABB	REL670	
			Backup Relay	Alstom	P14DB16A6C05 40A	
17	Yurmoo Substation	132kV Tintibi	Main Relay	Alstom	P442916A6M05 50K	
			Back Up Relay	Alstom	P14DB16A6C05 40A	
		132kV MHP	Main Relay	GE	P44291AB6M07 20M	
			Back Up Relay	Schneider Electric	P141316N6M04 60J	

B: For Generating Stations

Sl. No.	Locations (Substation)	Location Towards	Relay Type	Make	Model No.	Remarks
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1	Chhukha Hydropower Plant	220kV Birpara-I	Main I&II	ABB	REL670	Software Version: 2.1.2.2
		220kV Birpara-II	Main I&II	ABB	REL670	Software Version: 2.1.2.2
2	Tala Hydropower Plant	400kV Siliguri-I	Main I&II	Siemens	SIPROTEC 7SA612	
		400kV Siliguri-II	Main I&II	Siemens	SIPROTEC 7SA612	
		400kV Malbase	Main I&II	Siemens	SIPROTEC 7SA612	
		400kV Siliguri-IV	Main I&II	Siemens	SIPROTEC 7SA612	
3	Kurichhu Hydropower Plant	132kV Kilikhar	Main & Backup	Schneider Electric	MiCOM P441	
		132kV Nangkor	Main & Backup	Schneider Electric	MiCOM P441	
4	Basochhu Hydropower Plant	220kV Semtokha	Main I&II	Schneider Electric	Micom P443	
		220kV Dharjey	Main I&II	Schneider Electric	Micom P443	
		66kV Lobeyasa	Main & Backup	Schneider Electric	Micom P442	
5	Mangdichhu Hydropower Plant	400kV Jigmeling-I	Main I&II	SEL (Schweitzer Engineering Laboratories)	331C & 311L	
		400kV Jigmeling-II	Main I&II	SEL (Schweitzer Engineering Laboratories)	331C & 311L	
		400kV Jigmeling-III	Main I&II	SEL (Schweitzer Engineering Laboratories)	331C & 311L	
		400kV Jigmeling-IV	Main I&II	SEL (Schweitzer Engineering Laboratories)	331C & 311L	

		132kV Yurmoo	Main & Backup	SEL (Schweitzer Engineering Laboratories)	331C & 311L	
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37. Appendix J

Below Appendix –J Relay details, add Appendix K

APPENDIX K
48VDC Power Supply System

K-1.1 DC Power Supply System Overview

The DC Power Supply system shall be capable of meeting the load requirements for various Telecom equipment, RTUs and other associated equipment located at indoor, i.e., at the various substations.

The DC power supply system supplied will be as per configuration diagram given in Fig. 1-1.

Surge protection devices shall be installed in the DCPS panel to provide adequate protection against current and voltage transients introduced on input AC due to load switching and low energy lightning surges. These protection devices shall be in compliance with IEC- 61312, IEC- 61024 and VDE 0100-534 for following surges:

Lightning Electromagnetic impulse and other High Surges (Class B):

Between	Requirements
Ph & N	$I_{imp} \geq 50 \text{ kA}, 10/350 \mu\text{S}$ for each phase
N & PE	$I_{imp} \geq 100 \text{ kA}, 10/350 \mu\text{S}$
I_{imp} = Value of Lightning Impulse Current	

b) Low Voltage Surges (Class C)

Between	Requirements
Ph & N	$I_n \geq 10 \text{ kA}, 8/20 \mu\text{S}$ for each phase
N & PE	$I_n \geq 20 \text{ kA}, 8/20 \mu\text{S}$
I_n = Value of Nominal Discharge Current.	

The blind spots shall be avoided as per IEC 61312-3

K-1.2 General Technical Requirements for SMPS based DC power supply units

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. The System shall consist of the following:

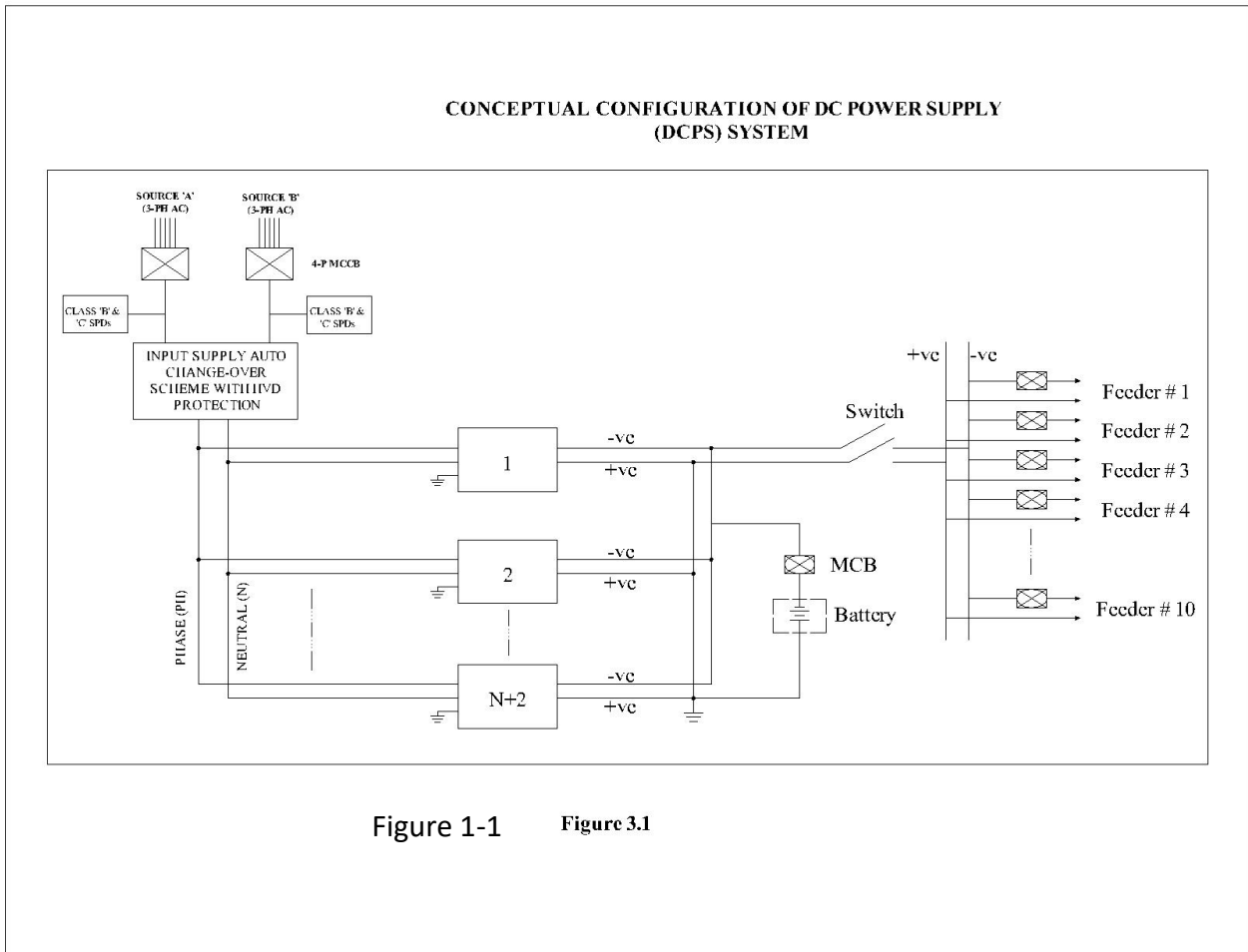
(a) SMPS modules

(b) Controller module to control and monitor all DCPS modules.

The Panel, Distribution/Switching arrangement shall be provided for the ultimate system capacity. Ultimate System capacity is defined as 150% of the present capacity specified in Section 4, Table 4.1. The ultimate capacity is over and above the requirement of redundancy wherever specified. All factory wiring for the panel shall be for the ultimate capacity so that only plugging-in of SMPS module shall enhance the DC power output. The size of fuses, MCBs, switch, bus etc shall be suitable for the ultimate capacity. The system shall be sufficiently flexible to serve any load depending on manufacturer's design, rating and number of SMPS modules used in panel and system configuration. To cater for higher load requirements, same type of SMPS modules mounted in the same rack or different racks shall be capable of working in parallel load sharing arrangement. The DCPS system shall also be suitable for operation from single phase A.C. mains/DG set.

K-1.3 Operational/Component Requirements

The basic modules shall operate at specified ratings and conform to requirements stipulated in this specification. The DCPS system shall meet requirement of the latest TEC specification / IEC/BS for other parameters as applicable. The component parts of the equipment shall be of professional grade of reputed manufacturer to ensure prompt and continuous service and delivery of spare parts. The component shall conform to relevant IEC/IS standards. The contractor shall obtain Employers approval of major component before procurement of the same. Conceptual diagram for DCPS is shown in figure 1-1.



K-1.4 Wiring

All insulated conductors except those within the confines of a printed circuit board assembly shall be of the rating enough to withstand the maximum current and voltage during fault and overload. All insulated conductors/cables used shall conform to IS 1554 or equivalent international standard. All wiring shall be neatly secured in position and adequately supported. Where wires pass through any part of metal panel or cover, the hole through which they pass shall be suitably secured.

K-1.5 Bus Bars

High conductivity Cu bus bar shall be provided and shall be sized to take care of the current of ultimate DCPS system capacity for which it is designed. However, it shall not be less than 25mm X 5mm.

K-1.6 Earthing

Two earth terminals shall be provided in the frame of the system. The Contractor shall connect these earth terminals to the earth bus. All modules and devices shall be connected

to these earth terminals. The hinged door shall be connected to the panel with braided Cu at two points at least.

K-1.7 Finish and Painting

The finish of Steel/Aluminum alloy structure and panels shall conform to relevant IS specification (or equivalent international specifications). The colour scheme for panel, Door and Modules shall be decided during detailed engineering.

K-1.8 Marking and Labeling of Cables

The Contractor shall propose a scheme for marking and labeling the inter panel cables and get it approved from the Employer. A cabling diagram, screen printed or any other better arrangement ensuring better life expectancy shall be placed in the inside of the front door or any other convenient place for ready reference of the maintenance staff.

K-1.9 Name Plate

A name plate etched, engraved, anodized or any other better arrangement ensuring better life expectancy shall be suitably fixed on each panel /module and contain at least the following information:

- (a) Specification Number*
- (b) Type of the Unit*
- (c) Manufacturer's Name and identification*
- (d) Model No*
- (e) Unit serial No*
- (f) Input voltage and phase*
- (g) Output Voltage and Current*
- (h) Year of manufacture*

K-1.10 System and Panel Configuration

The mechanical and electrical requirements of the Panel are described as below:

K-1.11 System Configuration

The SMPS modules shall be accommodated in panels. The system shall employ a modular configuration to provide flexibility, keeping in view the future load requirements of DC Power. The control, Monitoring, Alarm arrangement and DC & AC distribution shall be provided suitably in the panel.

*The SMPS modules shall be provided as per the load requirement stipulated in the **Appendix B**, Bill of Quantities. The DCPS system shall comprise of N+2 Modules. In case of DCPS system having N=1, the SMPS shall comprise of N+1 modules. Here N refers to number of SMPS modules to meet the load requirements specified in the Appendix-A,*

Table - 1 and battery charging current. The current rating of each module shall be considered as output current of the SMPS module at nominal voltage (48V).

Total current = load current + battery charging current

Where, battery charging current is equal to the 20 % AH of the battery supplied.

$$N = \frac{\text{Total Current}}{\text{Current rating of each SMPS module at 48 V}}$$

The Distribution/switching/Alarm unit shall be provided for the ultimate system capacity. All AC, DC or control/alarm cabling/wiring shall be pre-wired for the ultimate capacity so that mere plugging-in of SMPS module shall add to the DC power output.

It shall be possible to easily mount/remove the modules from the front side of the panel. The SMPS modules/SMPS module sub-racks shall be designed to slide into the panels and fixed securely by a suitable mechanical arrangement.

K-1.12 Constructional Features of Panel

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 shall have door as per standard design of the manufacturer and shall be hinged preferably with locking arrangement. Keyed locking is required with identical keys for all enclosures. The enclosures shall not exceed 220 cm in height. 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. The Contractor shall state the type, size, and weight of all enclosures and indicate the proposed manner of installation. The degree of protection of DCPS enclosures shall be IP21.

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 color coded and numbered at both ends within enclosures.

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 Employer. Further, finish colour of external surfaces shall be preferably of same colour for all enclosures/panels.

Maintenance access to the hardware and wiring shall be through lockable, full height, from doors. Each panel shall be supplied with 240 VAC, 50Hz single-phase sockets with switch and lighting lamp for panel illumination.

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. The Bidders shall submit detail design of proposed Panel/enclosure and heat dissipation calculations during detailed engineering. Forced cooling is permitted (DC Fans are permitted in the Panel or SMPS module) for equipment mounted indoors (buildings/rooms/shelters). If cooling is provided at Panel level it shall be provided with additional fan with facility for manual switch over. Proper filtering shall be provided to control dust ingress. There shall be an arrangement for automatic Switching-OFF of fans during AC input failure. The required individual modules may be separated by air baffle to provide effective convection. The manufacturer shall also ensure that the failure of fan does not cause any fire hazards. The failure of any of the fans shall draw immediate attention of the maintenance staff.

K-1.13 Electrical Requirements:

AC input supply: *The nominal input frequency is 50 Hz, which may vary from 47.5-52.5Hz. The input voltage shall be as mentioned below:*

Field Site Application – *Three phase/4Wire (Nominal 415 V): 415 + 10 % - 15% and Single phase (nominal 240 V): 160V to 265V. An Auto-Mains Changeover unit shall be provided for each field site DC power supply system. The Auto-Mains Changeover unit shall accept input from two AC sources and extend any one of the available sources to the DC Power supply system.*

Control Centre Application – *Three phase/4Wire (Nominal 415 V): 415 + 10 % - 15% and Single phase (nominal 240 V): 160V to 265V.*

The suitable HVD (High Voltage Disconnect) Protection shall be provided at input of DCPS. This HVD protection shall protect the SMPS modules of DC PS system against the sustained over voltage at the input.

There shall be an automatic arrangement for shutting off the SMPS module whenever the input voltage is beyond the specified operating limits with suitable alarm indication. The SMPS module shall resume normal working automatically when the input is restored within the working limits. Hysteresis within specified working limits shall not cause shutting down of the SMPS. A tolerance of $\pm 5V$ may be acceptable for protection & alarm operation.

K-1.14 DC output Characteristics of Modules

The module shall be capable of operating in "Auto Float-cum-Boost Charge" mode depending on the condition of the battery sets being sensed by the Control unit.

- (a) The float voltage shall be continuously adjustable & pre-settable at any value in the range of -48 to $-56V$ or as per battery manufacturer recommendations 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 battery supplier.*
- (b) In Boost charge mode, DCPS shall supply battery & equipment current till terminal voltage reaches set value, as recommended by the battery supplier & shall change over to constant voltage mode*
- (c) The DC output voltage variation shall not be more than 2% for load variation from 25% load to full load.*

K-1.15 Current Limiting (Voltage Droop)

The current limiting (Voltage Droop) shall be provided in DCPS SMPS modules in float and boost charge modes of operation. 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 or as per manufacturer's specified catalog.

The float and boost charge current limit adjustment shall be provided in the DCPS system. The SMPS modules shall be fully protected against short circuit. It shall be ensured that short circuit does not lead to any fire hazard.

K-1.16 Soft/Slow Start Feature

Soft/Slow start circuitry shall be employed such that SMPS module input current and output voltage shall reach their nominal value within 10 seconds. The maximum instantaneous current during start up shall not exceed the peak value of the rectifier input current at full load at the lowest input voltage specified.

K-1.17 Voltage overshoot/Undershoot

The requirements of (a) to (c) given below shall be achieved without a battery connected to the output of SMPS modules.

- (a) The SMPS modules shall be designed to minimize DC output voltage Overshoot/Undershoot such that when they are switched on the DC output voltage shall be limited to $\pm 5\%$ of the set voltage & return to their steady state within 20 ms for load variation of 25% to 100%.*
- (b) The DC output voltage overshoot for a step change in AC mains as specified in clause 4.3.12 Electrical Requirements shall not cause shut down of SMPS module and the voltage overshoot shall be limited to $\pm 5\%$ of its set voltage and return to steady state within 20ms.*
- (c) The modules shall be designed such that a step load change of 25 to 100% and vice versa shall not result in DC output voltage Overshoot/Undershoot of not more than 5% and return to steady state value within 10 ms without resulting the unit to trip.*

K-1.18 Electrical Noise

The Rectifier (SMPS) Modules shall be provided with suitable filter at output with discharge arrangements on shut down of the modules. The Psophometric Noise and ripple shall be as per relevant standards.

K-1.19 Parallel Operation

SMPS modules shall be suitable for operating in parallel with one or more modules of similar type, make and rating, other output conditions remaining within specified limits.

The current sharing shall be within $\pm 10\%$ of the average current per rectifier module individual capacity of each rectifier module in the system (mounted in the same or different Panels) when loaded between 50 to 100% of its rated capacity for all other working conditions.

K-1.20 Protection

The SMPS module, which has failed (for any reason) shall be automatically isolated from the rest of the modules and an alarm shall be initiated for the failure.

K-1.21 DC Over voltage protection

DCPS shall be fitted with an internal over voltage protection circuit. 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.

Shutting off faulty SMPS module shall not affect the operation of other SMPS modules operating in the Panel. Operation of over voltage shut down shall be suitably indicated and extended monitoring/control unit. The circuit design shall ensure protection against the discharge of the Battery through the SMPS module in any case. The over voltage protection circuit failure shall not cause any safety hazard.

K-1.22 Fuse/Circuit Breakers

Fuses or miniature circuit breakers (MCB) shall be provided for each SMPS module as follows:

- 1. Live AC input line*
- 2. Control Circuit*

All fuses/circuit breaker used shall be suitably fault rated.

K-1.23 AC Under/Over Voltage Protection

AC input Under/Over voltage protection shall be provided as per clause 2.1.12 for Electrical Requirements.

K-1.24 Over Load/Short Circuit Protection

The SMPS shall be protected for Over load/Short circuit as per clause 2.1.14 Current Limiting (Voltage Droop).

K-1.25 Alarms and indicating lamps

Visual indications/display such as LEDs, LCDs or a combination of both shall be provided on each SMPS module for detection of SMPS module failure.

K-1.26 Termination

Suitable termination arrangements shall be provided in the panel for termination of inter cubicle cables from other equipment such as Employers ACDB, Telecom and other associated equipment and alarm cables. All the termination points shall be easily accessible from front and top. AC and DC terminals shall be separated by physical barriers to ensure safety. All the terminals except AC earth shall be electrically isolated.

K-1.27 DC Terminations

All terminations including through MCBs shall be through lock and screw type terminations. Load and batteries shall be connected to DCPS through appropriate MCBs. The isolation of any of the battery from the load shall create an alarm. DC distribution shall be provided with adequate no of feeders (with three no. of spare) with appropriate MCBs (6 Amp thru 32 Amp) for termination of the loads. Actual rating of the MCBs shall be finalized during the detail engineering. The no. of feeders shall be minimum 10 (ten) nos.

DC distribution may be done either on wall mounted panel or on the DCPS panel. The proper rated MCB shall be provided at the combined output of the SMPS modules (if not provided at each SMPS module). All the AC, DC and Control/alarm cabling shall be supplied with the Panel. All DC +ve and –ve leads shall be clearly marked. All conductors shall be properly rated to prevent excessive heating.

K-1.28 Power Cables

All power cables shall be stranded copper conductor XLPE/PVC insulated and PVC sheathed, single core/two core/three core/four core, 1100V grade as per IS 1554 Part-I.

K-1.29 Earthing Cables

Earthing cables between equipment and grounding bus bars shall be minimum size 70 mm² stranded conductors copper/copper strip, rated at 300 volts. All hinged doors shall be earthed through flexible earthing braid. Signal and Safety earthing shall be provided separately.

K-1.30 Alarms

Following Visual indications/display such as LEDs, LCDs or a combination of both shall be provided to indicate:

Functional Indications for local monitoring:

- a) Mains available (not mandatory if provided at module level)*
- b) DCPS/SMPSs in Float charge Mode*
- c) DCPS/SMPSs in Boost Charge Mode*

Alarm Indication for local monitoring:

- a) Load Voltage High /Low*
- b) DCPS module/SMPS fail*
- c) Mains out of range*
- d) System Over Load*
- e) Mains "ON"/Battery Discharge*
- f) Battery fail/isolated*

All the protections/alarms shall be within tolerance of 0.25V in case of DC voltage, 1% in case of DC current and $\pm 5V$ for AC voltage

Alarm Indication for remote monitoring:

- a) Input AC mains supply fail alarm*

- b) *Battery low voltage (Pre cut off) alarm*
- c) *DCPS module fail*

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.

K-1.31 Digital Meters/Display Unit

There shall be provision to monitor the following parameters through digital meters or digital display units:

- (a) Input AC voltage.*
- (b) Output DC voltage*
- (c) Output DC current of charger*
- (d) Battery current*
- (e) Load current.*

The Digital display of meters or LCD based display unit shall be with minimum 3¹/₂ digital display of height 12mm and shall have accuracy 1.5% or better.

K-1.32 Type Testing of DCPS

The contractor shall supply DCPS System, which is already type tested. The test reports for Immunity, Emission and safety must be in accordance with relevant IEC/CISPR standards shall be submitted. The Contractor shall submit the DCPS type test reports of earlier conducted tests on the same make, model, type & rating which shall include the following tests. For type testing requirements in addition to provisions of this section 7 is also to be complied.

K-1.33 Type Tests on DCPS

- 1 Surge immunity (Level 4- as per IEC 61000-4-5)*
- 2 Electrical Fast Transients/Burst (Level 4 – as per IEC 61000-4-4)*
- 3 Electrostatic Discharge (Level 4 – as per IEC 61000-4-2)*
- 4 Radiated Electromagnetic Field (Level 3 – as per IEC 61000-4-3)*
- 5 Conducted disturbances induced by radio-frequency field
(Level 3 – as per IEC 61000-4-6)*
- 6 Damped oscillatory magnetic field (Level 3 – as per IEC 61000-4-10)*
- 7 Voltage dips, short interruptions and voltage variations
(Level 2 – as per IEC 61000-4-11)*

- 8 Conducted Emission (Level - Class A, Group 1 as per IEC CISPR 11)
- 9 Radiated Emission (Level - Class A, Group 1 as per IEC CISPR 11)
- 10 Verification of Protection class (IP 21) for enclosure
- 11 Safety Tests (as per IEC 60950)

K-1.34 Factory/Site Testing of DCPS

The factory/site tests to be carried out on each DCPS system/module in the factory and site are listed respectively in Table below.

Sl. No.	Test	FAT	SAT
Tests on DCPS System			
1.	Mechanical & Visual Check Tests	✓	✓
2.	Insulation Test.	✓	
3.	High Voltage Withstand Test	✓	
4.	Switch On Test	✓	✓
5.	DCPS Low voltage & High voltage limits check Test	✓	✓
6.	Pre-alarm test for Battery Voltage Low	✓	✓
7.	Battery Low Voltage Disconnect Level Test	✓	✓
8.	AC Input Low and High voltage limits check Test	✓	
9.	Rectifier Fail Alarm Test	✓	✓
10.	Voltage Regulation Test	✓	
11.	Current Sharing Test	✓	
12.	Total Output Power Test	✓	✓
13.	Hot Plug In Test (if applicable)	✓	✓
14.	Calibration & Parameter settings	✓	✓
15.	Automatic Float cum Boost Charge Mode Change	✓	✓
	Over Test		
16.	Battery Path Current Limiting Test	✓	✓
17.	Battery Charging and full load Current Test	✓	✓
18.	Total Harmonic distortion Test	✓	
19.	Burn in Test at 50 ° C (for 8 hrs duration)	✓	
Tests on SMPS module			
20	Mechanical & Visual Check Test	✓	
21	Module-On Test	✓	
22	Input low/high voltage cut-off test	✓	
23	Voltage Droop Test	✓	
24	Voltage Regulation Test	✓	
25	Power Output & Current Limit Test	✓	

26	<i>DC High Voltage Test</i>	✓	
27	<i>O/P Voltage Ripple Test</i>	✓	
28	<i>Psophometric Noise Test</i>	✓	
29	<i>Efficiency Test</i>	✓	
30	<i>Power Factor</i>	✓	
31.	<i>Input Current Limit</i>	✓	
32.	<i>Rectifier Dynamic Response</i>	✓	
33.	<i>Output Short Circuit Test</i>	✓	
34.	<i>Hold up Time Test</i>	✓	

BATTERY REQUIREMENTS

Valve Regulated Lead Acid (VRLA) maintenance free Battery

The contractor shall supply Valve Regulated Lead Acid (VRLA) maintenance free Battery. The battery shall be capable of being recharged to 90% State of Charge (SOC) from the fully discharged condition (1.75V/cell) within 8 hrs. In all cases, the battery is normally not allowed to discharge beyond 80% of rated capacity (80% DOD) at 10 hours rate of discharge.

The supplier, 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

K-2.1 Constructional Requirements

The design of battery shall be as per field 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.

K-2.2 Containers

The container material shall have chemical and electro-chemical compatibility and shall be acid resistant. The material shall meet all the requirements of VRLA batteries and be consistent with the life of battery. The container shall be fire retardant and shall have Oxygen Index of at least 20%. The porosity of the container shall be such as not to allow any gases to escape except from the regulation valve. The tensile strength of the material of the container shall be such as to handle the internal cell pressure of the cells in the worst working condition. Cell shall not show any deformity or bulge on the sides under all working conditions. The container shall be capable of withstanding the rigors of transport, storage and handling. The containers shall be enclosed in a steel tray.

K-2.3 Cell Covers

The cell covers shall be made of suitable material compatible with the container material and permanently fixed with the container. It shall be capable to withstand internal pressure without bulging or cracking. It shall also be fire retardant. Fixing of Pressure Regulation Valve & terminal posts in the cover shall be such that the seepage of electrolyte, gas escapes and entry of electro-static spark are prevented.

K-2.4 Separators

The separators used in manufacturing of battery cells, shall be of glass mat or synthetic material having high acid absorption capability, resistant to sulphuric acid and good insulating properties. The design of separators shall ensure that there is no misalignment during normal operation and handling.

K-2.5 Pressure Regulation Valve

Each cell shall be provided with a pressure regulation valve. The valve shall be self re-sealable 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.

K-2.6 Terminal Posts

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. The surface of the terminal post extending above the cell cover including bolt hole shall be coated with an acid resistant and corrosion retarding material. Terminal posts or any other metal part which is in contact with the electrolyte shall be made of the same alloy as that of the plates or of a proven material that does not have any harmful effect on cell performance. Both +ve and –ve posts shall be clearly and unambiguously identifiable.

K-2.7 Connectors, Nuts & Bolts, Heat Shrinkable Sleeves

Where it is not possible to bolt the cell terminals directly to assemble a battery, separate non-corroding lead or copper 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.

Nuts and bolts for connecting the cells shall be made of copper, brass or stainless steel. Copper or brass nuts and bolts shall be effectively lead coated to prevent corrosion. Stainless steel bolts and nuts can be used without lead coating.

All inter cell connectors shall be protected with heat shrinkable silicon sleeves for reducing the environmental impact including a corrosive environment.

K-2.8 Flame Arrestors

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.

K-2.9 Battery Bank Stand

All batteries shall be mounted in a suitable metallic stand/frame. The frame shall be properly painted with the acid resistant paint. The suitable insulation shall be provided between stand/frame and floor to avoid the grounding of the frame/stand.

K-2.10 Capacity Requirements

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. The battery shall be capable of being recharged from the fully exhausted condition (1.75V/cell) within 8 hrs. 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 average float voltage/cell +0.05V band.

The capacity (corrected at 27°Celsius) 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:

- (a) After Six minutes of discharge: 1.98V/cell*
- (b) After Six hours of discharge: 1.92V/cell*
- (c) After 8 hours of discharge: 1.85V/cell*
- (d) After 10 hours of discharge: 1.75V/cell*

Loss in capacity during storage at an average ambient temperature of 35° Celsius 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 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%.

K-2.11 Expected Battery Life

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).

K-2.12 Routine Maintenance of Battery system

For routine maintenance of battery system, the contractor shall supply one set of following tools:

- a. Torque wrench.*

- b. Tool for opening /closing of pressure regulation valve of battery.
- c. Hand held digital multi-meter for measurement of resistance, AC/DC voltages.

K-2.13 Testing requirements

The contractor shall submit type test reports for the battery for the same make, model & rating as offered as per the IEC 60896 or equivalent IS/EN/BS/TEC standards. In the event, the type test reports for exact rating is not available, the bidder shall submit type test reports for higher rating Battery. The testing requirements are defined as per Table below:

LIST OF TESTS FOR VRLA BATTERY

Sl. No.	Test	Type Test*	FAT	SAT
1	Verification of marking - Visual observation - Dimensional inspection - Polarity checking	X	X	X
2	Capacity test	X	X	X
3	Suitability for floating battery operation (to be conducted for 3 months instead of six months)	X		
4	Endurance in discharge/charge cycles (instead of 50, 25 discharge / charge cycles shall be followed)	X		
5	Charge Retention			
6	Short-circuit current and internal resistance	X		
7	Mechanical Tests -Vibration Test (procedure as per IEC 60068-2-6) - Free fall Test (procedure as per IEC 60068-2-32)	X X		
<p>NOTE: 1 The batteries shall meet the general requirements as per IEC 60896/EN 60896. 2 *Only the type test reports to be submitted.</p>				

Volume – III: Price Schedules

LOT 1: Revamp of SCADA/EMS Systems is replaced with the following:

Sl. No.	Item Description	Unit	Quantity		Total Qty.	Ex-works (Nu)	Unit Price (Nu)	Total Price (Nu)	Remarks
			Main NLDC	B/up NLDC					
					1	2	3	4 = 1 x 3	
A	MAIN EQUIPMENT								
1	Application Software								
1.1	SCADA applications	Lot	1	1	2				
1.2	ICCP Communication	Lot	1	1	2				
1.3	Network Management System	Lot	1	1	2				
1.4	Historian System (ISR)	Lot	1	1	2				
1.5	EMS applications								
a)	- Network Topology	Lot	1	1	2				
b)	- State Estimation	Lot	1	1	2				
c)	- Optimal Power flow Analysis	Lot	1	1	2				
d)	- Bus Load Forecast (BLF)	Lot	1	1	2				
e)	- Contingency analysis	Lot	1	1	2				
f)	- Interchange Scheduling	Lot	1	1	2				
g)	- Hydro Scheduling	Lot	1	1	2				
h)	- Load Forecasting	Lot	1	1	2				
1.6	Web Server Application	Lot	1	1	2				
1.7	Dispatcher Training Simulator (DTS)	Lot	1	-	1				
1.8	Centralized Management Console applications	Lot	1	1	2				
1.9	Patch Management software	Lot	1	1	2				
1.10	Image Backup software	Lot	1	1	2				
1.11	Antivirus server software	Lot	1	1	2				
2	Computer System Hardware								
2.1	Servers								
a)	SCADA/EMS Server	Nos.	2	2	4				
b)	Historian System (ISR) Server	Nos.	2	2	4				
c)	ICCP Server	Nos.	2	2	4				
d)	Communication Front End (CFE) Server	Nos.	2	2	4				
e)	NMS Server	Nos.	2	2	4				
f)	Web/Replica Data/ Antivirus/ Patch Management Server	Nos.	1	1	2				
g)	Centralized Management Console / Image Backup	Nos.	1	1	2				
h)	Dispatcher Training Simulator Server	Lot	1	-	1				
2.2	Dual TFT Monitor								
a)	Operator Workstation console	Lot	4	2	6				
b)	Workstation for DTS	Lot	2	-	2				
c)	Workstation for DDS	Lot	1	-	1				
2.3	Engineering Laptop	Nos.	3	1	4				

2.4	Next Generation Firewall (NGFW)								
a)	External NGFW	Nos.	1	1	2				
b)	Internal NGFW	Nos.	2	2	4				
2.5	LAN switches								
a)	SCADA/EMS LAN	Nos.	1	1	2				
b)	Dual CFE LAN	Lot	1	1	2				
c)	Dual DMZ LAN	Lot	1	1	2				
d)	DTS LAN	Nos.	1	-	1				
2.6	Auxiliary Storage for Historian	Nos.	1	1	2				
2.7	NAS Box	Nos.	1	1	2				
2.8	Server Rack With IP based KVM Switch	Nos.	3	3	6				
2.9	Multifunction Laser Printer	Nos.	1	-	1				
3	Time and Frequency System displays								
3.1	Time & Frequency System (GPS based)	Lot	1	1	2				
3.2	Digital display for Day	Nos.	1	1	2				
3.3	Digital display for Time	Nos.	1	1	2				
3.4	Digital display for Frequency	Nos.	2	2	4				
4	ICCP Integration								
4.1	Integration with Indian NLDC	Lot	1	1	2				
4.2	Integration with DMS	Lot	1	1	2				
5	Furniture	Lot	1	1	2				
B	MISCELLANEOUS								
1	Heavy duty Air Conditioner	Lot	-	1	1				
2	Uninterruptible Power Supply (UPS)	Lot	1	1	2				
3	VRLA maintenance-free Battery	Lot	-	1	1				
4	Input ACDB	Lot	1	1	2				
5	Output ACDB	Lot	1	1	2				
6	Civil works	Lot		1	1				
C	TRAINING FOR SCADA/EMS								
1	Overview of SCADA/EMS systems, design process, and implementation	Lot		1	1				
2	Computer System Software and Hardware	Lot		1	1				
3	Database & Display, Applications Software, and Historian	Lot		1	1				
4	NMS and Cyber Security	Lot		1	1				
5	Operator Applications Trainings	Lot		1	1				
6	Auxiliary Power Supply systems	Lot		1	1				
D	MANDATORY SPARES								

1	Servers including all main memory, auxiliary memory, interface cards complete one of each type	Lot	2	2				
2	LAN switch one of each type	Lot	2	2				
3	Router	Nos.	1	1				
E	MAINTENANCE SUPPORT							
1	Annual Maintenance Contract							
1.1	Year 1	Year 1	1	1				
1.2	Year 2	Year 2	1	1				
1.3	Year 3	Year 3	1	1				
1.4	Year 4	Year 4	1	1				
1.5	Year 5	Year 5	1	1				
2	Annual Cyber Security Auditing							
2.1	1 st Year	Year 1	1	1				
2.2	2 nd Year	Year 2	1	1				
2.3	3 rd Year	Year 3	1	1				
2.4	4 th Year	Year 4	1	1				
2.5	5 th Year	Year 5	1	1				
3	Annual Refresher Course							
3.1	1 st Year	Year 1	1	1				
3.2	2 nd Year	Year 2	1	1				
3.3	3 rd Year	Year 3	1	1				
F	INSTALLATION, TESTING, AND COMMISSIONING							
1	Installation, Testing, and Commissioning of all the SCADA/EMS systems as required for operation of all the systems as per the technical specifications.	Lot	1	1	2			
2	Installation, Testing, and commissioning of Miscellaneous equipment including AC, ACDB, UPS, Civil Works, etc.	Lot	1	1				
Total Amount in Figure (Nu)								

Total Amount quoted in Ngultrum (Nu) in Figure _____ only.

Company Seal

Signature of the Bidder

Volume – III: Price Schedules

LOT 2: Price Schedule for Revamp of Telecommunication System is replaced with the following:

Sl. No.	Item Description	MPLS-TP					Teleprotection Interface					
		Unit	Quantity	Ex-Works (Nu)	Unit Price (Nu)	Sub-Total (Nu)	Unit	Quantity	Ex-Works(Nu)	Unit Price(Nu)	Sub-Total(Nu)	Total Price(Nu)
			1	2	3	4=1x3		5	6	7	8=5x7	9=4+8
A	Supply of Main Equipment											
1	National Load Dispatch Centre (NLDC)	Set	1				Set	0				
2	Chubachhu Substation	Set	1				Set	0				
3	Olakha Substation	Set	1				Set	0				
4	Gidagom Mini-hydel	Set	1				Set	0				
5	Jamji Station	Set	1				Set	2				
6	Chhukha Hydropower Plant	Set	1				Set	5				
7	Gedu 66 kV Substation	Set	1				Set	0				

8	<i>Gedu 220 kV Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				
9	<i>Phuentsholin g Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>0</i>				
10	<i>Singhigaon Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				
11	<i>Malbase Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>6</i>				
12	<i>Dhamdum</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				
13	<i>Gomtu</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>0</i>				
14	<i>Tala Hydropower Plant</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>4</i>				
15	<i>Semtokha Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				
16	<i>Lobeysa Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>0</i>				
17	<i>Basochhu Hydropower Plant</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				
18	<i>Dharjey</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				
19	<i>Dagapela</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>1</i>				
20	<i>Jigmeling Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>10</i>				
21	<i>Backup NLDC, Jigmeling</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>0</i>				
22	<i>Mangdechhu (MHP)</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>5</i>				
23	<i>Gelephu Substation</i>	<i>Set</i>	<i>1</i>				<i>Set</i>	<i>2</i>				

24	Yurmoo Substation	Set	1				Set	2				
25	Tintibi Substation	Set	1				Set	3				
26	Nganglam Substation	Set	1				Set	3				
27	Nangkhor Substation	Set	1				Set	3				
28	Kurichhu Hydropower Plant	Set	1				Set	2				
29	Kilikhar Substation	Set	1				Set	2				
30	Corlung Substation	Set	1				Set	2				
31	Kanglung Substation	Set	1				Set	2				
32	Phuntshothang Substation	Set	1				Set	2				
33	Motanga Substation	Set	1				Set	3				
34	Deothang Substation	Set	1				Set	2				
	Total Amount quoted in Ngultrum for the Supply of Main Equipment (A)=											

<i>Sl.No</i>	<i>Item Description</i>	<i>Unit</i>	<i>Quantity</i>	<i>Ex-works(Nu)</i>	<i>Unit Price(Nu)</i>	<i>Total Price (Nu)</i>	<i>Remarks</i>
			1	2	3	4=1x3	
B	Supply of other equipment						
I	NMS at NLDC						
1	Software	LOT	1				
2	Work Station / Server	LOT	2				
3	Craft Terminal	Nos.	2				
II	Supplementary Modules of Main Equipment						
1	E1 Interface	Nos.	1				
II	Spares						
1	MPLS-TP	Set	5				
2	Teleprotection Interface	Set	5				
3	Ethernet Cards	Nos.	5				
III	Miscellaneous						
1	48VDC Power Supply System	Set	3				
2	GPS	Set	1				
IV	Annual Maintenance Contract						
1	Year 1	LOT	1				
2	Year 2	LOT	1				
3	Year 3	LOT	1				
V	Training For Communication System						

NIT No.: 3/BPSO/Tender/Vol-I/2022/03 dated December 19, 2022

Project: Revamp of SCADA and Telecommunication Systems

1	<i>Design, installation, and maintenance of Communication equipment</i>	<i>LOT</i>	<i>1</i>				
2	<i>Communication NMS</i>	<i>LOT</i>	<i>1</i>				
3	<i>Teleprotection</i>	<i>LOT</i>	<i>1</i>				
VI	<i>Installation, Testing and Commissioning</i>						
1	<i>Installation, Testing, and Commissioning of the Communication System</i>	<i>LOT</i>	<i>1</i>				
	<i>Total Amount quoted in Ngultrum (Nu) for other equipment(B)=</i>						
	<i>Total Amount quoted in Ngultrum (Nu) for the Communication System(C)=A+B</i>						

C. General

1. The detailed replies to the queries received from the Bidders are enclosed as **Appendix – I** to this Main Text.
2. This Addendum consists of the following:
 - (a) This Main Text of the Addendum, along with
 - (b) Replies to Bidders' Queries
3. All the above form Part of the Tender Documents.