सेंट्रल ट्रांसमिशन यूटिलिटी ऑफ इंडिया लिमिटेड
(पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड के स्वामित्व में)
(भारत सरकार का उद्यम)
CENTRAL TRANSMISSION UTILITY OF INDIA LTD.
(A wholly owned subsidiary of Power Grid Corporation of India Limited)
(A Government of India Enterprise)

**Ref. No.:** CTUIL/OM/35/40th NCT

18th May 2026

**To**
**The Chairman & Managing Director**
Power Grid Corporation of India Ltd.,
Saudamini, Plot No. 2, Sector-29,
Gurgaon- 122 001
cmd@powergrid.in

**Sub: Implementation of Grid Automation Scheme under Regulated Tariff Mechanism (RTM) as approved by MoP based on the recommendation of 40th meeting held on 15th April 2026.**

MoP vide OM dated 18th May 2026 approved the following Grid Automation Scheme for its implementation under RTM mode by the respective implementing agency as indicated in the table below:

| Sl. No. | Transmission Scheme | Implementing Agency |
|---|---|---|
| 1. | Unified Real time Dynamic State Measurement System (URTDSM) Phase-II ISTS Project | POWERGRID |

Copy of MoP OM dated 18th May 2026 is enclosed at **Annexure-A**. The detailed scope of work along with implementation time frame for the above Scheme shall be as per enclosed MoP OM.

The implementing agency shall enter into a concession agreement with CTUIL for implementation of the aforementioned Transmission Schemes. However, pending finalization of Concession Agreement, it is requested to initiate necessary actions for implementation of the aforementioned Transmission Schemes.

This is for your kind information and necessary action, please.

Thanking you.

Yours faithfully,

18/5/2026

**R V M M Rao**
**CGM (Transmission Planning)**

**Encl.: as stated.**

Annexure-A

No. 34-15/3/2026-Trans
Government of India
Ministry of Power
Shram Shakti Bhawan, Rafi Marg, New Delhi-110001
****

Date: 18th May, 2026

**OFFICE MEMORANDUM**

**Subject: New Grid Automation scheme to be taken up under Regulated Tariff Mechanism (RTM) based on the recommendation of 40th Meeting of National Committee on Transmission (NCT).**

The undersigned is directed to say that the following Grid Automation scheme, which was recommended by 40th meeting of the National Committee on Transmission (NCT) has been approved for implementation under the Regulated Tariff Mechanism (RTM) mode by agencies as indicated in the table below:

| Sl. No. | Element | Agency |
|---|---|---|
| 1. | Unified Real time Dynamic State Measurement System (URTDSM) Phase-II ISTS Project | POWERGRID |

3. Detailed scope of work for the above scheme as recommended by the 40th NCT is at **Annexure-I**. The DPR of the said scheme is enclosed at **Annexure-II**.

4. This scheme is awarded to CTUIL for its implementation under RTM mode. The CTUIL is requested to take necessary action for entering into a concession agreement with agencies as mentioned in table at Para 1 above, for implementation of this scheme.

4. This issues with the approval of Minister of Power.

18/5/26

(Abhishek Yadav)
Section Ofiicer (Trans-I)
Tele-Fax: 2332 5242
Email: transdesk-mop@nic.in

To,
COO, CTUIL,
Gurugram.

Copy to:
1. Member (PS), CEA, New Delhi
2. CMD, PGCIL, Gurugram.

**ANNEXURE-I**

1. **Unified Real time Dynamic State Measurement System (URTDSM) Phase-II ISTS Project.**

**Implementation timeframe:** 36 months from the date of allocation.

The detailed scope of work is as below:

| S. No. | Scope of the scheme |
|---|---|
| 1. | • Supply and Installation of 1087 (approx.) PMUs in Central Sector substations (ISTS, ISGS).<br>• Supply and Installation for Replacement/Establishment of WAMS URTDSM systems including PDCs, Analytical Applications, System planning application and associated control center equipment comprising of software and hardware at 7 Control centers of Grid-India. (Main & backup NLDC and 5 RLDCs) including (1+6) years AMC- by implementing agency.<br>• Remote Consoles at SLDCs for State PMUs reporting. Remote consoles at CEA, NPC, RPCs, CTU & POWERGRID.<br>• Integration of existing PMUs (under URTDSM-Ph-I) and migration of existing historian database in line with the applicable regulations.<br>• AI enabled systems for identified analytical applications. Migrating the URTDSM Ph-I database to URTDSM Ph-II system for necessary input for Artificial Intelligence and generating recommendation for operational and planning purposes- as finalised during engineering stage.<br>• Software Application for Planning- And for analysis of various Load Generation Balance patterns throughout the year (Operating Area Wise, State Wise, Region Wise and All India basis etc) such that the same profiling can be used by CTU for future planning purposes for different time horizons for short term, medium term and long term (2 years, 5 yrs and 10 Years and beyond) and for report generation. Provision for PMU data integration with CTUIL Planning system software for System studies, System planning of ISTS system, in consumable form, through standard protocols along with visualization.<br><br>** Quantity (PMU/ Remote Consoles/ etc.) is subjected to change during engineering based on Grid India inputs in line regulations/ guidelines/ committee reports.* |

पावरग्रिड
POWERGRID

Annexure-II

***Brief on***
***Unified Real Time Dynamic State Measurement (URTDSM)***
***Project Phase-II (for ISTS Portion)***

# Contents

# Brief on
# Unified Real Time Dynamic State Measurement
# URTDSM Phase-II ISTS Project
# for discussion in NCT

## 1.0 Background of URTDSM Phase-II Proposal:

As the URTDSM phase-I systems are to be replaced to meet the new requirements for Grid management, The URTDMS phase-II project was envisaged.

During the 13th NPC meeting held on 05.07.2023 at Kolkata, it was decided that the DPR of URTDSM project phase-II in accordance with the recommendation of the Sub-committee may be prepared by POWERGRID. As discussed in the meeting, PSDF funding for URTDSM project phase-II is to be sought subsequently.

DPR for URTDSM Phase-II Project, which included 4000 PMUs (new) and 34 control centres (NLDCs, RLDCs & SLDCs) was prepared with funding pattern of 70% PSDF grant and 30% POWERGRID equity in line with Phase-I. The DPR with an estimate of Rs.3922 Crores, was submitted to NPC/CEA on 11.03.2024. The scope included replacement of 32 control centres, addition of 2 control centres and supply of 4000 new PMUs including integration of 1400 existing PMUs.

In the 14th NPC meeting held in Bengaluru on 03.02.2024, DPR status was updated to members. It was suggested to optimize the cost. Various options for optimization were discussed with GRID-INDIA. These Options were presented to NPC on 30.05.2024 for further deliberation.

NPC vide email dated 18.04.2024 has informed that PSDF funding shall not be available for the project and alternate sources of funding shall be explored by POWERGRID. Hence, POWERGRID proposed implementing the URTDSM Phase-II Project on RTM basis (70% debt and 30% equity) and approached the Constituents in all the five RPCs for concurrence for of the same.

During the deliberations at all RPCs, SLDCs of all Regions have expressed in-principle technical acceptance for implementation of the URTDSM Phase-II Project, but the RTM proposal was not concurred by States due to funding constraints.

Subsequently, in the 15th NPC Meeting held on 14.11.2024, POWERGRID was entrusted to put up proposal for URTDSM phase II ISTS portion to NCT and revised proposal for STU portion separately for discussion. ISTS portion comprises of 7 no's Control Centers of Grid-India (NLDCs and RLDCs) and 1070 PMUs for Central Sector locations as per latest CEA Guidelines referred below.

During various NPC & RPC meetings for URTDSM phase-II project, it was discussed that the number of PMUs for URTDSM Phase-II needs to be optimized for reducing the overall project cost. The initial DPR prepared by POWERGRID was based on the Sub-committee recommended philosophy of PMU placement. However, CEA has published new guidelines for uniform philosophy of PMU placement in Indian Grid in March 2025, which will supersede all existing guidelines including the sub-committee report.

Accordingly, POWERGRID prepared tentative DPR and project cost estimate for URTDSM Phase-II ISTS portion (upgradation of control centers at NLDCs, RLDCs and installation of new PMUs at Central Sector stations as per latest CEA guidelines) based on budgetary quote given by M/s L&T. Tentative cost and BOQ for STUs portion (Control centers of SLDCs across India and new PMUs for State sector substations) is also put up for discussion in the 16th NPC held on 04.07.2025.

POWERGRID submitted the proposal for Unified Real time Dynamic State Measurement System (URTDSM) Phase-II ISTS Project with an estimated cost of **Rs. 1124 Crores**, comprising of control centers (7 nos.) of NLDC and RLDCs and PMUs at central sector stations (1070** PMUs as per latest CEA guidelines on Unified Philosophy for PMU Placement in Indian Grid published in March 2025) on cost sharing PoC mechanism pan India (100% RTM route with 70:30 Debt equity ratio) in the 16th NPC, in consultation with Grid-India.

The 16th NPC directed that URTDSM project Phase-II proposal may be put up in RPC forum for further discussion & the mode of implementation of the URTDSM project phase-II may be put up in upcoming NCT meeting for deliberation and approval.

## 2.0 Brief Details of URTDSM Phase-I Project:

POWERGRID took up the implementation of URTDSM phase-1 in Jan 2014 and the project was commissioned progressively from 2018 to 2021 with installation of 1409 PMUs and PDCs at 32 control centers, the project was funded 70% from PSDF grant and 30% from POWERGRID equity.

The existing system of URTDSM Phase-I is under maintenance support through Annual Maintenance contract with the contractor, which will end in Jan 2027. The PMUs installed at substations can be in service for fifteen years from their date of commissioning.

## 3.0 Need for URTDSM Phase-II Project

### *3.1 Need for new PMUs*

After commissioning of URTDSM Phase-I Scheme, expansion of power system has taken place at considerable pace with addition of large-scale renewable generation and incorporation of new transmission system technologies (SVC, STATCOM, FSC, etc.,). Over the years, there have been significant organizational, regulatory, Market operations, and technological changes. The placement of PMUs at new renewable generation plants and other new technology devices (FACTS) is required to know their dynamic response during disturbances and to verify that they are operating under the limits stipulated as per the regulatory norms.

The Committee report on PMU has defined a new philosophy for placement of PMUs and suggested to cover additional equipment such as ICTs, SVCs, Bus Reactors, FSC, TCSC etc. have been considered for measurement through PMU, which were not in Phase-I implementation.

### *3.2 Upgradation of Control centers*

AMC support for the existing control centers will lapse by Jan 2027. Due to this, the maintenance of the existing hardware and software beyond its design life cycle of 7 years will be very challenging owing to lack of spares and services, poor performance and increasing cyber vulnerabilities due to obsolete technologies.

Moreover, the existing hardware and software cannot support the new analytics being envisaged under Phase-II project for better monitoring of the power system.

The URTDSM phase-1 Control centres are having issues of End of Life/End of support due to technical obsolescence of software, hardware, and cyber security appliances and will become technically obsolete. Hence to keep the WAMS URTDSM Control centres functional, the URTDSM phase 2 project which includes the upgrade of existing control centres, is to be implemented on priority.

Increased penetration of Renewable energy has required increase in more monitoring of the regional grids which requires more deployment of PMUs. The URTDSM phase 2 includes installation of PMUs as per latest CEA Guidelines on PMU placement.

### *3.3 Additional technical factors to establish the need for URTDSM Phase-II System*

In addition to the reasons mentioned above, the following are some of the power system aspects which are being handled only with URTDSM system, which is based upon Wide Area Measurement System (WAMS) technology:

(i) PMU measurements provide synchronized voltage, current and phase angle measurements, which is not possible in RTU measurements. The phase angle measurement is valuable information about the state of the grid and the grid operators can take decisions based upon precise measured information instead of thumb rule based upon their experience.

(ii) Based upon the phase angle measurements from both the ends of the line enhanced utilization of Transmission lines closer to thermal loading of line can be achieved.

(iii) In case of system separations, the Synchrophasor measurements display the load angle separation and can be used to determine the change required in generation to synchronize the two isolated systems, this being more accurate data facilitates faster restoration and avoid any jerks or oscillations in the power system.

(iv) One of the most important applications of PMU measurement is post facto analysis so that an incident can be analyzed with high resolution data so the behavior of each element-generator, RE generator, FACTS devices, Power system islands etc.

(v) With increasing grid size and installed capacity from multiple generation sources, the approved placement shall provide a wider footprint of PMU data, increasing observability by the Operator for Grid management.

## 4.0 Approach for Implementation for URTDSM Phase II Project

The approach for Implementation for URTDSM phase-II project is as follows:

(i) The URTDSM Phase-II project shall be implemented initially for ISTS portion covering NLDCs (2), RLDCs (5), new PMUs at Central Sector locations and remote consoles for CEA, CTU, RPCs, all SLDCs, main and backup NTAMCs, and any strategic locations.

(ii) Phase-II for STU portion (SLDCs and State sector/IPP stations) shall be implemented separately, subject to finalization of funding method for state portion.

## 5.0 Approvals for URTDSM Phase-II Project:

URTDSM Phase-II ISTS proposal has been deliberated in following RPCs so far:

a) 55th SRPC meeting held during 25.07.2025 & 26.07.2025 - SRPC approved the proposal.
b) 56th TCC & WRPC Meeting held on 26-27 Sep 2025 – WRPC Members deliberated & agreed for the ISTS proposal (minutes is awaited)
c) 81st NRPC meeting held during 30-31 Oct 2025 – NRPC agreed for the ISTS proposal.
d) 30th TCC and 30th NERPC meeting held during 13-14 Nov 2025 – NERPC agreed for the ISTS proposal. NERPC reduced the no. of PMU by 44nos. in the NER region to optimize cost.
e) 55th TCC and 55th ERPC held during 16-17Dec 2025 approved.

(** *No of Central Sector PMUs for ISTS portion was estimated as 1070 initially, later during deliberations in NERPC, central sector PMUs quantity for NER portion has been reduced from 151 to 107.*
*Further, Grid-India vide letter dated 13.04.2026 and further E-mail dated 15.04.2026 updated the list of PMUs for ISTS locations in line with CEA guidelines. Hence, the total PMU quantity for ISTS portion is finalized as 1087*). Accordingly, the cost of the URTDSM Phase-II ISTS project is updated as per revised PMU quantity of **1087** nos.

URTDSM Phase-II Project – Evolution of scope of work in successive NPC/RPC meetings is as given below:

| S No | As per directions of NPC/RPC Meeting | Evolution of Scope of work for URTDSM Phase-II | Brief Scope, DPR Estimate and funding method |
|---|---|---|---|
| i. | As per 13th NPC Meeting held on 05.07.2023 | DPR prepared for full-fledged scope of work for Central/State PMUs, PDCs across India | 4000 PMUs (new)<br>34 control centres<br>DPR estimate: Rs.3922 Crores<br><br>70% PSDF grant & |

| | | | |
|---|---|---|---|
| | | | 30% POWERGRID equity in line with Phase-I. |
| ii. | As per 15th NPC Meeting held on 14.11.2024 | DPR for only ISTS portion prepared comprising of central sector PMUs and control centers of Grid-India. | 1070 PMUs at Central Sector Stations<br>7 Control centers of NLDC & RLDCs<br><br>DPR Estimate: **1124Cr**<br><br>100% RTM (70% Debt & 30% POWERGRID equity) |
| iii. | As per 16th NPC dated 04.07.2025 | The 16th NPC recommended following actions:<br>"URTDSM project phase-II proposal may be put up in RPC forum for further discussion"<br>"The mode of implementation of the URTDSM project phase-II may be put up in upcoming NCT meeting for deliberation and approval" | |
| iv. | 52nd TCC & 55th SRPC Meeting held during 25.07.2025 & 26.07.2025 | **SRPC Approved** the URTDSM Phase-II ISTS Proposal. | 1070 PMUs at Central Sector locations<br>7 Control centers of NLDCs, RLDCs<br><br>DPR Estimate: 1124Cr<br><br>100% RTM (70% debt 30% POWERGRID Equity) |
| v. | 56th TCC & WRPC meeting held during 26.09.2025 & 27.09.2025 | **WRPC Approved** the URTDSM Phase-II ISTS Proposal | 1070 PMUs at Central Sector locations<br>7 Control centers of NLDCs, RLDCs<br><br>DPR Estimate: 1124Cr<br><br>100% RTM (70% debt 30% POWERGRID Equity) |
| vi. | 56th TCC & 81st NRPC Meeting held during 30.10.2025 & 31.10.2025 | **NRPC Approved** the URTDSM Phase-II ISTS Proposal. | 1070 PMUs at Central Sector locations<br>7 Control centers of NLDCs, RLDCs<br><br>DPR Estimate: **1124Cr**<br><br>100% RTM (70% debt 30% POWERGRID Equity) |
| vii. | 30th TCC & 30th NERPC Meeting held during 13.11.2025 & 14.11.2025 | **NERPC Approved** the URTDSM Phase-II ISTS Proposal with modification in no of PMUs under NER region (reduced to 107 from 151) | **1026 PMUs** at Central Sector locations<br>7 Control centers of NLDCs, RLDCs<br><br>DPR Estimate: **1111.5Cr**<br><br>100% RTM (70% debt 30% POWERGRID Equity) |
| viii. | 55th TCC & 55th ERPC Meeting held during 16.12.2025 & 17.12.2025 | **ERPC Approved** the URTDSM Phase-II ISTS Proposal | **1026 PMUs** at Central Sector locations<br>7 Control centers of NLDCs, RLDCs<br><br>DPR Estimate: **1111.5Cr**<br><br>100% RTM (70% debt 30% POWERGRID Equity) |

## 6.0 Scope of Work for URTDSM Phase II Project:

The scope of work under URTDSM Phase-II project is proposed as follows.

1. Installation of approximately **1087** nos. of PMUs at the Central Sector Substations and Power plants across the country as per the lates CEA Guidelines for unified PMU placement philosophy in Indian Grid.
2. Replacement/Establishment of PDCs and associated control center equipment comprising of software and hardware at 7 Control centers.
    a. Main and Backup NLDCs (2 nos.)
    b. All RLDCs (5 nos.)
    c. Remote Consoles for CEA, CTU, Main & Backup NTAMCs, RPCs, All SLDCs and any strategic locations - total 46 no's
3. The hardware and software to be installed at Control Centers shall be sized to accommodate all the PMUs currently installed under Phase-I, and the proposed PMUs under Phase-II with provision for future expansion of about 100% over and above.
4. The FO based communication system existing and being established by POWERGRID and Constituents shall meet the requirement of Phase-II. *The addition/augmentation of communication link is NOT envisaged under the scope of URTDSM Phase-II project DPR.*
5. **New Analytical applications**: Analytical applications have been suggested by the subcommittee for deployment under Phase-II scheme. Few of them, like Linear State Estimator and Oscillation Monitoring Application, are already deployed in Phase-I. However, due to obsolescence of the hardware/software issues in the existing control centers, they need to be replaced with new software and hardware. The following are the new analytical applications being proposed under Phase-II at all 7 control centers:
    a. Linear State Estimator
    b. Oscillation Monitoring Application.
    c. Real time automated event detection along with early warning system and ROCOF calculation over variable window.
    d. Voltage Stability analytics (VSA)
    e. WAMS based contingency analysis, security assessment & Islanding Detection.
    f. Real time Inertia Estimation and monitoring.
    g. Post-mortem analytics.
    h. Generator Model Validation
    i. Wide Area Control Systems (at selected nodes only)
        (i) WAMS based automatic load shedding (AUFLS and df/dt):
        (ii) Control of HVDC, PSS and STATCOM for damping system oscillations
    j. Response of Wind Farm and Solar PV for LVRT, Reactive Power etc.

    The above analytical applications are the requirements suggested based on the feedback of the system operator. It will be explored to procure them either from the prospective Bidders/Software OEMs or to develop them in association with premier academic institutes.
6. Integration of the existing PMUs.
7. Integration of the Phase-II PDCs with the existing SCADA/EMS systems at each location.
8. Integration with existing Video Projection System (VPS) (supplied under separate project) at each location.
9. Consultancy Services from premier academic institutions for development of new analytics under phase-II implementation, if required.
10. Engagement of Consultant for design of large scale WAMS system comprising of IT infrastructure for handling the vast amount of PMU data in real-time and historical data.
11. Capacity building through training of engineers from Grid-India (for Control center portion) & Central Sector Utilities (for PMU portion) are proposed as part of this URTDSM Phase-II project.

### 6.1 *Location of SLDCs for PDC replacement and no of PMUs in each Region under URTDSM Phase II Project:*

| Region→ | NR | ER | NER | WR | SR |
|---|---|---|---|---|---|
| No of Control Centers | 2 | 2 | 1 | 1 | 1 |
| Location of 7 control centers | 1. Main NLDC<br>2. NRLDC | 1. Backup NLDC<br>2. ERLDC | 1. NERLDC | 1. WRLDC | 1. SRLDC |
| PMUs (1087 No's) in Central Sector locations of each Region (as per latest CEA Guidelines) | 306 | 194 | 142 | 235 | 210 |

## 7.0 URTDSM Phase II Project DPR Cost for ISTS portion across India:

| BoQ Category | Software | Hardware | Auxiliary Power System | Services | Training | AMC | Total (including T&D) | T&D |
|---|---|---|---|---|---|---|---|---|
| PDCs at NLDC | 144.03 | 21.58 | 2.06 | 2.76 | 0.00 | 3.34 | 173.77 | 25.67 |
| PDCs at RLDC | 348.57 | 56.86 | 4.00 | 6.90 | 7.43 | 8.35 | 432.11 | 63.87 |
| PMUs | 17.57 | 325.53 | 0.00 | 0.00 | 2.11 | 20.11 | 365.32 | 54.01 |
| Mandatory Spares | 0.00 | 17.11 | 0.68 | 0.00 | 0.00 | 0.00 | 17.79 | 2.63 |
| **Total** | **510.17** | **421.08** | **6.74** | **9.66** | **9.54** | **31.80** | **989.00** | **146.17** |

DPR is based on a 100% RTM basis with 70% debt and 30% equity from POWERGRID.

| Sl. No. | Description | Total Cost (Rs. in crores) |
|---|---|---|
| 1 | Unified Real Time Dynamic State Measurement Phase-II *(Supply, services, taxes & duties, testing & commissioning)* | 957.20 |
| 2 | Overheads *(IEDC, Contingencies)* | 76.58 |
| 3 | Consultancy charges for Panel of Experts | 10.00 |
| | Sub-Total | 1043.78 |
| 4 | Interest during Construction (IDC) | 57.41 |
| | TOTAL (Supply, Services) | 1101.19 |
| 5 | AMC charges and other services during AMC | **31.80** |
| | GRAND TOTAL including AMC | **1132.99** |

The abstract cost estimate is given at ***Annexure***
The above project cost including AMC is based on the Budgetary quote from M/s L&T, the actual project and AMC charges will be known after the process of tendering and award, subject to approval of this proposal by Regulatory Authority.

### 7.1 *Target Beneficiaries*

The beneficiaries of the project would be all the designated ISTS customers (DICs) *as per POC mechanism for the URTDSM Phase-II (ISTS portion) as per CERC regulations.* ***(as per Clause no. 78 of CERC Tariff Regulations 2024-29).***

### *7.2 Project Strategy*

The Unified Real Time Dynamic State Measurement System (URTDSM) Phase-II Project shall be implemented by POWERGRID. The PMU installation shall be taken up at those locations where Fiber Optic based communication system is either existing or is being installed under various projects, which shall be available by Dec' 2027. The tariff on the investments for the same shall be recovered from the beneficiaries (SLDCs) as per CERC regulations.

*Upon the concurrence of POWERGRID's RTM proposal for ISTS portion by NPC/NCT, POWERGRID shall proceed for further tendering process.*

The project shall be planned for a lifetime of 7 years for the IT infrastructure at Control Centers. The AMC shall be taken for 1-year (Defect liability period) and 6 years (AMC period) after operational acceptance (with an additional provision to extend the AMC by another 2 years on the same terms and conditions.

## 8.0 O&M facilities

The URTDSM system shall be used by respective NLDC/ RLDC/ Central Sector substations and the maintenance responsibility for the subject project shall be under the scope of Grid-India (for all 7 Control centers) and by respective Central Sector Utility for the PMU locations.

After the defect liability period (DLP) of 1 year, 6-year maintenance support by OEM shall be kept in the Project.

## 9.0 Time Frame

The subject project is scheduled to be commissioned within **36 months** from the date of Investment Approval.

## 10.0 Conclusion:

The URTDSM phase-1 Control centres are nearing their Operational life and will become technically obsolete. Hence to keep the WAMS URTDSM Control centres functional, the URTDSM Phase-II project which includes an upgrade of existing control centres, is to be implemented on priority.

Increased penetration of Renewable energy has required increase in more monitoring of the regional grids which requires more deployment of PMUs. The proposal for URTDSM Phase-II (ISTS portion) includes installation of PMUs at Central Sector locations as per the latest CEA guidelines.

1. ***In line with the approvals accorded in all RPCs as mentioned above, "POWERGRID proposes to take up URTDSM Phase-II Project (for ISTS portion) on pan India basis, on cost sharing mechanism (100% RTM route with 70:30 Debt Equity ratio)".***

   **Put up for deliberation & approval in NCT.**

| URTDSM Phase-II WAMS System - BoQ for Main & Backup NLDC | | | | |
|---|---|---|---|---|
| Sr.No | Name of the item | Unit | Main NLDC Qty | Backup NLDC Qty |
| A | SOFTWARE | | | |
| 1 | PDC Software | Lot | 1 | 1 |
| 2 | WAMS Visualisation (UI) Software | Lot | 1 | 1 |
| 3 | Analytical Applications | | | |
| (a) | Linear State Estimator | Lot | 1 | 1 |
| (b) | Oscillation Monitoring Application | Lot | 1 | 1 |
| (c) | Real time automated event detection along with early warning system and ROCOF calculation over variable window | Lot | 1 | 1 |
| (d) | WAMS based Voltage Stability analytics (VSA) | Lot | 1 | 1 |
| (e) | WAMS based contingency analysis, security assessment & Islanding Detection | Lot | 1 | 1 |
| (f) | Generator Model Validation, Real time Inertia Estimation and monitoring | Lot | 1 | 1 |
| (g) | Post-mortem analytics | Lot | 1 | 1 |
| (h) | Wide Area Control Systems | | | |
| i. | WAMS based automatic load shedding (AUFLS and df/dt) | Lot | 1 | 1 |
| ii. | Control of HVDC, PSS and STATCOM for damping system oscillations | Lot | 1 | 1 |
| (i) | Response of Wind Farm and Solar PV for LVRT, Reactive Power. | Lot | 1 | 1 |
| 4 | Programming Development System (PDS) Software | Lot | 1 | 1 |
| 5 | Commercial Off-The-Shelf (COTS) Softwares | | | |
| (a) | Data Historian Software | Lot | 1 | 1 |
| (b) | Identity Management Software | Lot | 1 | 1 |
| (c) | Network Access Control (NAC) | Lot | 1 | 1 |
| (d) | Patch Management Software | Lot | 1 | 1 |
| (e) | Virtualisation Software for all the virtual servers envisaged and required under the project along-with centralised management software | Lot | 1 | 1 |
| (f) | Operating System for all the servers | Lot | 1 | 1 |
| (g) | Host based intrusion prevention system (HIPS) with centralised management | Lot | 1 | 1 |
| (h) | End Point Security Solution | Lot | 1 | 1 |
| (i) | Centralised Management and Log Analyser of all FWs | Lot | 1 | 1 |
| (j) | Network Management System (NMS) | Lot | 1 | 1 |
| (k) | SIEM (Security Information and Event management) | Lot | 1 | 1 |
| (l) | VAPT Tool | Lot | 1 | 1 |
| 6 | Report Development & Generation Software | Lot | 1 | 1 |
| 7 | Storage system | | | |
| (a) | SAN Software | Lot | 1 | 1 |
| (b) | NAS Software | Lot | 1 | 1 |

| | | | | |
|---|---|---|---|---|
| 8 | SMS & Email Interface | Lot | 1 | 1 |
| 9 | Backup Solution Software | Lot | 1 | 1 |
| 10 | Data exchange Software with external applications | Lot | 1 | 1 |
| **B** | **HARDWARE** | | | |
| 1 | PDC Server sized for data of 10000 PMUs | No. | 2 | 2 |
| 2 | Analytical Applications Servers | No. | 2 | 2 |
| 3 | Historian Servers | No. | 2 | 2 |
| (a) | Data Historian Server | | | |
| (b) | Report Development & Generation Server | | | |
| 4 | WAMS Visualisation (UI) Server | No | 2 | 2 |
| 5 | Programming Development System (PDS) Server | No | 1 | 0 |
| 6 | Management Applications Servers | | | |
| (a) | Identity Management Server | No. | 2 | 2 |
| (b) | NMS Server | | | |
| (c) | Network Access Control (NAC) Server | No. | 2 | 2 |
| (d) | End Point Security Solution | | | |
| (e) | Centralised Management & Log analyser of Firewall (Internal) | | | |
| 7 | Internal DMZ Servers | | | |
| (a) | SIEM Server | No | 2 | 2 |
| (b) | Centralised Management & Log analyser of Firewall (External) | | | |
| 8 | External DMZ Servers | | | |
| (a) | End Point Security Solution | No | 2 | 2 |
| (b) | Patch Management Server | | | |
| 9 | Anti APT | No | 1 | 1 |
| 10 | Storage System | | | |
| (a) | Storage Solution of Minimum 1200TB, RAID10, SAN or equivalent along with SAN Management Server | No. | 1 | 1 |
| (b) | NAS Storage of 100TB | No. | 1 | 1 |
| 11 | Workstation consoles with 23.8" dual monitor | | | |
| (a) | PDC application | No. | 2 | 2 |
| (b) | PDS Application | No. | 1 | 1 |
| (c) | Analytical Applications | No. | 1 | 1 |
| (d) | External DMZ | No. | 1 | 1 |
| (e) | Inernal DMZ | No. | 1 | 1 |
| (f) | Management Applications | No. | 1 | 1 |
| (g) | Historian Applications | No. | 1 | 1 |
| (h) | Server Management Console | No | 1 | 1 |
| (i) | Remote Diagnostic Console | No | 1 | 1 |
| 12 | Color Laser Printer | No. | 1 | 1 |
| 13 | Time System (NavIC & GPS based) | Lot | 2 | 2 |
| 14 | Firewalls (with Minimum 10Gbps NGTP) | | | |
| (a) | External Firewall with NIPS for Internet and Remote consoles | No. | 2 | 2 |

| | | | | |
|---|---|---|---|---|
| (b) | External Firewall with NIPS for PDC/PMU/SCADA data | No. | 2 | 2 |
| (c) | Internal Firewall with NIPS | No. | 2 | 2 |
| 15 | WAN Router cum Firewall | | | |
| (a) | For Communicating with PDCs at RLDCs ( 8 x Fiber Optic Ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 |
| (b) | For communicatiing with Remote Consoles (8 x Fiber Optic ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 |
| (c) | For Internet/Corporate Intranet connectivity (8 x Fiber Optic ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 |
| (d) | WAN router at Remote Console end (4 Ethernet ports (1Gbps)) | No. | 7 | |
| 16 | L3 LAN Switches (10G FO ports) for the following LANs | | | |
| (a) | 48-port L3 LAN Switch for PDC LAN | No. | 2 | 2 |
| (b) | 24 port L3 LAN Switch for Historian LAN | No. | 2 | 2 |
| (c) | 24 port L3 LAN Switch for External DMZ LAN | No. | 2 | 2 |
| (d) | 24 port L3 LAN Switch for Internal DMZ LAN | No. | 2 | 2 |
| (e) | 24 port L3 LAN Switch for Management LAN | No. | 2 | 2 |
| (f) | 24 port L3 LAN Switch for Analytics LAN | No. | 2 | 2 |
| (g) | 32 port FC Switch for SAN system | No. | 2 | 2 |
| 17 | Remote Consoles, equivalent to Work station console mentioned at Item No.4 above (for NTAMC and other Strategic locations) | No. | 7 | |
| 18 | Server for Backup Solution | No. | 1 | 1 |
| 19 | Backup Appliance | No. | 1 | 1 |
| 20 | Laptop for VAPT | No | 1 | 1 |
| 21 | Server for Data Exchange with external applications | No | 1 | 1 |
| 22 | Any other additional hardware at Control center end for implementing Wide Area Measurement Protection and Control (WAMPAC) system | No | 1 | 1 |
| **C** | **Auxiliary Power System** | | | |
| (a) | 120 kVA (96kW at 0.8 pf) UPS running in parallel | No. | 2 | 2 |
| (b) | VRLA type Battery banks for above UPS (each bank of 230.4 kVAH) | No. | 2 | 2 |
| (c) | Input ACDB (600kVA rating) | No. | 1 | 1 |
| (d) | Output ACDB (400kVA rating) | No. | 1 | 1 |
| (e) | Accessories for maintenance of VRLA type batteries | Lot | 1 | 1 |
| (f) | Power Distribution and cabling work required to establish UPS | Lot | 1 | 1 |
| (g) | UPS Monitoring System and it's integration with URTDSM System | Lot | 1 | 1 |

| D | SERVICES | | | |
|---|---|---|---|---|
| 1 | Integration of WAMS system with following units/applications: | | | |
| (a) | Integration with the SCADA/EMS Sytem at NLDC and backup NLDC respectively | No. | 1 | 1 |
| (b) | Integration with 3rd party applications | Lot | 1 | 1 |
| (c) | Integration (at Control center end) of existing PMUs | No | 3,000 | 3,000 |
| (d) | Integration (at control center end) of new PMUs supplied under this project | No | 1,100 | 1,100 |
| (e) | Integration of WAMS System with existing Video Projection System (VPS) of SCADA/EMS System in respective control center | Lot | 1 | 1 |
| (f) | Cyber Security Audit by Cert-IN certified Auditors during FAT. | Lot | 1 | 1 |
| (g) | Cyber Security Audit by Cert-IN certified Auditors during SAT. | Lot | 1 | 1 |
| (h) | Dismantling and Buyback of existing WAMS system of URTDSM Phase-I (after successful parallel operation) | Lot | 1 | 1 |
| (i) | SMS integration with service provider Email integration with owner email system | Lot | 1 | 1 |
| E | **Training** | | | |
| 1 | Training - Man days @15 Days x 18 persons | Man-days | 270 | |
| F | **Annual Maintenance Contract** | | | |
| (a) | Annual maintenance contract of WAMS System and all the equipment supplied in the project for a period of 7 years (1 year DLP and 6 years AMC) | Lot | 1 | 1 |
| (b) | Annual Training under AMC period | Lot | 1 | 1 |
| (c) | Six Monthly Cyber Security Audit by Cert-IN certified Auditors during 7 years AMC period | Lot | 1 | 1 |
| (d) | Patch Management including Signature updates for all Cyber security equipments for 7 years | Lot | 1 | 1 |
| (e) | Integration of new PMUs data from PDCs at respective RLDCs with PDC at NLDC during entire AMC period | No | 5,000 | 5,000 |

>> The sizing for Historian Storage at NLDCs is considered @25 samples/second reporting rate of the existing and new PMUs including 100% expansion

| URTDSM Phase-II WAMS System - BoQ for 5 RLDCs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sr.No | Name of the item | Unit | Name of RLDC | | | | | Total Qty |
| | | | NRLDC | ERLDC | NERLDC | SRLDC | WRLDC | |
| **A** | **SOFTWARE** | | | | | | | |
| 1 | PDC Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 2 | WAMS Visualisation (UI) Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 3 | Analytical Applications | | | | | | | |
| (a) | Linear State Estimator | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (b) | Oscillation Monitoring Application | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (c) | Real time automated event detection along with early warning system and ROCOF calculation over variable window | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (d) | WAMS based Voltage Stability analytics (VSA) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (e) | WAMS based contingency analysis, security assessment & Islanding Detection | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (f) | Generator Model Validation, Real time Inertia Estimation and monitoring | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (g) | Post-mortem analytics | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (h) | Wide Area Control Systems | | | | | | | |
| i. | WAMS based automatic load shedding (AUFLS and df/dt) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| ii. | Control of HVDC, PSS and STATCOM for damping system oscillations | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (i) | Response of Wind Farm and Solar PV for LVRT, Reactive Power. | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 4 | Programming Development System (PDS) Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 5 | Commercial Off-The-Shelf (COTS) Softwares | | | | | | | |
| (a) | Data Historian Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (b) | Identity Management Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (c) | Network Access Control (NAC) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (d) | Patch Management Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (e) | Virtualisation Software for all the virtual servers envisaged and required under the project along-with centralised management software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (f) | Operating System for all the servers | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (g) | Host based intrusion prevention system (HIPS) with centralised management | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (h) | End Point Security Solution with centralised management | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (i) | Centralised Management and Log Analyser of all FWs | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (j) | Network Management System | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (k) | SIEM (Security Information and Event management) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (l) | VAPT Tool | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 6 | Report Development & Generation Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 7 | Storage system | | | | | | | |
| (a) | SAN Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (b) | NAS Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 8 | SMS & Email Interface | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 9 | Backup Solution Software | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 10 | Data exchange Software with external applications | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| **B** | **HARDWARE** | | | | | | | |
| 1 | PDC Server sized for data of 2500 PMUs | No. | 2 | 2 | 0 | 2 | 2 | 8 |
| 2 | PDC Server sized for data of 1000 PMUs | No. | 0 | 0 | 2 | 0 | 0 | 2 |
| 3 | Analytical Applications Servers | No. | 2 | 2 | 2 | 2 | 2 | 10 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | Historian Servers | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (a) | Data Historian Server | | | | | | | |
| (b) | Report Development & Generation Server | | | | | | | |
| 5 | WAMS Visualisation (UI) Server | No | 2 | 2 | 2 | 2 | 2 | 10 |
| 6 | Programming Development System (PDS) Server | No | 1 | 1 | 1 | 1 | 1 | 5 |
| 7 | Management Applications Servers | | | | | | | |
| (a) | Identity Management Server | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (b) | NMS Server | | | | | | | |
| (c) | Centralised Management & Log analyser of Firewall (Internal) | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (d) | Network Access Control (NAC) Server | | | | | | | |
| (e) | End Point Security Solution | | | | | | | |
| 8 | Internal DMZ Servers | No | 2 | 2 | 2 | 2 | 2 | 10 |
| (a) | SIEM Server | | | | | | | |
| (b) | Centralised Management & Log analyser of Firewall (External) | | | | | | | |
| 9 | External DMZ Servers | No | 2 | 2 | 2 | 2 | 2 | 10 |
| (a) | End Point Security Solution | | | | | | | |
| (b) | Patch Management Server | | | | | | | |
| 10 | Anti APT | No | 1 | 1 | 1 | 1 | 1 | 5 |
| 11 | Storage System | | | | | | | |
| (a) | Storage Solution of Minimum 600TB, RAID10, SAN or equivalent along with SAN Management Server | No. | 1 | 1 | 0 | 1 | 1 | 4 |
| (b) | Storage Solution of Minimum 250TB, RAID10, SAN or equivalent along with SAN Management Server | No. | 0 | 0 | 1 | 0 | 0 | 1 |
| (c) | NAS Storage of 50TB | No. | 1 | 1 | 0 | 1 | 1 | 4 |
| (d) | NAS Storage of 20TB | No. | 0 | 0 | 1 | 0 | 0 | 1 |
| 12 | Workstation consoles with dual monitor | | | | | | | |
| (a) | PDC application | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (b) | PDS Application | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (c) | Analytical Applications | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (d) | External DMZ | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (e) | Inernal DMZ | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (f) | Management Applications | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (g) | Historian Applications | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (h) | Server Management Console | No | 1 | 1 | 1 | 1 | 1 | 5 |
| (i) | Remote Diagnostic Console | No | 1 | 1 | 1 | 1 | 1 | 5 |
| 13 | Color Laser Printer | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| 14 | Time System (NavIC & GPS based) | Lot | 2 | 2 | 2 | 2 | 2 | 10 |
| 15 | Firewalls (With Minimum 8Gbps NGTP) | | | | | | | |
| (a) | External Firewall with NIPS for Internet and Remote consoles | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (b) | External Firewall with NIPS for PDC/PMU/SCADA data | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (c) | Internal Firewall with NIPS | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| 16 | WAN Router cum Firewall | | | | | | | |
| (a) | For Communicating with PDCs at NLDCs ( 8 x Fiber Optic Ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (b) | For Communicating with PDCs at SLDCs ( 8 x Fiber Optic Ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (c) | For communicatiing with Remote Consoles (8 x Fiber Optic ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (d) | For Internet/Corporate Intranet connectivity (8 x Fiber Optic ports, 8 Ethernet ports (1Gbps)) | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (e) | WAN router at Remote Console end (4 Ethernet ports (1Gbps)) | No. | 11 | 8 | 7 | 7 | 6 | 39 |
| 17 | L3 LAN Switches (10G FO ports) for the following LANs | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (a) | 48-port L3 LAN Switch for PDC LAN | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (b) | 24 port L3 LAN Switch for Historian LAN | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (c) | 24 port L3 LAN Switch for External DMZ LAN | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (d) | 24 port L3 LAN Switch for Internal DMZ LAN | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (e) | 24 port L3 LAN Switch for Management LAN | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (f) | 24 port L3 LAN Switch for Analytics LAN | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (g) | 32 port FC Switch for SAN system | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| 18 | Remote Consoles, equivalent to Work station console mentioned at Item No.4 above | No. | 11 | 8 | 7 | 7 | 6 | 39 |
| 19 | Server for Backup Solution | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| 20 | Backup Appliance | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| 21 | Laptop for VAPT | No | 1 | 1 | 1 | 1 | 1 | 5 |
| 22 | Server for Data Exchange with external applications | No | 1 | 1 | 1 | 1 | 1 | 5 |
| 23 | Any other additional hardware at Control center end for implementing Wide Area Measurement Protection and Control (WAMPAC) system | No | 1 | 1 | 1 | 1 | 1 | 5 |
| **C** | **Auxiliary Power System** | | | | | | | |
| (a) | 60 kVA (48kW at 0.8 pf) UPS running in parallel | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (b) | VRLA type Battery banks for above UPS (each bank of 115.2 kVAH) | No. | 2 | 2 | 2 | 2 | 2 | 10 |
| (c) | Input ACDB (450kVA rating) | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (d) | Output ACDB (300kVA rating) | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (e) | Accessories for maintenance of VRLA type batteries | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (f) | Power Distribution and cabling work required to establish UPS | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (g) | UPS Monitoring System and it's integration with URTDSM System | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| **D** | **SERVICES** | | | | | | | |
| 1 | Integration of WAMS system with following units/applications: | | | | | | | |
| (a) | Integration with the SCADA/EMS Sytem at respective RLDC | No. | 1 | 1 | 1 | 1 | 1 | 5 |
| (b) | Integration with 3rd party applications | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (c) | Integration (at Control center end) of existing PMUs | No. | | | 3,000 | | | 3000 |
| (d) | Integration (at Control center end) of new PMUs supplied under this project | No. | 218 | 303 | 151 | 89 | 309 | 1070 |
| (e) | Integration of WAMS System with existing Video Projection System (VPS) of SCADA/EMS System in respective region | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (f) | Cyber Security Audit by Cert-IN certified Auditors during FAT. | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (g) | Cyber Security Audit by Cert-IN certified Auditors during SAT. | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (h) | Dismantling and Buyback of existing WAMS system of URTDSM Phase-I (after successful parallel operation) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (i) | SMS integration with service provider Email integration with owner email system | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| **E** | **Training** | | | | | | | |
| 1 | Training - Man days @15 Days x 24 persons in each Region | Man-days | 360 | 360 | 360 | 360 | 360 | 1,800 |
| **F** | **Annual Maintenance Contract** | | | | | | | |
| (a) | Annual maintenance contract of WAMS System and all the equipment supplied in the project for a period of 7 years (1 year DLP and 6 years AMC) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (b) | Annual Training under AMC period | Lot | 1 | 1 | 1 | 1 | 1 | 5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (c) | Six Monthly Cyber Security Audit by Cert-IN certified Auditors during 7 years AMC period | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (d) | Patch Management including Signature updates for all Cyber security equipments for 7 years | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| (e) | Integration of new PMUs (from existing substations or from new substations) with PDCs at RLDCs during entire AMC period | No | 1,200 | 800 | 700 | 1,100 | 1,200 | 5000 |
| (f) | Integration of PDCs at SLDCs with PDCs at respective RLDCs during AMC period | No | 9 | 5 | 3 | 5 | 4 | 26 |

>> The sizing for Historian Storage at RLDCs is considered @50 samples/second reporting rate of the existing and new PMUs including 100% expansion

| BOQ for Central Sector PMUs to be procured under URTDSM Phase-II | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Name of the item | Unit | Regionwise Qty | | | | | Total Qty |
| | | | NR | ER | NER | SR | WR | |
| A | **SOFTWARE** | | | | | | | |
| 1 | PMU configuration software | Lot | 12 | 6 | 4 | 6 | 4 | 32 |
| B | **HARDWARE** | | | | | | | |
| 1 | PMUs | | 306 | 194 | 142 | 210 | 235 | 1087 |
| 2 | Panel for mounting PMUs (complete with all necessary accessories, cables etc. as per specification) along with identified analog channels / modules | Lot | 1 | 1 | 1 | 1 | 1 | 5 |
| 3 | Time System (GPS receiver) | Lot | 306 | 194 | 142 | 210 | 235 | 1087 |
| 4 | Substation Grade Layer-3 LAN Switches with 10 ports minimum<br>i.1 Gbps Fibre port- 4 nos.<br>ii.1 Gbps Cu ports- 2 nos.<br>iii.100 Mbps Cu ports- 4 nos | No. | 135 | 170 | 55 | 75 | 210 | 645 |
| 5 | Substation Grade Layer-2 LAN Switches with 10 ports minimum<br>i.1 Gbps Fibre port- 4 nos.<br>ii.100Mbps Fibre ports- 4 nos.<br>iii.100Mbps Cu ports – 2 nos. | No. | 153 | 97 | 71 | 105 | 118 | 544 |
| 6 | Armored Fibre Optic Cable and associated termination | Lot | 135 | 170 | 55 | 75 | 210 | 645 |
| 7 | LIU - FO PATCH PANEL-12 PORT | No. | 288 | 267 | 126 | 180 | 328 | 1189 |
| 8 | PMU configuration tool (Laptop) | No. | 12 | 6 | 4 | 6 | 4 | 32 |
| 9 | Integration (at substation end) of new PMUs supplied under this project with PDCs of respective Control center | No. | 306 | 194 | 142 | 210 | 235 | 1087 |
| B | **TRAINING** | | | | | | | |
| 1 | Training (For All Central Sector locations in each Region, 3 days for 5 persons) | Man days | 150 | 90 | 90 | 90 | 90 | 510 |
| C | **Annual Maintenance Contract** | | | | | | | |
| (a ) | Annual maintenance contract of PMUs and all the associated equipment supplied in the project for a period of 7 years (1 year DLP and 6 years AMC) | Lot | 1 | 1 | 1 | 1 | 1 | 5 |

>> The PMU quantity mentioned above is indicative requirement under Phase-II for only Central Sector portion.
>> Each PMU shall be supporting measurement of 2sets of Voltage and Current phasors (i.e, of 2 elements) as a minimum and shall comply with latest version of IEEE C37.118.2 and IS/IEC 60255-118.1standards with latest amendments.

| URTDSM Phase-II - BOQ for Mandatory Spares | | | |
|---|---|---|---|
| **Sl.no** | **Item description** | **Unit** | **Total Qty** |
| **A** | **Spares for URTDSM system** | | |
| 1 | Servers one of each type at every RLDC & NLDC | Lot | 1 |
| 2 | **Storage System** | | |
| (i) | 10% of the critical items at every control center like Dual redundant power supplies, controllers and storage disks/ specialized storage etc. | Lot | 1 |
| 3 | Workstation console with dualcolour monitor (@10% of Total Supply in each Region/State) | Lot | 1 |
| 4 | LAN switch one of each type at every RLDC/NLDC | Lot | 1 |
| 5 | Internal Firewall at every RLDC and NLDC | Lot | 1 |
| 6 | External Firewall at every RLDC and NLDC | Lot | 1 |
| 7 | WAN Routers one of each type at every RLDC and NLDC | Lot | 1 |
| 8 | Time System (GPS receiver) (@10% of Supply) | Lot | 1 |
| 9 | PMU (complete with all necessary accessories, cables etc. as per specification) along with additional analog channels / modules | No. | 110 |
| **B** | **Spares for Auxiliary Power Supply system** | | |
| 1 | MCCB/MCB/Isolator/ Switch/Contactor of each type & rating (as applicable & used inside UPS panel) | Lot | 7 |
| 2 | Fuse of each type & rating (if applicable) | Lot | 35 |
| 3 | DC Filter assembly | Lot | 7 |
| 4 | Input AC Filter assembly | Lot | 7 |
| 5 | Output AC Filter assembly | Lot | 7 |
| 6 | Electronic Printed Circuit Board / Card of each type (including all cards/modules for rectifier/charger, inverter, system card, display module, interface cards etc.) | Lot | 7 |
| 7 | Power Semiconductor devices of each type & rating such as SCRs, IGBTs etc. for rectifier/charger module, Inverter module, Static Switch module for all the three phases (exclude those items which are covered under item-6 above) | Lot | 7 |

**ANNEXURE - 4.0**

# ABSTRACT COST ESTIMATE

(BASE COST)

## Unified Real Time Dynamic State Measurement (URTDSM) Project Phase-II

DPR Cost Estimate (Based on budgetary offers)

| Sl. No. | DESCRIPTION | | AMOUNT (Rupees in Crs.) |
|---|---|---|---|
| | **Equipment Cost** | | |
| A | **Supply** | | |
| | **Sub- Total A** | | 957.20 |
| B | **Services** | | |
| i | Installation, Testing and Commissioning | | |
| ii | Training charges | | |
| | **Sub- Total B (i to ii)** | | **Included above in A** |
| C | **Taxes and Duties** | | |
| i | GST @ 18%, 28% (as applicable on Supply cost & Services) on **(A+B)** | | **Included above in A** |
| D | Inland Freight and Insurance (as applicable on **A**) | | **Included above in A** |
| E | **Sub Total A TO D** | | **957.20** |
| F | Incidental Expediture During construction (IEDC) | **@ 5% of [F]** | 47.86 |
| G | Contingencies | **@ 3% of [F]** | 28.72 |
| H | Consultancy charges for URTDSM Phase-II for Panel of Experts | | 10.00 |
| I | **Sub Total (A TO H)** | | **1,043.78** |
| J | Interest During Construction (IDC) | | 57.41 |
| K | **GRAND TOTAL** | | **1,101.19** |
| L | Maintenance charges for 1 year during warranty period and 6 years after warranty period excl. GST* (AMC) incl. Cyber Security Audit | | **26.95** |
| | GST @ 18% on AMC | | **4.85** |

Note: 1. Debt:Equity ratio has been considered as 70:30.
2. Interest rate on Loan has been considered @ 11.00% for Domestic Loan subject to actuals.