



भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
Sewa Bhawan, R. K. Puram, New Delhi-110066



[ISO: 9001-2008]

No.200/5/2012/SP&PA/

Date/दिनांक:16-02-2012

To

(As per List attached)

Subject: Joint Meeting of all the regional Standing Committees on Power System Planning for firming up the 'Unified Real Time Dynamic State Measurement (URTDSM)' scheme as part of Smart Transmission Grid development.

विषय: विद्युत प्रणाली के आयोजन की सभी क्षेत्रीय स्थायी समितियों की संयुक्त बैठक – स्मार्ट पारेषण ग्रिड विकास हेतु 'यूनिफाईड रियल टाइम डायनमिक स्टेट मैजरमेन्ट' की योजना रिपोर्ट पर चर्चा

The Indian grid is very vast, large in size and expanding rapidly resulting in new challenges and complexities in its real time operation. It has, therefore, become imperative to provide devices for real time dynamic state measurement of grid parameters to facilitate secure and reliable grid operation. A Report on Unified Real Time Dynamic State Measurement (URTDSM) has been prepared by POWERGRID in consultation with CEA and the same is available on the website of CEA and POWERGRID.

In this regard, a Joint Meeting of all the five Regional Standing Committees on Power System Planning would be held **on March 5, 2012 (Monday) at 10.30 am. Venue for the meeting is Conference Room, Fifth Floor, Power Grid Corp. of India Ltd., Plot No:2, "Saudamini", Sector-29, Gurgaon, Haryana-122001.**

The Chairperson, CEA has kindly agreed to inaugurate the joint meeting. CMD, POWERGRID has also consented to address the meeting. Kindly make it convenient to attend the meeting.

The programme of the meeting and contact person in POWERGRID is at Annex-I. Executive summary of the report is given at Annex-II.

भवदीय /Yours faithfully,

(प्रदीप जिंदल)/ (Pardeep Jindal)

निदेशक(प्र यो एवं प मू प्रभाग)/ Director (SP&PA)
(Telephone: 011 26198092, Fax No. 011 26102045)

Programme Schedule for Joint Meeting of all the Regional Standing Committees on Power System Planning

Date & Time: March 5, 2012(Monday) at 10.30 AM

Venue: Conference Room, Fifth Floor, Power Grid Corporation of India Ltd., Plot No:2, “Saudamini”, Sector-29, Gurgaon, Haryana-122001

Time	Activity
10:30 Hrs – 10:40 Hrs	Lighting of Lamp.
10:40 Hrs – 10:50 Hrs	Real Time Dynamic Measurement – System Operation Perspective – by CEO, POSOCO
10:50 Hrs – 11.15 Hrs	Address by CMD, POWERGRID.
11:15 Hrs – 11:25 Hrs	Address by Member (Power Systems), CEA
11:25 Hrs – 11:40 Hrs	Inaugural address by Chairperson, CEA.
11:40 Hrs – 12:00 Hrs	Synchrophasor technology and Wide Area Measurement Systems – Basics – By IIT Bombay
12:00 Hrs – 12:30 Hrs	Presentation on Unified Real Time Dynamic Measurement System (URTDMS) – by POWERGRID.
12:30 Hrs – 13:30 Hrs	Discussions
Lunch	

Name of Contact Person:

Mr. Kashish Bhambhani
Manager(Smart Grid),
Power Grid Corporation of India Ltd.,
Plot No:2, “Saudamini”,
Sector-29, Gurgaon,
Haryana-122001.
Mob: 9971399117 Fax- 01242571809
Email: kashish@powergridindia.com

Address List

1. The Director (Projects) Power Grid Corp. of India Ltd., “Saudamini”, Plot No. 2, Sector-29, Gurgaon-122001 Fax 0124-2571760/2571932	2. CEO, POSOCO B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi-110016 Fax 011-26852747
3 Director (Projects), National Thermal Power Corp. Ltd. (NTPC), NTPC Bhawan, Core-7, Scope Complex, Lodhi Road, New Delhi-110003. FAX-011-24360912	4. Director (Technical) NHPC Office Complex, Sector – 33, NHPC, Faridabad - 121 003 (Fax-0129-2277941)
5. Director (Operations), NPCIL, 12 th Floor, Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai – 400 094. FAX : 022- 25991258	

Northern Region

1. Member Secretary Northern Region Power Committee, 18-A Shajeed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi – 110016 (Fax-011-26865206)	2. Member (Power) BBMB, Sectot-19 B Madya Marg, Chandigarh-160019 (Fax-0172-2549857)
3. Managing Director, HP Power Transmission Corporation Ltd. Himfed Bhawan, Panjari, old MLA Quarters, SHIMLA-171004 (Fax-0177-2626284, 2626283)	4. Director (Transmission) UPPTCL, Shakti Bhawan Extn, 3rd floor, 14, Ashok Marg, Lucknow - 226 001 (Fax-0522-2288410)
5. Director (Transmission) Urja Bhawan, Kawali Road, Dehradun, Uttarakhand - 248 001 (Fax-0135-2762460)	6. Director (Operations) Delhi Transco Ltd. Shakti Sadan, Kotla Marg, New Delhi - 110 002 (Fax-011-23234640)
7. Director (Technical) Punjab State Transmission Corp. Ltd. (PSTCL) Head Office The Mall, Patiala - 147 001 (Fax-0175-2304017)	8. Director (Projects) HVPNL , Shakti Bhawan, Sector -6, Panchkula - 134 109 (Fax-0172-2560640)
9. Development Commissioner (Power), Civil Secretariat, JAMMU - 180 001 (Fax-0191-2545447, 2530265)	10 Director (Transmission) RRVNL, Vidyut Bhawan, Janpath, Jyoti Nagar, Jaipur , Rajasthan Fax-0141-2740794

11. Chief Engineer (Operation) Ministry of Power, UT Secretariat, Sector-9 D Chandigarh - 161 009 (Fax-0172-2637880)	12. Director(Technical) THDC Ltd. Pragatipuram, Bypass Road, Rishikesh, Uttarakhand- 249201 (Fx-0135-2431519)
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Western Region

1. The Member Secretary, Western Regional Power Committee, MIDC Area, Marol, Andheri East, Mumbai Fax 022 28370193	2. Chairman and Managing Director, MPPTCL, Shakti Bhawan, Rampur, Jabalpur-482008 Fax 0761 2664141
3. The Managing Director, Chhattisgarh State Power Transmission Corporation Ltd.(CSPTCL) , Dangania, Raipur (CG)-492013. Fax 0771 2574246/ 4066566	4. The Managing Director, GETCO, Sardar Patel Vidyut Bhawan, Race Course, Baroda-390007. Fax 0265-2338164
5. Director (Operation), MAHATRANSCO, 'Prakashgad', Plot No.G- 9, Bandra-East, Mumbai-400051. Fax 022-26390383/26595258	6. The Chief Engineer, Electricity Department, The Government of Goa, Panaji, Goa Fax 0832 2222354
7. Executive Engineer (Projects) UT of Dadra & Nagar Haveli, Department of Electricity , Silvassa . Ph. 0260-2642338/2230771	8. Executive Engineer Administration of Daman & Diu (U.T.) Department of Electricity Moti Daman-396220 . Ph. 0260-2250889, 2254745

Southern Region

1.The Member Secretary, Southern Regional Power Committee, 29, Race Course Cross Road, Bangalore 560 009. FAX: 080-22259343	2. The Director (Grid Operation), Transmission Corp. of Andhra Pradesh Ltd., Vidyut Soudha, Hyderabad – 500 082. FAX : 040-66665137/ 66665133
3.The Director (Transmission), Karnataka State Power Transmission Corp.Ltd., Cauvery Bhawan, Bangalore 560 009. FAX : 080 -22228367	4. The Member (Transmission), Kerala State Electricity Board, Vidyuthi Bhawanam, Pattom, P.B. No. 1028, Thiruvananthapuram - 695 004. FAX : 0471-2444738

5. Member (Distribution), Tamil Nadu electricity Board (TNEB), 6 th Floor, Eastern Wing, 800 Anna Salai, Chennai - 600002. FAX : 044-28516362	6. The Superintending Engineer –I, First Floor, Electricity Department, Gingy Salai, Puducherry – 605 001. FAX : 0413-2334277/2331556
7.The Director (Power), Corporate Office, Block – I, Neyveli Lignite Corp. Ltd., Neyveli , Tamil Nadu – 607 801. FAX: 04142-252650/ 252570	

Eastern Region

1. Member Secretary, Eastern Regional Power Committee, 14, Golf Club Road, Tollygange, Kolkata-700033.	2. Director (System), Damodar Valley Corporation DVC Towers, VIP Road, Kolkata-700054.
3. Member (Transmission), Bihar State Electricity Board Vidyut Bhavan, Baily Road, Patna-800021.	4. Director (Transmission), Orissa Power Transmission Corporation Jan path, Bhubaneshwar-751022.
5. Director (System Operation), West Bengal State Electricity Transmission Company Ltd., Vidyut Bhavan, 5th Floor, Block-D, Bidhannagar, Sector-II Kolkata-700091.	6. Member (Transmission), Jharkhand State Electricity Board, In front of Main Secretariat, Doranda, Ranchi-834002.
7. Principal Chief Engineer cum Secretary, Power Department Government of Sikkim, Sikkim	

North Eastern Region

1. The Member Secretary, North Eastern Regional Power Committee, Meghalaya State Housing Finance Cooperative Society Ltd. Building, Nongrim Hills Shillong (Meghalaya) 793003 Fax: 0364 – 22520030	2. The Chairman and Managing Director, North Eastern Electric Power Corporation Ltd Brookland Compound, Lower New Colony, Shillong (Meghalaya) – 793003. Fax: 0364 – 2226417
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3. The Managing Director, Assam Electricity Grid Corporation Limited, Bijulee Bhawan; Paltan Bazar, Guwahati (Assam) – 781001 Fax: 0361 – 2739513 & 0361 – 2739989	4. The Chairman-cum-Managing Director, Meghalaya Energy Corporation Limited, Lum Jingshai, Short Round Road, Shillong (Meghalaya) – 793001 . Fax: 0364 – 2590355
5. The Chief Engineer (Power), Electricity Department, Keisampat, Imphal (Manipur) Fax: 0385 – 2220702	6. The Chief Engineer, Department of Power, Nagaland, Kohima Fax: 0832 – 2222354
7. Engineer-in-Chief Power & Electricity Department, Govt. of Mizoram, Tuikhuahtlang, Aizawl (Mizoram) Fax: 0389-2320862	8. The Chief Engineer (Power), Vidyut Bhawan, Department of Power, Zero Point Tinali, Itanagar (Arunachal Pradesh) – 791111 . Fax: 0360 – 2217302
9. The Chairman-cum-Managing Director, Tripura State Electricity Corporation Limited, Bidyut Bhavan, Banamalipur, Agartala, Tripura . Fax: 0381 – 2319427	

Copy to:

1. The Chairman & Managing Director Power Grid Corp. of India Ltd., “Saudamini”, Plot No. 2, Sector-29, Gurgaon-122001 Fax 0124-2571760/2571932	2. Executive Director (Smart Grid) Power Grid Corp. of India Ltd., “Saudamini”, Plot No. 2, Sector-29, Gurgaon-122001 Fax 0124-2571760/2571932
4. SA to Chairperson, Central Electricity Authority, Sewa Bhawan, R. K. Puram, New Delhi-110066 .	3. The Member (PS), Central Electricity Authority, Sewa Bhawan, R. K. Puram, New Delhi-110066 .
5. Prof S.A Soman, Department of Electrical Engineering, Indian Institute of Technology Bombay, Powai, Mumbai-400076	

Executive Summary

BACKGROUND

Spread of Indian Power System is increasing to new dimensions especially with the synchronous interconnection NEW grid with Southern Regional Grid. In future single grid of more than 250 GW capacity shall be operated in next 4-5 years. With the growth of meshed network, complexities due to change in power flow direction, wide variation in supply & demand etc. have grown manifold. Open Electricity Market has given a new paradigm shift the way power is generated, transmitted and distributed. Further, In order to maintain sustainability, emphasis has been given to develop renewable energy and its integration with the grid. All these poses challenges in terms of grid security, safety and stability under different operating conditions and has also increased the complexity towards the monitoring and control of such large grid.

Existing SCADA/EMS has the capability to provide only steady state view of the power system with high data flow latency. Synchrophasor measurements using PMU over wide-area facilitate dynamic real time measurements and visualization of power system which are useful in monitoring safety and security of the grid as well enable in taking control/corrective actions in the new regime of grid management.

WAMS pilot project implemented in Northern Region (NR) consists of PMUs along with GPS installed at selected 9 substations in the grid and a Phasor Data Concentrator (PDC) and other associated equipment is placed at Northern Regional Load Despatch Center (NRLDC). From the phasor data, load angle between different pockets of the grid is available more accurately with updation time of order of few milliseconds and this enhances the capability of the tools available to grid operator. The data historian provided is collecting concentrated data from PDC and shall be useful for post event analysis of any grid incidences. In the past data has also been utilized to observe low frequency oscillations and checking effectiveness of SPS operations.

Most programs for WAMS technology world over have three stages to implement phasor technology. The initial stage is to collect and archive phasor and frequency data from important locations throughout the grid using PMU to determine the topology and operating limits. In Second stage, the data gathered along with real-time phasor and frequency measurements to calculate grid conditions using analytical functions to make suggestions to grid operator to keep grid stable and reliable. The third and final stage is to do all of the above automatically without human intervention.

Recognising the need of WAMS application in Indian Power System, it is proposed to follow the same philosophy i.e. installation of PMUs on substations at 400kV level and above in the State & Central grids, all generating stations at 220kV level and above HVDC terminals, important inter-regional connection points, inter-national connection points etc., provision of PDC at all SLDCs, RLDCs and NLDC along with visualization aids as a first phase. This shall facilitate an Unified Real-time Dynamic State Measurements (URTDSM) towards improved system operation. In the subsequent phases, development of software based analytic functions to be undertaken.

PROPOSED URTDSM IN INDIAN POWER SYSTEM

List of PMU and PDCs to be installed at various substations in Central & State utilities as part of URTDSM is tabulated as under:

Region	Sub-stations		No of feeders		PMU		Nodal PDC	MPDC	SPDC	Main & Back-up NLDC
	ISTS	STU	ISTS	STU	ISTS	STU				
NR	83	96	434	435	227	231	6	9	1	
WR	60	76	520	415	267	216	11	4	1	
ER	51	44	395	199	202	105	4	5	1	
SR	60	71	348	289	183	152	6	4	1	
NER	18	22	95	69	50	36	0	3	1	
Total	272	309	1792	1407	929	740	27	25	5	
	581		3199		1669		57			2

In addition to above, Remote console at each RPC(5) , UT(3) ,Sikkim (1), NTMC(2), CEA(1) & NER States(4) ,Total 16 Remote consoles are proposed.

Training programs are also proposed as a part of capacity building activity under the URTDSM Phase-1 implementation.

Based on the availability of existing Fibre Optic(FO) communication link as well as FO link under implementation, it is proposed that implementation may be undertaken in two(2) phases; Phase-1 where substations with FO link would be available by 2014-15 and; Phase-2 in balance substations where separate FO link to be established. Details are tabulated as under:

	N R-PH-I			N R-PH-II			PDC		
	S/st	Feeder	PMU	S/st	Feeders	PMU	Nodal PDC	MPDC	SPDC
UP	17	82	44	7	28	15	1	1	
Rajasthan	8	42	24	17	61	35	1	1	
Himachal Pradesh	0	0	0	3	6	3	0	1	
Uttrakhand	1	2	1	5	16	8	0	1	
Haryana	3	21	11	11	46	23	0	1	
Delhi	3	18	9	4	14	7	0	1	
J&K	0	0	0	1	2	1	0	1	
Punjab	3	22	11	7	38	19	0	1	
BBMB	6	37	20	0	0	0	4		1
CS	74	394	206	9	40	21		1	
Total	115	618	326	64	251	132	6	9	1

SR-PH-I				SR-PH-II			PDC		
	S/St	Feeders	PMU	S/St	Feeders	PMU	Nodal PDC	MPDC	SPDC
Andhra Pradesh	10	61	32	18	60	32	2	1	
Karnataka	1	8	4	18	65	33	0	1	
Tamilnadu	3	14	7	13	49	27	0	1	
Kerala	2	7	4	6	25	13	0	1	
Central	57	338	178	3	10	5	4		1
TOTAL	73	428	225	58	209	110	6	4	1
WR-PH-I				WR-PH-II			PDC		
	S/ST	Feeders	PMU	S/ST	Feeders	PMU	Nodal PDC	MPDC	SPDC
MAHARASTRA	4	34	18	26	128	65	2	1	
MADHYA PRADESH	8	57	30	6	30	16	1	1	
CHATTISGARH	3	21	11	1	4	2	0	1	
GUJARAT	3	23	12	25	118	62	2	1	
CENTRAL	49	456	234	11	64	33	6		1
Total	67	591	305	69	344	178	11	4	1
ER-PH-I				ER-PH-II			PDC		
	S/st	Feeders	PMU	S/st	Feeders	PMU	Nodal PDC	MPDC	SPDC
WEST BENGAL	9	40	22	9	40	20	0	1	
DVC	12	66	34	0	0	0		1	
ORISSA	6	30	16	4	10	6	0	1	
BIHAR	1	6	3	0	0	0	0	1	
Jharkhand	3	7	4	0	0	0	0	1	
CS	51	395	202	0	0	0	4		1
Total	82	544	281	13	50	26	4	5	1
NER-PH-I				NER-Ph-II			PDC		
	S/St	Feeders	PMU	S/st	Feeders	PMU	Nodal PDC	MPDC	SPDC
ARUNACHAL PRADESH	1	4	2	3	8	4	*	1	
Assam	4	20	11	10	27	14	0	1	
TRIPURA	0	0	0	1	2	1	*		
MEGHALAYA	0	0	0	2	6	3	*	1	
NAGALAND	0	0	0	1	2	1	*		
CENTRAL	9	69	36	9	26	14			1

TOTAL	14	93	49	26	71	37	0	3	1
Grand Total	351	2274	1186	230	925	483	27	25	5

METHODOLOGY OF IMPLEMENTATION

It is proposed that URTDSM project may be implemented in two (2) phases, as described under:

Phase-1: Placement of 1186 nos. PMUs at all lines in HVDC terminal stations, 400kV & above voltage level S/s, generating station stepped up at 220kV level & above where Fibre Optic(FO) cable along with communication equipment is either existing or being implemented by 2014-15.

Placement of Nodal PDC (27 nos) at strategic sub-station, Master PDC (25nos) at SLDCs, Super PDC (5) at RLDCs, 2 No PDC at Main & Backup NLDC, Remote console at each RPC(5) , UT(3) ,Sikkim , NTMC(2),CEA(1) & NER States(4) ,Total 16 .

Broad Estimated Cost: Rs 169.82 Cr

Implementation time: Progressively by 2014-15

Development of Analytics for various applications using PMU data shall be taken up in parallel.

Phase-2: Placement of balance 483 nos. PMUs at all HVDC terminal stations, 400kV & above voltage level S/s, generating station stepped up at 220kV level & above along with provision of Fibre Optic connectivity and communication equipments.

Broad Estimated Cost: Rs 185.57 Cr including estimated communication system (Fibre Optic & communication terminals) cost: Rs. 116.10 Cr.

Total (Phase-1 and Phase-2):

- Estimated cost of URTDSM **Phase-1** for WAMS: Rs. 169.82 Cr.
- Estimated cost of URTDSM **Phase-2** for WAMS: Rs. 69.47 Cr.
- **Total cost of WAMS (Ph-1 & 2) : Rs. 239.29 Cr.**
- Estimated cost of communication system under Phase-2: Rs. 116.10 Cr
