



भारत सरकार

**Government of India**

विद्युत मंत्रालय

**Ministry of Power**

केन्द्रीय विद्युत प्राधिकरण

**Central Electricity Authority**

ग्रिड प्रबंधन एवं एन.पी.सी. प्रभाग

**Grid Management & NPC Division**

No. 4/MTGS/NPC/CEA/2019/

Date: 19<sup>th</sup> November 2019

To

(As per the distribution list)

Subject: **Agenda for the Ninth (09<sup>th</sup>) meeting of NPC - reg.**

Madam/Sir,

The Agenda for the 9<sup>th</sup> meeting of National Power Committee (NPC) scheduled to be held on 22.11.2019 at 11:00 AM in New Delhi is enclosed for kind information please. The same is also available on CEA website.

**Meeting Venue:**

**NRPC Conference Hall (1<sup>st</sup> floor), 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016**

Kindly make it convenient to attend the Meeting.

Yours faithfully

हेमन्त जैन  
19/11/2019

(हेमन्त जैन/Hemant Jain)

मुख्य अभियन्ता एवं सदस्य सचिव, रा.वि.स /  
Chief Engineer & Member Secretary, NPC

**Copy for kind information to:**

1. Chairperson, CEA, New Delhi
2. Member (G&OD), CEA, New Delhi

### **Distribution List (Members of NPC)**

1. Shri James K. Sangma, Chairman, North Eastern Regional Power Committee (NERPC) & Hon'ble Power Minister, Govt. of Meghalaya, Meghalaya Secretariat, Shillong-793001. [Email: [wintear.sangma@gov.in](mailto:wintear.sangma@gov.in)]
2. Shri Kunji Lal Meena, IAS, Chairperson, Northern Regional Power Committee (NRPC) and Chairman & Managing Director, Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (RVPNL) Vidyut Bhawan, Jyoti Nagar, Jaipur 302005. [Email : [cmd.rvpn@gmail.com](mailto:cmd.rvpn@gmail.com)]
3. Shri Shailendra Kumar Shukla, Chairperson, Western Regional Power Committee (WRPC) & Chairman, Chhattisgarh State Power Co. Ltd., Room No. 211, 2<sup>nd</sup> Floor, Vidyut Bhawan, Dangania, Raipur- 492013. [Email: [chairman@cspc.co.in](mailto:chairman@cspc.co.in)]
4. Dr. N Manjula, IAS, Chairperson, Southern Regional Power Committee (SRPC) & Managing Director, KPTCL, Corporate Office, Kaveri Bhavan, K.G. Road, Bengaluru - 560009. [Email: [md@kptcl.com](mailto:md@kptcl.com)]
5. Shri A. B. Rai, Chairperson, Eastern Regional Power Committee (ERPC) & Principal Chief Engineer cum Secretary, Energy & Power Department, Govt. of Sikkim, Kazi Road, Gangtok-737101. [Email: [abrodung@gmail.com](mailto:abrodung@gmail.com) and, [secypower.sikkim@gmail.com](mailto:secypower.sikkim@gmail.com) ]
6. Shri Y.K. Raizada, Chairperson, Technical Coordination Committee(TCC), NRPC & Director (Technical), Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (RVPNL), Vidyut Bhawan, Janpath, Jyoti Nagar, Jaipur-302005. [Email: [dir.tech@rvpn.co.in](mailto:dir.tech@rvpn.co.in)]
7. Shri Mohd. Qaiser Abdulhaque (IAS 2007), Chairperson, Technical Coordination Committee(TCC), WRPC & Managing Director, Chhattisgarh State Power Distribution Co. Ltd., Room No. 311, 3<sup>rd</sup> Floor, Vidyut Bhawan, Dangania, Raipur- 492013. [Email: [mddiscom@cspc.co.in](mailto:mddiscom@cspc.co.in)]
8. Shri K V Shivakumar, Chairperson, Technical Coordination Committee(TCC), SRPC & Director (Transmission), KPTCL, Kaveri Bhavan, K.G. Road, Bengaluru - 560009. [Email: [dt@kptcl.com](mailto:dt@kptcl.com)]
9. Shri P. T. Bhutia, Chairperson, Technical Coordination Committee(TCC), ERPC & Principal Chief Engineer-II, Energy & Power Dept., Govt. of Sikkim, Kazi Road, Gangtok-737101.[Email: [phigu05@gmail.com](mailto:phigu05@gmail.com)]
10. Shri E. W. Nongrum, Chairman, Technical Coordination Committee(TCC), NRPC & CMD, Meghalaya Electricity Company Limited, Lumjingshai, S.R. Road, Shillong-793002. [Email: [ewnong@yahoo.com](mailto:ewnong@yahoo.com)]
11. Shri Naresh Bhandari, Member Secretary, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016.[ Email: [ms-nrpc@nic.in](mailto:ms-nrpc@nic.in)]
12. Shri Satyanarayan S., Member Secretary, WRPC, Plot No. F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-400093. [Email: [ms-wrpc@nic.in](mailto:ms-wrpc@nic.in)]
13. Shri A. Balan, Member Secretary, SRPC, No.29, Race Course Cross Road, Bengaluru-560009. [Email: [mssrpc-ka@nic.in](mailto:mssrpc-ka@nic.in)]
14. Shri J. Bandyopadhyay, Member Secretary, ERPC, 14, Golf Club Road, ERPC Building, Tollygunje,Kolkata-700 033.[ Email: [mserpc-power@nic.in](mailto:mserpc-power@nic.in)]
15. Shri A.K. Thakur, Member Secretary, NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006. [Email: [nerpc@ymail.com](mailto:nerpc@ymail.com) ]

### **Special Invitees:**

1. CMD, POSOCO, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016.
2. Director (Operation), Powergrid, Saudamini, Plot No.2, Sector-29, Gurgaon-122001

**CENTRAL ELECTRICITY AUTHORITY  
NATIONAL POWER COMMITTEE**

**AGENDA NOTES FOR THE 9<sup>th</sup> MEETING OF  
NATIONAL POWER COMMITTEE (NPC) TO BE HELD ON 22<sup>nd</sup> November 2019**

**1. CONFIRMATION OF MINUTES OF 8<sup>TH</sup> MEETING**

The Minutes of 08<sup>th</sup> meeting of NPC held on 30<sup>th</sup> November 2018 at Guwahati were circulated vide letter No. 4/MTGS/NPC/CEA/2019/121-140 dated 28<sup>th</sup> January 2019. No comments have been received.

The Minutes of 08<sup>th</sup> Meeting of NPC may please be confirmed.

**2. Automatic Under Frequency Load Shedding (AUFLS) Scheme and Mapping of Feeders**

**(A) Review of AUFLS Settings**

- 2.1 As per the decision in the 2<sup>nd</sup> meeting of NPC held on 16<sup>th</sup> July 2013, the following AUFLS scheme with 4 stages of frequency viz. 49.2 Hz, 49.0 Hz, 48.8 Hz & 48.6 Hz had been implemented in all the regions:

AUFLS	Frequency (Hz)	Load relief in MW					
		NR	WR	SR *	ER	NER	Total
Stage-I	49.2	2160	2060	2350	820	100	7490
Stage-II	49.0	2170	2070	2360	830	100	7530
Stage-III	48.8	2190	2080	2390	830	100	7590
Stage-IV	48.6	2200	2100	2400	840	100	7640
<b>Total (MW)</b>		<b>8720</b>	<b>8310</b>	<b>9500</b>	<b>3320</b>	<b>400</b>	<b>30250</b>

\*SR grid not integrated with NEW grid at that point of time.

The existing Region wise/State wise details of AUFLS and df/dt settings are given at **Annexure-I**

- 2.2 In the 7<sup>th</sup> meeting of NPC held on 08<sup>th</sup> September 2017, it was agreed that there is need for review of the quantum of load shedding without introduction of additional slabs/stages of frequency. The RPCs were to deliberate on additional slabs of frequency as well as raising the set frequency for UFR operation and inform the outcome to NPC.
- 2.3 During the presentation of Consultants Reports on Package A&B on “Power System Analysis Under Contingencies” held at CERC on 05<sup>th</sup> March 2018, CERC had advised the stakeholders to assess the need to revisit the setting of UF relays at 49.2 Hz.
- 2.4 Subsequently, WRPC had intimated that a meeting to review the stages and quantum in the existing Automatic Under Frequency Load Shedding Scheme (AUFLS) was held on

13.03.2018 at WRPC Mumbai. In general, it was agreed that the frequency setting of various stages of AUFLS be raised by 0.2 Hz from existing level while keeping the state-wise load shedding quantum same.

- 2.5 Subsequently, SRPC vide letter dated 18.05.2018 had requested NPC to suggest the UFR quantum to be adopted by Southern Region in the evolving grid scenerio.

In view of the above and considering the change in grid size etc., NPC Secretariat vide letter dated 30.05.2018 had communicated the following two options for UFR quantum to RPCs for consideration:

**(a) AUFLS scheme with 4 stages of frequency viz. 49.2, 49.0, 48.8 & 48.6 Hz**

AUFLS	Frequency (Hz)	Load relief in MW					
		NR	WR	SR	ER	NER	Total
Stage-I	<b>49.2</b>	3920	3360	3170	1380	170	12000
Stage-II	<b>49.0</b>	3950	3380	3190	1380	170	12070
Stage-III	<b>48.8</b>	3970	3400	3210	1390	170	12140
Stage-IV	<b>48.6</b>	4000	3430	3230	1400	170	12230
<b>Total (MW)</b>		<b>15840</b>	<b>13570</b>	<b>12800</b>	<b>5550</b>	<b>680</b>	<b>48440</b>

**(b) AUFLS scheme with 4 stages of frequency viz. 49.4, 49.2, 49.0 & 48.8 Hz**

AUFLS	Frequency (Hz)	Load relief in MW					
		NR	WR	SR	ER	NER	Total
Stage-I	<b>49.4</b>	3900	3340	3150	1370	170	11930
Stage-II	<b>49.2</b>	3920	3360	3170	1380	170	12000
Stage-III	<b>49.0</b>	3950	3380	3190	1380	170	12070
Stage-IV	<b>48.8</b>	3970	3400	3210	1390	170	12140
<b>Total (MW)</b>		<b>15740</b>	<b>13480</b>	<b>12720</b>	<b>5520</b>	<b>680</b>	<b>48140</b>

- 2.6 NPC, in its 08<sup>th</sup> meeting held on 30.11.2018, agreed for the AUFLS scheme with 4 stages and raising the frequency by 0.2 Hz viz. 49.4, 49.2, 49.0 & 48.8 Hz. It was further decided that the quantum for AUFLS would be reworked by NPC Secretariat considering the requirement of load shedding to increase the frequency to 50 Hz in each stage of AUFLS operation. **The quantum of AUFLS considering the above criteria has been calculated by NPC Secretariat (considering Power Number as 7,000 and 10,000) (detailed calculation at Annexure-II) and is summarized below:**



**(a) Frequency Dependence(FD)=1.5% & Assumed Power Number(P)=7000**

AUFLS	Frequency (Hz)	Load relief in MW					
		NR	WR	SR	ER	NER	Total
Stage-I	<b>49.4</b>	2350	2000	1850	850	100	7150
Stage-II	<b>49.2</b>	3160	2690	2480	1140	140	9610
Stage-III	<b>49.0</b>	3970	3380	3110	1140	170	12070
Stage-IV	<b>48.8</b>	4800	4080	3760	1730	210	14580
<b>Total (MW)</b>		<b>14280</b>	<b>12150</b>	<b>11200</b>	<b>5160</b>	<b>620</b>	<b>43410</b>

**(b) Frequency Dependence(FD)=1.5% & Assumed Power Number(P)=10,000**

AUFLS	Frequency (Hz)	Load relief in MW					
		NR	WR	SR	ER	NER	Total
Stage-I	<b>49.4</b>	3360	2860	2640	1220	140	10220
Stage-II	<b>49.2</b>	4510	3840	3540	1630	190	13710
Stage-III	<b>49.0</b>	5680	4830	4450	2050	240	17250
Stage-IV	<b>48.8</b>	6850	5830	5370	2480	290	20820
<b>Total (MW)</b>		<b>20400</b>	<b>17360</b>	<b>16000</b>	<b>7380</b>	<b>860</b>	<b>62000</b>

2.7 It was also decided that NRPC may appoint a Consultant from their own resources as proposed by MS, NRPC in the 8<sup>th</sup> NPC meeting, for studying the AUFLS scheme for Indian grid and submit the study report to NPC Secretariat within a time of six months. The revised load relief for AUFLS computed by NPC Secretariat would be discussed along with the study report of Consultant appointed by NRPC (if available) in the next meeting of NPC.

2.8 NPC vide letter dated 08.05.2019 (**Annexure-III**) had sought the study report of Consultant on AUFLS from NRPC which has not been received. However, NRPC, vide letter dated 24<sup>th</sup> May 2019 and 17<sup>th</sup> July 2019 (**Annexure-IV**), had proposed the constitution of a Committee consisting of CPRI- Nodal agency for the study team, experts in the field of AUFLS and ROCOF load shedding, experts from CEA/NPC/RPC for carrying out the study. NRPC had further proposed that the cost may be shared equally amongst all RPCs.

**The Committee may like to deliberate on the subject issue.**

## (B) Mapping of Feeders for AUFLS:

In the 8<sup>th</sup> Meeting of NPC held on 30.11.2018, it was agreed that each RPC would submit the details / progress of feeder mapping to NPC Secretariat on a regular (**quarterly**) basis.

The latest status furnished by the RPCs are as follows:

**SRPC** has informed that 84 % *mapping of feeders on SCADA had been completed in SR as on 31<sup>st</sup> March 2019 (AP=63%, TS=67%, KAR =100%, KER=100%, TN=89% & PUDU=90%)*.

### **NRPC**

The issue is being regularly deliberated in every OCC meeting. A separate meeting was also held on 23.05.2019 and the issue was further deliberated in 160<sup>th</sup> OCC meeting wherein it was decided that:

- All the feeders coming under UFR and df/dt scheme shall be mapped in the display. In case data is not available, alternate feeder details are to be mapped. All the details (main feeder details and alternate feeder details) to be mapped before 30<sup>th</sup> June 2019.
- All the state utilities shall check and monitor the UFR, df/dt display on monthly basis and submit the monthly progress report to NRPC / NRLDC.
- All the suspected data in the mapping shall be monitored on daily basis and accordingly remedial measures shall be taken.

The updated status of mapping of UFR and df/dt in SCADA in percentage is as follows:

### **% SCADA data visibility**

State Name	UFR (Main)	UFR (Alternate)	df/dt (Main)	df/dt (Alternate)
<b>Punjab</b>	67	13	77	12
<b>Haryana</b>	91	0	0	0
<b>Rajasthan</b>	29	75	100	100
<b>Delhi</b>	100	100	100	100
<b>Uttar Pradesh</b>	2	0	48	0
<b>HP</b>	88	79	73	0
<b>Uttarakhand</b>	0	0	0	0
<b>J&amp;K</b>	0	0	0	0

### **WRPC:**

The implementation status as confirmed in the 520<sup>th</sup> OCC meeting held on 13.06.2019 is as follows:

- SLDC Maharashtra representative informed that 7 no. of feeders identified for feeder mapping.
- SLD Gujarat representative informed that feeder mapping on pilot project will be completed by July 19.
- SLDC Madhya Pradesh representative informed that 33kV feeders are mapped and visible in MPPTCL SCADA.

### **ERPC:**

- In 154<sup>th</sup> OCC meeting held on 21<sup>st</sup> February 2019, DVC informed that mapping of the UFR feeders had already been implemented in DVC system.
- In 40<sup>th</sup> TCC meeting held on 15<sup>th</sup> March 2019, Bihar and Jharkhand have confirmed that mapping of the UFR feeders has been implemented.
- West Bengal informed that out of 18 S/s only 6 S/s data are available at SLDC. For the remaining 12 S/s the RTUs are old and needed replacement. WBSETCL added that they have already placed a proposal for PSDF funding.
- OPTCL informed that out of 58 feeders only 14 feeders data are available at SLDC. For mapping of the remaining feeders, the RTUs needed to be replaced as they were old. OPTCL added that replacement of old RTUs is in advance stage and it would be implemented within a year.

**NERPC:** No status update has been received.

**RPCs may update the status to the Committee.**

### **3. Ensuring Proper Functioning of Under Frequency Relays (UFR) & df/dt Relays**

- 3.1 In the 7<sup>th</sup> meeting of NPC held on 08.09.2017, it was decided that mock test is good enough to test the healthiness of the UFR & df/dt relays. RPC Secretariat shall carry out periodic inspection in line with the provisions of IEGC. The frequency of site inspection was proposed to be up to six months. RPC Secretariat to furnish the inspection reports to NPC Secretariat.

The information furnished by the RPCs are as follows:

#### **SRPC:**

Inspection of UFR & df/dt relays for the year 2019-20 would be taken up.

#### **NRPC:**

- The status is being regularly monitored in the OCC meetings. Report of Mock exercise for healthiness of UFRs carried out by utilities themselves on quarterly basis is regularly submitted to NRPC Secretariat and NRLDC. All utilities were also advised to certify specifically, in the report that “All the UFRs are checked and found functional”.
- The information of period ending June 2019 has been submitted by Punjab, Delhi while information of period ending March 2019 has been submitted by UP, Haryana, Delhi, Punjab and Rajasthan. The information for quarter ending 12/2018 was submitted by BBMB, UP and Rajasthan.

#### **WRPC:**

From December 20018 till June 2019, UFRs were tested for proper functioning, by WRPC secretariat at the following 15 locations:

May 19- 220kV Sawangi S/S(MSETCL)- 2 Nos

May 19- 132kV Gangapur S/S(MSETCL)- 3 Nos

April 19- 132kV Ayodhya S/S(MPPTCL)- 10 Nos

#### **ERPC:**

- In Eastern Region, a sub-group has been constituted for carrying out site inspection of UFR relays installed in Eastern Region regularly using secondary injection kit.
- All the constituents are submitting the healthiness certificate of UFRs installed in their control area in monthly OCC meetings.

#### **NERPC:**

No status update has been received.

**RPCs may update the status to the Committee.**

- 3.2 In the 08<sup>th</sup> meeting of NPC held on 30.11.2018, MS, NPC had pointed out that the df/dt schemes are different in NR, WR & SR (**Annexure-V**) and suggested to have a uniform scheme of df/dt. It was decided that NPC Secretariat would work out a common approach for df/dt settings in all the five regions and bring the same in the next meeting of NPC.

**In this regard, it is proposed to form a Sub-group with members from RPCs, RLDCs/NLDC and NPC to work out a common approach for df/dt settings in all the five regions.**

**The Committee may like to deliberate on the subject issue.**



#### **4. Implementation of Automatic Generation Control (AGC) in India (at Inter-State level)**

4.1 CERC in its order dated 13.10.2015 in Petition No. 11/SM/2015 reiterated the need for mandating Primary Reserves as well as enabling Secondary Reserves, through Automatic Generation Control (AGC) as follows:

*“(a) All generating stations that are regional entities must plan to operationalise AGC along with reliable telemetry and communication by 1st April, 2017. This would entail a one-time expense for the generators to install requisite software and firmware, which could be compensated for. Communication infrastructure must be planned by the CTU and developed in parallel, in a cost-effective manner.*

*(b) On the other hand, National/Regional/State Load Dispatch Centres (NLDC/RLDCs/SLDCs) would need technical upgrades as well as operational procedures to be able to send automated signals to these generators. NLDC /RLDCs and SLDCs should plan to be ready with requisite software and procedures by the same date.*

*(c) The Central Commission advises the State Commissions to issue orders for intra-state generators in line with this timeline as AGC is essential for reliable operation of India’s large inter-connected grid.”*

4.2 In the 7<sup>th</sup> meeting of NPC held on 08.09.2017, POSOCO had shared the experience in implementation of AGC at Dadri Station of NTPC in NR. It was decided that AGC would be discussed in detail in a special meeting in respective RPCs. The discussions would include aspects of implementation of primary and tertiary controls also. For this, the agenda would be sent by POSOCO and routed through NPC Secretariat to have a common approach and national perspective. Accordingly, agenda on AGC was submitted by POSOCO and the same was sent to all RPCs for deliberation in the respective RPC forums.

4.3 A special meeting on AGC issues had been conducted on 28<sup>th</sup> March 2018 in SRPC and on 17<sup>th</sup> September 2018 in WRPC. The Minutes of the meetings are available on the website of respective RPCs.

This issue was also discussed in the 34<sup>th</sup> meeting of SRPC and 41<sup>st</sup> meeting of NRPC. Extract from the Minutes of 34<sup>th</sup> Meeting of SRPC, record notes of AGC meeting held on 17.09.2018 at WRPC and minutes of 41<sup>st</sup> meeting of NRPC is at **Annexure-VI**.

4.4 In the 08<sup>th</sup> meeting of NPC held on 30.11.2018, it was agreed that all RPCs and NLDC shall provide updated information on status of implementation of AGC, to NPC Secretariat.

4.5 NPC Secretariat, vide letter dated 09<sup>th</sup> May 2019 (**Annexure-VII**), had requested NLDC to provide the status of implementation of AGC for deliberations in the 09<sup>th</sup> meeting of NPC. In the meantime, status as furnished by RPCs as under:

**SRPC:**

The issue was discussed in detail in the 34<sup>th</sup> TCC/35<sup>th</sup> SRPC meeting held on 01/02.02.2019 (copy of deliberation is enclosed as **Annexure-VIII**). In line with the decision taken in the SRPC Meeting, a Special Meeting for implementation of Pilot project in the states was also held at SRPC, Bengaluru on 14.03.2019 (MOM available on SRPC website). The units identified for AGC in the states are given below:

<b>States</b>	<b>SLDC</b>	<b>Generators</b>
Andhra Pradesh	AP SLDC	Krishnapattnam Lower Sileru (would be taken up later)
Kerala	KER SLDC	Kuttiadi Idukki
Tamil Nadu	TN SLDC	North Chennai Stage-II Mettur Stage-III
Telangana	TS SLDC	Kothagudem E

The following are the recommendations finalized in the Meeting held on 14.03.2019:

- All SLDCs and respective generators were requested to kindly jointly finalise scope of work /technical specifications in an expeditious manner. The objective should be to complete the AGC project by end of December 2019.
- It was suggested that SLDCs could have the AGC infrastructure keeping in view the perspective plan of integrating all the units (which would be wired for AGC) in their control area. If the SLDCs go for pilot project now, there may be a need for a full-fledged AGC system in near future. The AGC at the balance generating units could be rolled out in a phased manner.
- SLDCs / generators were requested to kindly keep their respective SERCs informed.
- SLDCs / generators were requested to take up the issue of mark up (if any) for smooth implementation of AGC in the states.
- SLDCs / generators requested the OEMs to assist in preparing the scope of work, finalizing the technical specifications etc. OEMs stated that they would take a call and requested SLDCs/ generators to communicate their requirements separately.
- LOA would be placed by LDCs/generators as per the stipulated procurement guidelines etc in their states.
- Software specifications at NLDC would be furnished in a couple of days by NLDC.
- SLDCs / generators were requested to initiate the works and seek the expert advice of NLDC (if required) after carrying out preliminary works.
- NLDC had stated that all the technical specifications had been furnished. States should commence framing the draft scope of work/technical specifications.

### **NRPC:**

The agenda has been discussed in 44<sup>th</sup> NRPC meeting, held on 19<sup>th</sup> March, 2019, wherein it was evolved that this agenda needs to be discussed further.

### **WRPC:**

The discussions in the 516<sup>th</sup> OCC meeting held on 11.02.2019 is as follows:

Gujarat representative informed that Ukai unit 6 was identified the project for AGC implementation. Further, he informed that Hon'ble SERC Gujarat has not released order specific to AGC. Chhattisgarh representative informed that Korba west unit 5 was identified for AGC project. NTPC Mouda representative informed that AGC was implemented and tested in NTPC Mouda stg-I. In case of Stage –II, testing is over and NLDC suggested to operationalise with effect from 15/02/2019 He also informed that AGC command can be given to change 50±25MW. NLDC representative informed that AGC response in NTPC Mouda can be improved in comparison to NTPC Simhadri and NTPC Dadri. MS,WRPC requested NTPC Mouda representative to give a presentation in next OCC on operation issues, challenges and performance of AGC implementation in NTPC Mouda.

In the 518<sup>th</sup> OCC meeting following was updated:

Under the pilot project, 2x660 MW Mouda Stage-II units started remote operation under AGC on 20 Mar 2019. Area control Error of Western Region was being scaled down for generating AGC signals for Mouda –II - When ACE is positive regulation down was sent and when ACE is negative regulation up was sent to Mouda-II. - The first account for energy dispatch under AGC for the week 18.03.2019 to 24.03.2019 had been released by WRPC. Gradually other units shall be included in AGC.

### **ERPC:**

In 161<sup>st</sup> OCC meeting held on 20<sup>th</sup> September 2019, NTPC informed that AGC at Unit#4 & 5 of Barh STPS stage II was successfully implemented.

In 40<sup>th</sup> TCC meeting held on 15<sup>th</sup> March 2019, DVC confirmed that unit#8 of Mejia TPS has been identified for AGC implementation as a pilot project. Odisha informed that unit#3 of OPGC had been selected for implementation of AGC. WBPDCI informed that unit#5 of Bakreswar had been selected for implementation of AGC.

**RPCs and NLDC may update the status to the Committee.**

## **5. Grid Events reported by RLDCs, Analysis and Remedial Measures recommended by RPCs:**

- 5.1 Regulation 13(2) of Central Electricity Authority (Grid Standards), Regulations, 2010 provide that: “The grid disturbance resulting in failure of power supply to large areas in a State shall also be reported by the Regional Load Despatch Centre to the Authority within twenty-four hours of the occurrence of the grid disturbance.” The work related to

grid disturbances on regional/national basis in CEA is being dealt in the National Power Committee (NPC) Secretariat. Accordingly, all the RLDC were requested to sent any occurrence of the grid disturbance to NPC Secretariat, CEA with a copy to Member (GO&D), CEA.

5.2 As per Regulation 15(6) of Central Electricity Authority (Grid Standards) Regulations, 2010 “Regional Load Despatch Centre shall classify the grid incidences and grid disturbances according to Regulation 11, analyse them and furnish periodic reports of grid incidences and grid disturbances to the Regional Power Committee which shall recommend remedial measures to be taken on the report of Regional Load Despatch Centre to prevent recurrence of such grid incidence and grid disturbances.”

5.3 Accordingly, RPCs are being requested to send a copy of the analysis report on those grid events reported by RLDCs to CEA, along with remedial measures recommended to prevent the recurrence of such incidences and disturbance.

5.4 In the 08<sup>th</sup> meeting of NPC held on 30.11.2018, it was agreed that all RPCs would conduct regular meetings of Protection Sub-Committee for analyzing all the trippings and take remedial actions and the same would be furnished to NPC Secretariat on a regular basis.

5.5 The dates of Protection Coordination Sub Committee meetings (source: RPCs website) conducted by the RPCs after 8<sup>th</sup> meeting of NPC is tabulated below:

SRPC	NRPC	WRPC	ERPC	NERPC
85 <sup>th</sup> PCSC 31.07.2019	38 <sup>th</sup> PSC 01/02.08.2019	138 <sup>th</sup> PCM 17.10.2019	85 <sup>th</sup> PCC- 19.11.2019	53 <sup>rd</sup> PCC 11.07.2019
84 <sup>th</sup> PCSC 26/27.06.2019	37 <sup>th</sup> PSC 21.01.2019	137 <sup>th</sup> PCM 17.07.2019	84 <sup>th</sup> PCC 23.10.2019	52 <sup>nd</sup> PCC 13.12.2018
83 <sup>rd</sup> PCSC 16.05.2019		136 <sup>th</sup> PCM 17.05.2019	83 <sup>rd</sup> PCC 27.09.2019	
82 <sup>nd</sup> PCSC 28.03.2019		135 <sup>th</sup> PCM 26.02.2019	82 <sup>nd</sup> PCC 25.06.2019	
81 <sup>st</sup> PCSC 24-01-2019			81 <sup>st</sup> PCC 18.07.2019	
80 <sup>th</sup> PCSC 21.12.2018			80 <sup>th</sup> PCC 18.07.2019	

**RPCs may apprise the Committee of the analysis of trippings and remedial actions taken thereof.**

## **6. Scheme for Protection System Data Base Management System (PDMS) in RPCs**

- 6.1 The Task Force headed by Shri V. Ramakrishna had submitted the Report on “Power System Analysis under Contingencies” which had recommended as under for creation of database for relay settings.

*“10.12.3 There is also a need for creating and maintaining data base of relay settings. Data regarding settings of relays in their network should be compiled by the CTU and STUs and furnished to the RLDC and SLDC respectively and a copy should also be submitted to RPC for maintaining the data base.”*

- 6.2 The scheme of ERPC and SRPC for above purpose have been sanctioned grant from PSDF by MoP. In the 6<sup>th</sup> meeting of NPC held on 19.12.2016, it was agreed that NRPC, WRPC & NERPC would also create data base of relay setting in their regions as per the scheme finalized by ERPC / SRPC.

- 6.3 In the 7<sup>th</sup> meeting of NPC held on 08.09.2017, NRPC and NERPC had informed that they were in the process of submission of DPR for funding from PSDF. WRPC had informed that they would like to go for in-house development of the data base which could be in excel or SQL format and if any needs arises they would opt for development through third party

- 6.4 Subsequently, the PDMS proposals submitted by NRPC and NERPC for funding from PSDF were approved by the Monitoring Committee of PSDF.

- 6.5 In the 08<sup>th</sup> meeting of NPC held on 30.11.2018, RPCs informed the following:

- i) ERPC: Protection System Data Base has been implemented and it is in service from 31.10.2017.
- ii) SRPC: The scheme is likely to be completed by February 2019.
- iii) NERPC: The project has been awarded & work started. The project is likely to complete by March 2020.
- iv) NRPC: The NIT was floated on 30<sup>th</sup> August 2018. As there were very few bidders, re-tendering is proposed. It is also informed that Chairperson, NRPC while approving the proposal, raised apprehension on awarding the works to the same agency involved in other regions.
- v) WRPC: The in-house development of protection database is in good progress. Work of around 30% is over. The scheme would be implemented in WR before next meeting of NPC and the experience would be shared.

- 6.6 The updated status in this regard has been received from RPCs and is given below:

**SRPC:** The Protection Management System (PMS) project undertaken by the constituents of SR region and implemented by M/s PRDC had the following milestones as per LoA. Milestone wise compliance status (as on 12.04.2019) is indicated in the table below:

S.No.	Description of Milestone/ Deliverables	Percentage Completed by PRDC
1.	Submission of High level Design Document for implementation of web based protection management system & protection setting calculation tool for Southern Region to SRPC	100%
2.	Delivery of 35 No of base license of protection calculation engine along with laptops	100%
3.	Delivery of associated servers, Installation and deployment of application and database software along with standard operating System	100%
4.	Delivery of web based database management system software	100%
5.	Building the entire southern region Network Data for operational load flow and fault calculation	50%
6.	Completion of Training program on the desktop based protection setting calculation software	100%
7.	Site Acceptance Test (SAT) with one pilot state system	65%
8.	Real time interactive hardware and software at selected 400 kV substation at central location for fault analysis and reporting	95%
9.	Building the entire southern region protection database and substation SLD preparation for protection study	13%
10.	Uploading all SR-Constituents Data along with SLDs and Go- Live.	NIL
11.	Extended Technical Services (Additional 5 years)	NIL

The completion of the Project is likely to be delayed by 3 - 4 months from the envisaged time-line of 9th February, 2019. **This is primarily on account of delay in achieving the Milestones – 5, 7, 9 & 10.**

**NRPC:**

- A tender was published on Central Public Procurement (CPP) Portal of Govt. of India and NRPC website for Protection System Database in NRPC on 30.08.2018 which was retendered twice to ensure healthy and effective competition.



- However, tender has now been cancelled due to lack of competition and necessary actions are being taken to reshape the scheme of Protection System Database in NRPC.
- The issue was deliberated in 42nd TCC/45th NRPC meetings held on 07th and 08th June, 2019, it was informed that even after going with the tendering process three times, no bidder has been found to be suitable in the Technical evaluation due to lack of competition. It was stated that in the 8th NPC meeting held on 30.11.2018, the efforts of WRPC for in-house development of the database was appreciated and NRPC was suggested to seek assistance of WRPC in case no bidder comes up after retendering. In view of the above it was proposed that rather than going for an external agency for creating the database of Protection setting, NRPC should proceed as being done by WRPC. Accordingly, two options were discussed in view of the non-selection of third party and the advice of NPC.
- First option was that all the STUs shall submit the protection setting data in a time bound manner so as to comply with the recommendations of Enquiry Committee on grid disturbance of 30th & 31st July 2012, 'Task Force on Power System Analysis under Contingencies'. Further it was informed that 13 utilities have already submitted the above data and others could also provide the same in a time bound manner. However, all utilities were requested to furnish the data afresh so as to cater to any changes made in the settings. For the first option, all the states were requested to appoint some nodal officers (SE level or above) for facilitating the collection of protection setting data. To facilitate manpower, it was also proposed that the States may depute their one or two officers in NRPC for some period on rotation basis.
- Second option was to approach to any central agency like CPRI without any change in scope of work as already approved so that the approved PSDF funding could also be utilized. It was also clarified that NRPC so far has not discussed the matter with CPRI.
- TCC was of the view that the Protection setting are already available with the substation personnel and any third party engaged would also require the help of the substation personnel for extracting the settings from the relay. Also, in case of some changes in the setting, the substation personnel shall have the responsibility of reflecting the changes accordingly in the centralized database

and for that he should be well aware of how to extract the settings and getting it reflected in the centralized database. They also opined that a portal may also be made on which the changes made in the protection settings could be updated in real time.

- In view of the above TCC decided to initially go for the first option and advised utilities to nominate the nodal officers at the earliest so that the database could be operationalized as soon as possible. TCC opined that matter may also be discussed with CPRI and its outcome may be informed in the next meeting.
- In view of the meetings, all utilities are advised to go forward with the collection of the data and appointment of nodal officers and by that time the possibility of CPRI collecting the data is also being explored.
- NRPC vide letter dated 22.10.2019 (**Annexure-IX**) intimated that as per decision taken in 43<sup>rd</sup> TCC/46<sup>th</sup> NRPC meetings held on 23<sup>rd</sup> and 24<sup>th</sup> September, 2019 the **sanctioned scheme of Development of Protection Database Management System in NR would not be proceeded as per the scope of work in the DPR submitted for PSDF funding. As such, the proposal is scrapped and the grant of Rs. 28 Crore which was sanctioned for the project from PSDF may be cancelled.** Further, it was also approved in this meeting that protection setting data may be submitted by STUs and CTU to SLDCs and NRLDC respectively with a copy to NRPC for maintaining database. The guidelines for data collection in an orderly and time bound manner will be finalized in next Protection sub-committee meeting.

#### **WRPC:**

- Relay setting database is under preparation.

#### **ERPC:**

- Protection System Data Base has been implemented and it is in service from 31.10.2017.

#### **NERPC:**

- NERPC informed that PDMS project was awarded in Sep'2018 and the project is slated to be commissioned in Dec'2019.

6.8 In the 8<sup>th</sup> NPC meeting held on 30.11.2018, WRPC had proposed to share the experience of in-house development of Protection database in the next meeting of the NPC. **WRPC may share their experience. Other RPCs may also update the status and share the experience.**

## **7. Monitoring of Schemes Sanctioned Grant from PSDF**

7.1 MoP has sanctioned grant of around Rs. 11,282 Crores (140 Schemes as on 31.10.2019) to States/ Central Power utilities/RPCs from PSDF. The details of the schemes are at **Annexure-X**. Region wise summary is given below:

<b>Sr. No.</b>	<b>Region</b>	<b>No. of Schemes</b>	<b>Grant Sanctioned (Rs. Crores)</b>	<b>Grant Disbursed (Rs. Crores)</b>	<b>Grant Disbursed ( %age)</b>
1	Northern	26	2017.30	662.41	32.83
2	Western	31	1107.38	156.84	14.16
3	Southern	31	1908.53	900.72	47.19
4	Eastern	23	1001.19	331.96	33.15
5	North Eastern	21	665.34	364.61	54.80
6	All India Schemes (PGCIL,REC, BBMB, DVC)	08	4582.32	4130.82	90.15
<b>Total</b>		<b>140</b>	<b>11282.06</b>	<b>6547.37</b>	<b>58.03</b>

**It is observed that utilization of grant by state utilities in different regions is not satisfactory vis-a-vis central sector utilities.**

- 7.2 In the 14<sup>th</sup> meeting of Monitoring Committee of PSDF held on 07.01.2019, the issue of physical monitoring of the sanctioned projects was discussed. The physical monitoring has been initiated by officers from CEA, RPCs, POSOCO and PGCIL
- 7.3 It was agreed in the 5th meeting of Project Monitoring Group of PSDF held on 24.10.2017 that the project monitoring meetings would be carried out at regional level with participation of all the concerned entities in the region to review the progress of the project/schemes being funded from PSDF, to expedite their implementation. Accordingly, meetings on regional basis were conducted in all regions: SR (05.01.2018), WR (09.02.2018), NR (04.05.2018 and 23.07.2019), ER ( 08.06.2018), NER (13.09.2018). During the meetings of Project Monitoring Group, the following was observed:

- Delay in signing of the Tri/Bi-partite agreements for already sanctioned projects.
- Delay in the implementation of projects, and it results into not meeting the objectives of projects funded from PSDF.

**Committee may like to deliberate on the issue.**

## **8. Status of Compliance of Enquiry Committee Recommendations**

8.1 There was a major grid disturbance in Northern Region at 02.33 hrs on 30.07.2012. Northern Regional Grid load was about 36,000 MW at the time of disturbance. Subsequently, there was another grid disturbance at 13.00 hrs on 31.07.2012 resulting in collapse of Northern, Eastern and North-Eastern regional grids. The total load of about 48,000 MW was affected in this black out. On both the days, few pockets survived from black out. Ministry of Power constituted an Enquiry Committee, to analyse the causes of these disturbances and to suggest measures to avoid recurrence of such disturbance in future.

8.2. Factors contributed to initiation of grid collapse:

- i. Depleted transmission network mainly in the NR-WR interface
- ii. Overdrawals by some states attributable to frequency control through commercial signals
- iii. Inability to control flow on 400 kV Bina-Gwalior-Agra line
- iv. Non-compliance of directions of RLDCs by SLDCs
- v. Protection System Issues

8.3 Measures recommended by Enquiry Committee to avoid re-occurrence in future is at **Annexure-XI**.

8.4 In the 8<sup>th</sup> meeting of NPC held on 30.11.2018, Chairperson, NPC & CEA advised that all the RPCs may update the status of implementation of the recommendation of the Enquiry Committee **on quarterly basis** and furnish the same to NPC Secretariat.

8.5 The status available with NPC Secretariat is as per the following communications from RPCs:

- (a)NRPC: Email dated 13.09.2019
- (b)WRPC: Email dated 19.02.2019
- (c)SRPC: Email 08.03.2019
- (d)ERPC: Email dated 01.02.2019
- (e)NERPC: Not received

The information furnished by the RPCs are at **Annexure-XII**.

**RPCs may update the status to the Committee.**

## **9. National Energy Account (NEA)**

- 9.1 In the 7<sup>th</sup> meeting of NPC held on 08.09.2017, MS, SRPC had expressed concern on the proposal of amendment in CBR in respect of inclusion of Preparation and issuance of **National Energy Account (NEA)** for inter-regional and inter-national energy transactions by NPC Secretariat, as the same was not deliberated in RPC forums. Member Secretary, NPC had clarified that while processing the proposal of membership of NLDC in NPC, MoP had raised some queries/observations and sought comments of CEA. One of the observation was that *considering the changing scenarios, the functions of NPC may also be broadened including the functions of maintain the National Energy Account involving the inter-national and inter-regional transmission transactions*. Accordingly, comments of CEA had been furnished to MoP.
- 9.2 NLDC had informed that the issue of creation of National Pool account was under deliberation in various forums in view of the formation of all India grid. Inter-regional transactions needed to be accounted at national level and with the formation of National Power Committee it is possible also.
- 9.3 Chairperson, NPC had suggested that an agenda in this regard with detailed procedure / institutional arrangement etc. could be presented by NLDC in the next meeting of NPC, and the same was agreed.
- 9.4 NLDC vide letter dated 09<sup>th</sup> November 2018 (**Annexure-XIII**) had furnished agenda note on National Energy Account & National Deviation Pool Account. NLDC has stated that in order to streamline the accounting and settlement at national level there is a need for implementing a National Deviation Pool based on the National Energy Account. Summary of the proposed methodology is as follows:
- (a) Scheduling: Scheduling interregional transactions on a net basis for each region. NLDC shall communicate the net inter-regional schedules to the NPC for accounting.
- (b) Metering: SEM data shall be collected by the RLDCs, processed meter data shall be made available to NPC through NLDC.
- (c) Accounting & Settlement: Based on the scheduling and meter data provided, NPC shall prepare the National Energy Account (NEA) including the National Deviation Account for the inter-regional and trans-national transactions. The NEA will reflect the payables/receivables for each region on a net-basis and this amount shall be payable/receivable to the National Deviation Pool Account which shall be operated by NLDC. The NEA shall also reflect the cross-border or trans-national

transactions and the neighboring countries shall be paying/receiving to/from the National Deviation Pool Account operated by NLDC. Payment to the National DSM Pool shall have the highest priority.

- (d) Handling Surplus/Deficit in Regional Pool Accounts and transfer of residual to PSDF: Once the National DSM Pool becomes operational, all residual/surplus amount in the regional DSM pools shall be transferred to the National DSM pool account. The NPC accounts would also facilitate the transfer of funds from the surplus available in the National DSM pool to the deficit regional DSM pool accounts as a single transaction thereby simplifying the process. Once all liabilities have been met, any residual in National DSM Pool shall be transferred periodically to the PSDF in accordance with the extant CERC Regulations.

9.5 Suitable changes/modifications are required to be carried out in the IEGC and DSM Regulations and the functions of NPC also need to be recognized in the regulatory frame work.

9.6 In the 08<sup>th</sup> meeting of NPC held on 30.11.2018, it was decided that the proposal may be discussed in all the RPCs and the observations of RPCs may be furnished to NPC Secretariat. The observations of RPCs may be put up for consideration in the next meeting. RPCs may include the proposal as an agenda item in their upcoming meetings for deliberations and RPCs agreed for the same.

9.7 The following information w.r.t NEA have been received from RPCs:

**SRPC**: The proposal of National Energy Account was discussed in the Special Meeting held on 11.01.2019 (**Annexure-XIV**). On suggestion of NLDC, that their inputs were not included in the MOM, the addendum to the MOM was also issued. The proposal of NEA was also discussed in the 34<sup>th</sup> TCC / 35<sup>th</sup> SRPC meetings held on 01/02.02.2019 wherein, NLDC had informed that Hon'ble CERC had sought a paper on NEA. The observations of SRPC would be duly considered while submitting the final proposal to Hon'ble Commission.

**NRPC**: The agenda has been discussed in 44<sup>th</sup> NRPC meeting held on 19<sup>th</sup> March, 2019, wherein it was decided that a National Pool Account may be maintained by NLDC for settlement of inter-regional and cross border transactions and NRPC may issue the net deviation.

**WRPC**:

In the 37<sup>th</sup> WRPC meeting held on 18.12.2018, Member Secretary requested all the constituents to submit their views. All constituents were agreed that they will submit views on NEA within one week to WRPC Secretariat.



NPCIL have given comments that the existing practice of preparing REA by RLDC and approval may continue. National Energy Account (NEA) may be prepared by NPC Secretariat for inter-regional and international energy account from the REA issued by RPCs

**ERPC:**

In 40<sup>th</sup> TCC meeting, it was clarified by NLDC that the existing responsibilities of the RPCs for energy accounting including inter regional and trans-national transactions shall remain intact. Only the national DSM pool account shall take care of the receipt and disbursement of interregional and trans-national transactions. This will avoid loop flow of money.

TCC observed that before operationalization of the DSM pool account, necessary changes in the regulation are required.

- 9.8 NPC Secretariat, vide letter dated 09<sup>th</sup> May 2019 (**Annexure-XV**), had requested NLDC to provide a copy of the paper on NEA submitted to CERC, for deliberations in the 09<sup>th</sup> meeting of NPC.

**RPCs may apprise their views and NLDC may present the paper on NEA submitted to CERC.**

**The Committee may like to deliberate on the subject issue.**

**10. POWER SYSTEM STABILISERS TUNING:**

- 10.1 The Enquiry Committee constituted by GoI to enquire into grid disturbances of July 2012 had recommended proper tuning of electronic devices and PSS of generators.
- 10.2 In the 04<sup>th</sup> meeting of NPC, NRPC submitted their recommended procedure to NPC for comments / adoption by other RPCs so as to bring uniformity across all the regions (**Annexure-XVI**).
- 10.3 In the 05<sup>th</sup> meeting of NPC held on 08.04.2016, following was observed:
- SRPC informed that the PSS methodology in line NRPC has been agreed and implemented in SR.
  - WRPC informed that they required more interaction with NR on PSS tuning for proper documentation of the scheme. They would revert back in the next meeting of NPC. WRPC would share its experience and documentation with all RPCs.
  - ERPC informed that they had implemented the scheme in CESC Budge Budge under the supervision of IIT Mumbai.

10.4 In the 06<sup>th</sup> meeting of NPC held on 19.12.2016, following was observed:

- WRPC shared the experience of WR in PSS Tuning (**Annexure-XVII**)
- SRPC informed that as mandated in IEGC, SRPC has formed a PSS group and three meetings have been held in respect of PSS Tuning. PSS tuning procedure has been adopted in line with NRPC procedure. SRPC has already worked out a schedule and the issue has been escalated to SRPC forum.
- NRPC pointed out that as per IEGC, PSS in AVR of generating units, shall be got properly tuned by the respective generating unit owner as per a plan prepared for the purpose by the CTU/RPC from time to time. PSS tuning is being carried out based on the procedure finalized by NRPC. NRPC also suggested for some kind of knowledge sharing programme in this area among the RPCs.
- WRPC said that the part we have to focus is about the correctness of setting otherwise there may be chance for destabilizing the system. In this regard interaction with experts are required and it is a team work. Knowledge could be shared. MS, SRPC pointed out that lot of PMUs are installed in the grid and the oscillations are being monitored. He requested NLDC to share the oscillations observed in the system.

**After deliberation, it was decided that a small group comprising of representative of Protection Sub-Committee of respective RPCs, NLDC and NTPC would be formed to finalize a common procedure.**

10.5 It is proposed, to constitute a Sub-group comprising of representative of Protection Sub-Committee of respective RPCs, NPC, NLDC and NTPC to finalize a common procedure for PSS Tuning.

**The Committee may like to deliberate on the subject issue.**

## **11. Maintenance and support (AMC) renewal of PSSE Software-Agenda from ERPC:**

11.1 ERPC vide mail dated 17<sup>th</sup> July 2019, had submitted the following for deliberations in the NPC meeting:

Siemens vide letter dated 20<sup>th</sup> March 2019 informed that the AMC for PSSE software has ended on 30<sup>th</sup> November 2018. The letter is enclosed at **Annexure-XVIII**.

Siemens requested ERPC Secretariat to renew the maintenance and support period for all the existing supplied licenses of states for next five years.

In 156<sup>th</sup> OCC, all the SLDCs in the meeting agreed for renewal of the AMC of PSSE software for next five years and requested to take up the AMC contract jointly for all the states with the Siemens as it was done during the procurement of software.

In 158<sup>th</sup> OCC, it was decided to take up the issue with NPC for taking up the AMC contract at National Level.

**The Committee may like to deliberate.**

**12. Uniformity in methodology for Open Cycle Certification-Agenda from NRPC (from 08<sup>th</sup> meeting of NPC):**

- 12.1 NRPC, in the 08<sup>th</sup> meeting of NPC held on 30.11.2018, had submitted the agenda on Uniformity in methodology for Open Cycle Certification.
- 12.2 **SRPC**, vide letter dated 15.04.2019, had informed that there is no ISGS gas station in SR for which Open Cycle Certification is required and therefore necessary experience is not there on the issue.
- 12.3 **NRPC**, vide letter dated 24<sup>th</sup> May 2019, had informed that the agenda has so far not been discussed in NRPC meeting however, it has been discussed in 39<sup>th</sup> CSC meeting held on 21<sup>st</sup> May 2019, wherein members of the Committee were apprised about Point no, 11.2 ii) of “Framework on Ancillary Services Operations Regulations 2015: Statement of Reasons” issued by CERC on 17<sup>th</sup> September 2015, which inter-alia clearly states that the mark up price would account for revised costs due to open cycle operation however NTPC presented an Order issued by CERC on 12<sup>th</sup> Jan 2016, before the committee, which inter-alia states that mark up price seeks to only compensate for the additional wear and tear or loss in efficiency, if any, that may be caused due to increased ramp up & ramp down cycles under Ancillary Services scheduling.

**12.4 WRPC**

In the 516<sup>th</sup> OCC meeting held on 11.02.2019, NTPC representative informed that after ST is disconnected, approximately 7 minutes will be required to stop GT. During this period machine works in Open cycle and period should be considered under open cycle certification. Further he informed that after the implementation of WBS at WRLDC, this short time period of GT operation is not getting captured in WRLDC data and therefore open cycle certification of such instances has not been done by WRPC. SE(Operation), suggested that WRPC shall study the past available records on POCM and process the request of NTPC accordingly.

**RPCs may present their views to the Committee.**

**13. Consideration of request from CTU for Membership in National Power Committee (NPC)**

- 13.1 In the 7<sup>th</sup> meeting of NPC held on 08.09.2017, CTU had requested to include CTU as a permanent member of NPC. CTU was advised to submit a detailed proposal with justification in this regard to NPC Secretariat for deliberation in the next NPC meeting.

Accordingly, CTU vide letter dated 14<sup>th</sup> June 2018 had submitted the proposal with following justification:

*“ Keeping in view the critical role being played by CTU in development of Indian Power Sector as well as electricity market while discharging its functions as statutory body for Inter-State Transmission System (ISTS) grid related aspects at National level, it would be prudent to include Director (Operations), CTU as a permanent member in NPC to address challenges of Power System, facilitate common approach in all the regions and adopt uniform best practices across the regions for smooth development of National Grid”.*

- 13.2 In the 8<sup>th</sup> meeting held on 30.11.2018, the Committee accepted the proposal of CTU to include it as a member of NPC. It was decided that Member Secretary, NPC shall take up with Ministry of Power, MoP for necessary amendment in the constitution of NPC.
- 13.3 Further, the proposal to include NLDC as the member of NPC was already agreed in the 4<sup>th</sup> meeting of NPC after the concurrence of RPCs.
- 13.4 Accordingly, Member Secretary, NPC vide letter dated 07.01.2019 (**Annexure-XIX**) requested MoP to include CTU and NLDC as a member of NPC and make the necessary amendment in the order of establishment of NPC and Conduct of Business Rules of NPC. Amendment in this regard is awaited from MoP.

**This is for information of the committee.**

**14. Guidelines on Availability of Communication System as per CERC (Communication System for Inter-State Transmission of Electricity), Regulations, 2017.**

- 14.1 CERC has entrusted NPC to prepare Guidelines on “Availability of Communication System” in terms of Regulation 7.3 (i) of CERC (Communication System for Inter-State transmission of electricity) Regulations, 2017. In this regard, a Working Group has been constituted with members from RPCs, POSOCO, CTU, CEA, PGCIL and NTPC. Three meetings of the working group were held and a draft guideline on availability of communication system was finalized in the 3<sup>rd</sup> meeting held on 06<sup>th</sup> August 2018.
- 14.2 As required under CERC Regulations, the draft guidelines were uploaded on CEA’s website on 06<sup>th</sup> September 2018 for comments by 20<sup>th</sup> September 2018 from the general public and stakeholders. Additionally, NPC has requested RPCs to circulate the guidelines among the constituents for wider publicity and comments.

- 14.3 The comments were received from NRPC & NERPC on 08.10.2018 and from SRPC on 20.11.2018 . Summary of the comments are given below:

NRPC	NERPC	SRPC
The actual availability (duration for which the communication system was actually available) & deemed availability of the communication system may be calculated separately. However, for commercial purposes, the sum of the two shall be used.	Maintenance Shutdown will be allowed 24 hrs per Optical OPGW/FO end to end Link per year which will not be considered in outage as shown in draft. That calculation may be done on yearly basis or at most half yearly basis.	A new clause 4.1 to be added as given below (Other clauses of 4 to be numbered accordingly): The RPC Secretariat shall certify the availability of communication equipment for CTU, ISGS, RLDCs, NLDC, SLDCs based on the data furnished by RLDC. For the concerned entities for whom the Availability of Communication System is to be certified by RPC, RLDC shall verify the outage details and availability and submit to RPC.

- 14.4 In the 8<sup>th</sup> meeting of NPC, these Guidelines was put up for the approval of the NPC. The members in NPC meeting requested Chairperson, NPC & CEA to give more time to furnish comments. Chairperson, NPC & CEA decided that 15 to 20 days more time may be given to furnish comments on the draft guidelines. Accordingly, NPC Secretariat shall address a letter to all Member Secretaries of RPCs, with a copy to ED (NLDC) and ED (LD&C), PGCIL requesting to furnish the comments by 20<sup>th</sup> December 2018 to NPC Secretariat. It was also decided that NPC Secretariat would review the draft guidelines considering the comments received from RPCs/NLDC/PGCIL and shall forward the revised guidelines to CERC with the approval of Chairperson, CEA & NPC.
- 14.5 NPC Secretariat vide letter dated 05.12.2018 requested to all Member Secretaries of RPCs to furnish the comments by 20<sup>th</sup> December 2018 to NPC Secretariat. The comments were received from NERPC (08<sup>th</sup> January 2019), TSTRANSCO (19<sup>th</sup> December 2018), WRPC (20<sup>th</sup> December 2018), PGCIL (20<sup>th</sup> December 2018) and NLDC (31<sup>st</sup> December 2018) and the same were suitably incorporated in the Guidelines on Availability of Communication System.

- 14.6 NPC Secretariat vide letter dated 28.02.2019 (**Annexure-XX**) had forwarded the “Guidelines on availability of communication system” to CERC with the approval of Chairperson, CEA & NPC.

**This is for information of the committee.**

**15. Other Agenda Items:**

- (A) Timely issuance of Load Generation Balance Report (LGBR) by RPCs for 2020-21.
- (B) Uniformity in Energy Accounting of RPCs.

**16. Any other item with permission of chair**

- 17. Hosting of next (10<sup>th</sup>) meeting of NPC:** As per the roster adopted in the 5<sup>th</sup> meeting of NPC held on 08.04.2016, the next meeting of NPC will be hosted by ERPC. ERPC may confirm.

\*\*\*\*\*



## **LIST OF ANNEXURES**

<b>No.</b>	<b>DESCRIPTION</b>
<b>I</b>	Region wise/State wise details of AUFLS and df/dt settings
<b>II</b>	Quantum of AUFLS calculated by NPC secretariat (considering Power Number 7,000 and 10,000)
<b>III</b>	NPC letter dated 08.05.2019 to NRPC requesting the study report of Consultant on AUFLS.
<b>IV</b>	NRPC letter dated 24.05.2019 and 17.07.2019 for constitution of a committee
<b>V</b>	df/dt schemes in different regions
<b>VI</b>	Extract from the Minutes of 34 <sup>th</sup> Meeting of SRPC, record notes of AGC meeting held on 17.09.2018 at WRPC and minutes of 41 <sup>st</sup> meeting of NRPC
<b>VII</b>	NPC Secretariat letter dated 09 <sup>th</sup> May 2019 to NLDC requested to provide the status of implementation of AGC.
<b>VIII</b>	Copy of deliberation in 34 <sup>th</sup> TCC/35 <sup>th</sup> SRPC meeting held on 01/02.02.2019
<b>IX</b>	NRPC letter dated 22.10.2019 regarding PDMS scheme withdrawal.
<b>X</b>	The details of the schemes sanctioned grant from PSDF.
<b>XI</b>	Measures recommended by Enquiry Committee to avoid re-occurrence in future.
<b>XII</b>	The status update of Enquiry Committee furnished by the RPCs.
<b>XIII</b>	NLDC letter dated 09 <sup>th</sup> November 2018 to furnish agenda note on National Energy Account & National Deviation Pool Account.
<b>XIV</b>	Discussion related to NEA in the Special Meeting in SRPC held on 11.01.2019
<b>XV</b>	NPC Secretariat letter dated 09 <sup>th</sup> May 2019 to NLDC requesting to provide a copy of the paper on NEA submitted to CERC.
<b>XVI</b>	Related to PSS Tuning
<b>XVII</b>	WRPC experience in PSS Tuning
<b>XVIII</b>	Siemens letter dated 20 <sup>th</sup> March 2019 related to AMC for PSSE software.
<b>XIX</b>	NPC letter dated 07.01.2019 requesting MoP to include CTU and NLDC as a member of NPC.
<b>XX</b>	NPC letter dated 28.02.2019 to CERC on “Guidelines on availability of communication system”.

**A. Regionwise / Statewise AUFLS:**

**1. Northern Region:**

S.No	State/UT	Relief Quantum in MW			
		49.2 Hz	49.0. Hz	48.8 Hz	48.6 Hz
1.	Punjab	400	402	406	408
2.	Haryana	308	309	312	314
3.	Rajasthan	390	392	395	397
4.	Delhi	258	259	262	263
5.	UP	551	554	559	561
6.	Uttarakhand	77	77	78	78
7.	HP	77	77	78	78
8.	J & K	83	84	84	85
9.	Chandigarh	16	16	16	16
<b>Total</b>		2160	2170	2190	2200

**2. Western Region:**

S.No	State/UT	Relief Quantum in MW			
		49.2 Hz	49.0. Hz	48.8 Hz	48.6 Hz
1.	Gujarat	580	580	580	590
2.	Madhya Pradesh	460	460	460	465
3.	Chattisgarh	150	150	155	155
4.	Maharashtra	805	810	815	820
5.	Goa	25	25	25	25
6.	Daman & Diu	10	15	15	15
7.	TPC(Tata Power)	30	30	35	35
<b>Total</b>		2060	2070	2085	2105

**3. Southern Region:**

S.No	State/UT	Relief Quantum in MW			
		49.2 Hz	49.0. Hz	48.8 Hz	48.6 Hz
1.	Andhra Pradesh	392	393	418	399
2.	Telangana	422	432	430	542
3.	Tamil Nadu	796	771	787	767
4.	Karnataka	580	587	597	595
5.	Kerala	254	234	277	221
6.	Puducherry	27	24	22	18
<b>Total</b>		2471	2441	2531	2542

#### 4. Eastern Region:

S.No	State/UT	Relief Quantum in MW			
		49.2 Hz	49.0. Hz	48.8 Hz	48.6 Hz
1.	Bihar	98	99	99	101
2.	Jharkhand	61	62	61	62
3.	DVC	134	135.5	136	137
4.	Odisha	181.5	183.5	184	186
5.	WBSETCL & CESC	345.5	350	350	354
<b>Total</b>		<b>820</b>	<b>830</b>	<b>830</b>	<b>840</b>

#### 5. North Eastern Region:

S.No	State/UT	Relief Quantum in MW			
		49.2 Hz	49.0. Hz	48.8 Hz	48.6 Hz
1.	Ar.Pradesh	5.00	5.00	5.50	4.50
2.	Assam	54.50	61.00	59.00	57.00
3.	manipur	5.00	6.00	5.00	4.00
4.	Meghalaya	15.00	15.00	15.00	15.00
5.	Mizoram	5.09	5.31	5.10	5.20
6.	Nagaland	6.00	4.50	5.00	4.50
7.	Tripura	11.00	10.00	14.50	12.50
<b>Total</b>		<b>101.59</b>	<b>106.81</b>	<b>109.10</b>	<b>102.70</b>

#### B. df/dt Settings (Region-wise):

##### 1. Northern Region:

S.No	State/UT	Load Relief in MW		
		Stage-I 49.9Hz& 0.1Hz/sec	Stage-II 49.9Hz&0.2Hz/sec	Stage-III 49.9Hz&0.3Hz/sec
1.	Punjab	430	490	490
2.	Haryana	280	310	310
3.	Rajasthan	330	370	370
4.	Delhi	250	280	280
5.	UP	500	280	280
6.	Uttarakhand	70	70	70
7.	HP	50	70	70
8.	J & K	90	90	90
9.	Chandigarh	0	50	50
<b>TOTAL</b>		<b>2000</b>	<b>2010</b>	<b>2010</b>

##### 2. Western Region:

S.No	State/UT	Load Relief in MW		
		Stage-I 49.9Hz& 0.1Hz/sec	Stage-II 49.9Hz&0.2Hz/sec	Stage-III 49.9Hz&0.4Hz/sec
1.	Gujarat	1006	905	1001
2.	Madhya Pradesh	371	355	392
3.	Chattisgarh	27	37	120
4.	Maharashtra	546	621	686
5.	TPC (Tata Power)	60	82	273
<b>TOTAL</b>		2000	2010	2472

Gujarat additional df/dt setting at 49.9Hz & 0.3Hz/sec= 399MW

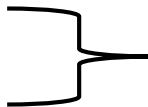
TPC additional df/dt setting at 49.9Hz & 0.5Hz/sec = 931MW

### 3. Southern Region:

S.No	State/UT	Load Relief in MW	
		Stage-I 49.5Hz& 0.2Hz/sec	Stage-II 49.3Hz&0.3Hz/sec
1.	Andhra Pradesh	345	855
2.	Telangana	369	992
3.	Tamil Nadu	578	417
4.	Karnataka	480	741
5.	Kerala	235	175
6.	Puducherry	12	6
<b>TOTAL</b>		2019	3186

### 4. Eastern Region:

### 5. North Eastern Region:



Not Implemented.

**Revised Computation- AUFLS ( based on Zalte Committee)**

( Ref:8th Meeting of NPC-30.11.2018)

Freqn Dependence (FD) = 1.5

Assumed Power Number (P) = 7,000

Frequency (A)	Deviation from 50 Hz (B)=50-(A)	% Change in Freq. (C) =(B/50)*100	% Change in MW (D) =FD*C	Freq. Factor Correction(E) = 100/(100-D)	Voltage correction factor (F)= 1/0.855	Daily load fluctuation factor (G)= 1/0.7 )	Overall Correction factor (H) = E*F*G	Required Load Relief = B*P*H	Proposed rise in Frequency
49.4	0.6	1.2	1.8	1.018	1.17	1.43	1.7038	<b>7156</b>	0.6Hz
49.2	0.8	1.6	2.4	1.025	1.17	1.43	1.7142	<b>9600</b>	0.8 Hz
49.0	1	2	3	1.031	1.17	1.43	1.7248	<b>12074</b>	1.0 Hz
48.8	1.2	2.4	3.6	1.037	1.17	1.43	1.7356	<b>14579</b>	1.2 Hz

Regions	Anticipated MW (Peak) for 2018-19	Ratio % (Region to all India)	Load Relief in MW				Total
			49.4 Hz	49.2 Hz	49.0 Hz	48.8 Hz	
NR	63,300	32.91	<b>2350</b>	<b>3160</b>	<b>3970</b>	<b>4800</b>	14280
WR	53,837	27.99	<b>2000</b>	<b>2690</b>	<b>3380</b>	<b>4080</b>	12150
SR	49,600	25.79	<b>1850</b>	<b>2480</b>	<b>3110</b>	<b>3760</b>	11200
ER	22,884	11.90	<b>850</b>	<b>1140</b>	<b>1440</b>	<b>1730</b>	5160
NER	2,708	1.41	<b>100</b>	<b>140</b>	<b>170</b>	<b>210</b>	620
<b>Total</b>		100.00	<b>7150</b>	<b>9610</b>	<b>12070</b>	<b>14580</b>	<b>43410</b>

**Revised Computation- AUFLS ( based on Zalte Committee)**(Ref:8<sup>th</sup> Meeting of NPC-30.11.2018)

Freqn Dependence (FD) = 1.5

Assumed Power Number (P) = 10,000

Frequency (A)	Deviation from 50 Hz (B)=50-(A)	% Change in Freq. (C) =(B/50)*100	% Change in MW (D) =FD*C	Freq. Factor Correction(E) = 100/(100-D)	Voltage correction factor (F)= 1/0.855	Daily load fluctuation factor (G)= 1/0.7 )	Overall Correction factor (H) = E*F*G	Required Load Relief = B*P*H	Proposed rise in Frequency
49.4	0.6	1.2	1.8	1.018	1.17	1.43	1.7038	<b>10223</b>	0.6Hz
49.2	0.8	1.6	2.4	1.025	1.17	1.43	1.7142	<b>13714</b>	0.8 Hz
49.0	1	2	3	1.031	1.17	1.43	1.7248	<b>17248</b>	1.0 Hz
48.8	1.2	2.4	3.6	1.037	1.17	1.43	1.7356	<b>20827</b>	1.2 Hz

Regions	Anticipated MW (Peak) for 2018-19	Ratio % (Region to all India)	Load Relief in MW				
			49.4 Hz	49.2 Hz	49.0 Hz	48.8 Hz	Total
<b>NR</b>	63,300	32.91	<b>3360</b>	<b>4510</b>	<b>5680</b>	<b>6850</b>	20400
<b>WR</b>	53,837	27.99	<b>2860</b>	<b>3840</b>	<b>4830</b>	<b>5830</b>	17360
<b>SR</b>	49,600	25.79	<b>2640</b>	<b>3540</b>	<b>4450</b>	<b>5370</b>	16000
<b>ER</b>	22,884	11.90	<b>1220</b>	<b>1630</b>	<b>2050</b>	<b>2480</b>	7380
<b>NER</b>	2,708	1.41	<b>140</b>	<b>190</b>	<b>240</b>	<b>290</b>	860
<b>Total</b>		100.00	<b>10220</b>	<b>13710</b>	<b>17250</b>	<b>20820</b>	<b>62000</b>



भारत सरकार/Government of India

विद्युत मंत्रालय/Ministry of Power

केंद्रीय विद्युत प्राधिकरण/Central Electricity Authority

**राष्ट्रीय विद्युत समिति प्रभाग/National Power Committee Division**

संख्या: 4/MTGS/NPC/CEA/2019/ 405-407

दिनांक/Date: 08<sup>th</sup> May. 2019

सेवा में/To

**सदस्य सचिव, उत्तर क्षेत्रीय विद्युत समिति/**

**Member Secretary, NRPC,**

18-A, S.J.S.S. Marg, Katwaria Sarai,  
New Delhi-110016.

**Email:** ms-nrpc@nic.in

**विषय: Review of AUFLS Settings –Regarding.**

**सन्दर्भ:** Item No.4(A) of Minutes of the 8<sup>th</sup> Meeting of NPC held on 30<sup>th</sup> November 2018


महोदय /Sir,

In the 08<sup>th</sup> meeting of NPC, held on 30<sup>th</sup> November 2018 at Guwahati, it was decided that NRPC may appoint a Consultant from their own resources as proposed by MS (NRPC) for studying the AUFLS scheme for Indian grid and submit the study report to NPC Secretariat **within a time of six months.**

In this regard, it is kindly requested to provide the status of the study for AUFLS scheme for Indian grid including the details of the Consultant appointed, Terms of Reference etc. to NPC Secretariat.

Thanking You,

भवदीय /Yours faithfully,

  
08/05/2019

**(इरफ़ान अहमद/Irfan Ahmad)**

निदेशक/Director

प्रति सूचनार्थ / Copy for information :

1. अध्यक्ष / Chairperson, CEA, New Delhi
2. सदस्य (ग्रिड प्रचालन एवं वितरण) / Member (GO&D), CEA, New Delhi



भारत सरकार/Government of India

विद्युत मंत्रालय/Ministry of Power

केंद्रीय विद्युत प्राधिकरण/Central Electricity Authority

**राष्ट्रीय विद्युत समिति प्रभाग/National Power Committee Division**

संख्या: 4/MTGS/NPC/CEA/2019/ 405-407

दिनांक/Date: 08<sup>th</sup> May. 2019

सेवा में/To

**सदस्य सचिव, उत्तर क्षेत्रीय विद्युत समिति/**

**Member Secretary, NRPC,**

18-A, S.J.S.S. Marg, Katwaria Sarai,  
New Delhi-110016.

**Email:** ms-nrpc@nic.in

**विषय: Review of AUFLS Settings –Regarding.**

**सन्दर्भ:** Item No.4(A) of Minutes of the 8<sup>th</sup> Meeting of NPC held on 30<sup>th</sup> November 2018


महोदय /Sir,

In the 08<sup>th</sup> meeting of NPC, held on 30<sup>th</sup> November 2018 at Guwahati, it was decided that NRPC may appoint a Consultant from their own resources as proposed by MS (NRPC) for studying the AUFLS scheme for Indian grid and submit the study report to NPC Secretariat **within a time of six months.**

In this regard, it is kindly requested to provide the status of the study for AUFLS scheme for Indian grid including the details of the Consultant appointed, Terms of Reference etc. to NPC Secretariat.

Thanking You,

भवदीय /Yours faithfully,

  
08/05/2019

**(इरफ़ान अहमद/Irfan Ahmad)**

निदेशक/Director

प्रति सूचनार्थ / Copy for information :

1. अध्यक्ष / Chairperson, CEA, New Delhi
2. सदस्य (ग्रिड प्रचालन एवं वितरण) / Member (GO&D), CEA, New Delhi





भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

संख्या: एन.आर. पी.सी / ओ.पी.आर./107/01

दिनांक: 24.05.2019

सेवा मे

मुख्य अभियंता(एन.पी.सी.प्रभाग),

केंद्रीय विद्युत प्राधिकरण

नई दिल्ली

विषय: Status of the Decision in the 08<sup>th</sup> NPC meeting/ Agenda for the 09<sup>th</sup> meeting of NPC – reg.

Reference is invited to NPC letter dated 05.04.2019 on the above cited subject. As desired, status of the Decisions taken in 08th NPC meeting, is attached as Annexure for your information and further necessary action please.

अनुलग्नक – यथोपरि

(आर.पी.प्रधान)

अधीक्षण अभियंता

**Status of the Decisions in the 08<sup>th</sup> Meeting of NPC**

1. Automatic Under Frequency Load Shedding(AUFLS)
  - In 41<sup>st</sup> TCC/44<sup>th</sup> NRPC meeting, it was informed that CPRI was requested to share information about technical procedure for carrying out the study. The relevant documents were shared with CPRI to propose the procedure for study. However CRPI opined that a committee consisting of CPRI –Nodal agency for the study team, Experts in the field of AUFLS and ROCOF load shedding, experts from CEA/NPC/RPC may be constituted for in-depth involvement during the study& time to time discussion/clarification and necessary technical guidance.
  - In view of above, an agenda for constituting a committee consisting of CPRI as Nodal Agency for the study ,Expert in the field of designing the AUFLS and ROCOF load shedding ,expert from CEA/NPC/NRPC is proposed.
  - It is also proposed that cost may be shared equally amongst all RPCs.
2. Mapping of feeders
  - The agenda is regularly being followed up in every OCC meeting and status is attached as Annexure-I. A separate meeting is scheduled to be held on 23.05.2019 deliberate the issue.
3. Ensuring Proper Functioning of under Frequency Relays (UFR) and df/dt Relays
  - The status is being regularly monitored in the OCC meetings. Report of Mock exercise for healthiness of UFRs carried out by utilities themselves on quarterly basis is regularly submitted to NRPC Secretariat and NRLDC. All utilities are also advised to certify specifically ,in the report that “All the UFRs are checked and found functional”.
  - The information of period ending March 2019 received from UP , Haryana, Delhi and Rajasthan and information for quarter ending 12/2018, was submitted by BBMB,UP and Rajasthan
4. Implementation of AGC in India (at Inter – State level)
  - The agenda has been discussed in 44<sup>th</sup> NRPC meeting, held on 19<sup>th</sup> March, 2019 wherein, it was evolved that this agenda needs to be discussed further.
5. Grid Events reported by RLDCs, Analysis and Remedial Measure recommended by RPC
  - Grid Events are being regularly discussed in the OCC as well as Protection Sub Committee meetings. The analysis and remedial measure recommended by RPC for Grid events have been communicated vide letter dated 14.02.2019 and 17.05.2019



6. Scheme of Protection system Data Base in RPCs

- A tender was published on Central Public Procurement (CPP) Portal of Govt. of India and NRPC website for Protection System Data Base in NRPC on 30.08.18 which was retendered twice to ensure healthy and effective competition.
- However, tender has now been cancelled due to lack of competition and necessary actions are being taken to reshape the scheme of Protection System Database in NRPC.

7. Status of Compliance of Enquiry Committee Recommendation

- The status is being regularly monitored and followed up in the OCC meeting which is as followed:

Submitted		Not Submitted	
NTPC(NCR)	POSOCO	Uttar Pradesh	
BBMB	NHPC	Himachal Pradesh	
Punjab	HPGCL(Panipat TPS)	NTPC(NR-HQ)	
Rajasthan	NPCIL	UT of Chandigarh	
THDC	POWERGRID	Jammu and Kashmir	
SJVNL	Delhi		

8. National Energy Accounting

- The agenda has been discussed in 44<sup>th</sup> NRPC meeting held on 19<sup>th</sup> March, 2019 wherein, it was decided that a National Pool Account may be maintained by NLDC for settlement of inter-regional and cross border transactions and NRPC may issue the net deviation.

9. Uniformity in methodology for Open Cycle Certification

- The agenda has so far not been discussed in NRPC meeting however, it has been discussed in 39<sup>th</sup> Commercial Sub-Committee meeting held on 21<sup>st</sup> May, 2019 wherein members of the Committee were apprised about Point no. 11.2 (ii) of "Framework on Ancillary Services Operations Regulations 2015 : Statement of Reasons" issued by CERC on 17<sup>th</sup> Sept., 2015 which inter-alia clearly states that the mark up price would account for revised costs due to open cycle operation however NTPC presented an Order issued by CERC on 12<sup>th</sup> Jan., 2016, before the Committee, which inter-alia states that mark up price seeks to only compensate for the additional wear and tear or loss in efficiency, if any, that may be caused due to increased ramp up & ramp down cycles under Ancillary Services scheduling.

States	UFR	df/dt	Status as per the 151 <sup>st</sup> OCC meeting	Remarks		Data Availability
J&K	No	No				
UP	Yes	Yes	<p>Following are provided since last status:</p> <ul style="list-style-type: none"> <li>Feeder wise planned load relief in df/dt.</li> <li>Alternate feeder details in UFR display.</li> <li>Total planned relief in df/dt display.</li> </ul>	<p>Following yet to be provided:</p> <ul style="list-style-type: none"> <li>Feeder-wise planned load relief of UFR.</li> <li>Telemetry of feeders (Partial details available).</li> <li>Alternate feeder details in df/dt display (Partial details available for UFR).</li> <li>Total planned relief in UFR display. (Stage wise)</li> <li>Total actual relief. (Stage Wise)</li> </ul>		Very Poor
Haryana	Yes	Yes	<p>Following are provided since last status:</p> <ul style="list-style-type: none"> <li>Stage-2, 3 of df/dt included in display.</li> <li>Feeder wise planned load relief.</li> <li>Alternate feeder details.</li> <li>Total actual relief in UFR.</li> </ul>	<p>Following yet to be provided:</p> <ul style="list-style-type: none"> <li>Telemetry of feeders (Partial details available).</li> <li>Telemetry of alternate feeders not available.</li> <li>Calculation of total actual relief in df/dt seems incorrect.</li> </ul>		Poor
Delhi	Yes	Yes		<p>Following yet to be provided:</p> <ul style="list-style-type: none"> <li>Total of actual analog data of MW and alternate feeders.</li> <li>Data suspected for most of the digital and Analog value at NRLDC display but available at SLDC display.</li> </ul>		Poor
HP	Yes	Yes	<p>Following are provided since last status:</p> <ul style="list-style-type: none"> <li>Segregation of stage wise load.</li> <li>Alternate feeder details include for most of the feeders.</li> <li>Partial telemetry of feeders.</li> </ul>	<p>Following yet to be provided:</p> <ul style="list-style-type: none"> <li>Telemetry of feeders (Partial data available).</li> <li>Alternate feeder details in UFR (a few not available).</li> </ul>		Poor
Uttarakhand	No	No				
Punjab	Yes	Yes		<p>Following yet to be provided:</p> <ul style="list-style-type: none"> <li>Complete telemetry of feeders.</li> <li>Alternate feeders' details.</li> <li>Digital Status of all the feeders</li> </ul>		Poor

**Annexure - I**

Rajasthan	Yes	Yes	<p>Following are provided since last status:</p> <ul style="list-style-type: none"><li>• UFR display provided.</li></ul>	<p>Following yet to be provided:</p> <ul style="list-style-type: none"><li>• Analog value and digital data not available in UFR display (only alternate feeder details provided)</li></ul>		Very Poor
-----------	-----	-----	--	--	--	-----------





सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

संख्या: एन.आर.पी.सी. /ओ.पी.आर. /107/01/7499

दिनांक: 17.07.2019

सेवा में,

निदेशक (एन.पी.सी. प्रभाग),

केंद्रीय विद्युत प्राधिकरण,

एन.आर.पी.सी. बिल्डिंग, तृतीय तल,

कटवारिया सराय, नई दिल्ली - 110016

**विषय:** Status of decisions in the 8<sup>th</sup> NPC meeting / Agenda for the 9<sup>th</sup> meeting of NPC  
– reg.

Reference is invited to NPC letter No. 4/MTGS/NPC/CEA/2019/567-573 dt. 09.07.2019 on above subject. In this regard, it is informed that status of the decisions taken in 8<sup>th</sup> NPC meeting has been submitted by NRPC Secretariat vide letter no. एन.आर.पी.सी./ओ.पी.आर./107/01/5481 dated 24.05.2019.

The updated status in respect of point no. 2,3,6 and 7 (of NPC letter No. 4/MTGS/NPC/CEA/2019/336-342 dt. 05.04.2019) is enclosed herewith for your kind information.

Further, following agenda in respect of 'Automatic Under Frequency Load Shedding' may be included in the 9<sup>th</sup> meeting of NRPC:

- A committee consisting CPRI as Nodal agency for the study, experts in the field of designing the AUFLS and ROCOF load shedding and experts from CEA/NPC/RPC may be constituted for in-depth involvement during the study & time to time discussion/clarification and necessary technical guidance.
- Cost may be shared equally amongst all RPCs.

संलग्नक: यथोपरि

  
17/07/2019

(सौमित्र मजूमदार)

अधीक्षण अभियंता (प्रचालन)

### **Status of the Decisions in the 08<sup>th</sup> Meeting of NPC**

#### 2. Mapping of feeders

- The issue is being regularly deliberated in every OCC meeting. A separate meeting was also held on 23.05.2019 deliberate the issue. The issue was further deliberated in 160<sup>th</sup> OCC meeting wherein it was decided that:
  - All the feeders coming under UFR and df/dt scheme shall be mapped in the display despite of data availability, RTU availability. In case data is not available, alternate feeder details to be mapped. All the details (main feeder details and alternate feeder details) to be mapped before 30th June 2019.
  - All the state utilities shall check and monitor the UFR, df/dt display on monthly basis and submit the monthly progress report to NRPC / NRLDC.
  - All the suspected data in the mapping shall be monitored on daily basis and accordingly remedial measures shall be taken.
- The updated status of mapping of UFR and df/dt in SCADA is as followed:

#### **% SCADA data visibility**

<b>State Name</b>	<b>UFR (Main)</b>	<b>UFR (Alternate)</b>	<b>df/dt (Main)</b>	<b>df/dt (Alternate)</b>
Punjab	67	13	77	12
Haryana	91	0	0	0
Rajasthan	29	75	100	100
Delhi	100	100	100	100
Uttar Pradesh	2	0	48	0
HP	88	79	73	0
Uttarakhand	0	0	0	0
J&K	0	0	0	0

#### 3. Ensuring Proper Functioning of Under Frequency Relays (UFR) and df/dt Relays

- The status is being regularly monitored in the OCC meetings. Report of Mock exercise for healthiness of UFRs carried out by utilities themselves on quarterly basis is regularly submitted to NRPC Secretariat and NRLDC. All utilities are also advised to certify specifically, in the report that “All the UFRs are checked and found functional”.
- The information of period ending June 2019 has been submitted by Punjab, Delhi while information of period ending March 2019 has been submitted by UP, Haryana, Delhi, Punjab and Rajasthan. The information for quarter ending 12/2018 was submitted by BBMB, UP and Rajasthan.

#### 6. Scheme of Protection System Data Base in RPCs

- A tender was published on Central Public Procurement (CPP) Portal of Govt. of India and NRPC website for Protection System Data Base in NRPC on 30.08.2018 which was retendered twice to ensure healthy and effective competition.

- However, tender has now been cancelled due to lack of competition in Tender and necessary actions are being taken to reshape the scheme of Protection System Database in NRPC.
- The issue was deliberated in 42<sup>nd</sup> TCC/45<sup>th</sup> NRPC meetings held on 07<sup>th</sup> and 08<sup>th</sup> June, 2019, it was informed that even after going with the tendering process three times, no bidder has been found to be suitable in the Technical evaluation due to lack of competition. It was stated that in the 8th NPC meeting held on 30.11.2018, the efforts of WRPC for in-house development of the database was appreciated and NRPC was suggested to seek assistance of WRPC in case no bidder comes up after retendering. In view of the above it was proposed that rather than going for an external agency for creating the database of Protection setting, NRPC should proceed as being done by WRPC. Accordingly, two options were discussed in view of the non-selection of third party and the advice of NPC.
- **First option** was that all the STUs shall submit the protection setting data in a time bound manner so as to comply with the recommendations of Enquiry Committee on grid disturbance of 30th & 31st July 2012, 'Task Force on Power System Analysis under Contingencies'. Further it was informed that 13 utilities have already submitted the above data and others could also provide the same in a time bound manner. However, all utilities were requested to furnish the data afresh so as to cater to any changes made in the settings. For the first option, all the states were requested to appoint some nodal officers (SE level or above) for facilitating the collection of protection setting data. To facilitate manpower, it was also proposed that the States may depute their one or two officers in NRPC for some period on rotation basis.
- **Second option** was to approach to any central agency like CPRI without any change in scope of work as already approved so that the approved PSDF funding could also be utilized. It was also clarified that NRPC so far has not discussed the matter with CPRI.
- TCC was of the view that the Protection setting are already available with the substation personnel and any third party engaged would also require the help of the substation personnel for extracting the settings from the relay. Also, in case of some changes in the setting, the substation personnel shall have the responsibility of reflecting the changes accordingly in the centralized database and for that he should be well aware of how to extract the settings and getting it reflected in the centralized database. They also opined that a portal may also be made on which the changes made in the protection settings could be updated in real time.
- In view of the above TCC decided to initially go for the first option and advised utilities to nominate the nodal officers at the earliest so that the database could be operationalized as soon as possible. TCC opined that matter may also be discussed with CPRI and its outcome may be informed in the next meeting.
- In view of the meetings, all utilities are advised to go forward with the collection of the data and appointment of nodal officers and by that time the possibility of CPRI collecting the data is also being explored.



7. Status of Compliance of Enquiry Committee Recommendations

- The status is being regularly monitored and followed up in the OCC meetings which is as followed:

Submitted		Not Submitted	
NTPC (NCR)	POSOSCO	Uttar Pradesh	UT of Chandigarh
BBMB	NHPC	Himachal Pradesh	Jammu and Kashmir
Punjab	HPGCL (Panipat TPS)	NTPC (NR-HQ)	
Rajasthan	NPCIL		
THDC	POWERGRID		
SJVNL	Delhi		

- The updated status has been shared vide email dated 19.06.2019.

**df/dt Settings (Region-wise):****1. Northern Region:**

S.No	State/UT	Load Relief in MW		
		Stage-I 49.9Hz& 0.1Hz/sec	Stage-II 49.9Hz&0.2Hz/sec	Stage-III 49.9Hz&0.3Hz/sec
1.	Punjab	430	490	490
2.	Haryana	280	310	310
3.	Rajasthan	330	370	370
4.	Delhi	250	280	280
5.	UP	500	280	280
6.	Uttarakhand	70	70	70
7.	HP	50	70	70
8.	J & K	90	90	90
9.	Chandigarh	0	50	50
<b>TOTAL</b>		2000	2010	2010

**2. Western Region:**

S.No	State/UT	Load Relief in MW		
		Stage-I 49.9Hz& 0.1Hz/sec	Stage-II 49.9Hz&0.2Hz/sec	Stage-III 49.9Hz&0.4Hz/sec
1.	Gujarat	1006	905	1001
2.	Madhya Pradesh	371	355	392
3.	Chattisgarh	27	37	120
4.	Maharashtra	546	621	686
5.	TPC (Tata Power)	60	82	273
<b>TOTAL</b>		2000	2010	2472

Gujarat additional df/dt setting at 49.9Hz & 0.3Hz/sec= 399MW

TPC additional df/dt setting at 49.9Hz & 0.5Hz/sec = 931MW

**3. Southern Region:**

S.No	State/UT	Load Relief in MW	
		Stage-I 49.5Hz& 0.2Hz/sec	Stage-II 49.3Hz&0.3Hz/sec
1.	Andhra Pradesh	345	855
2.	Telangana	369	992
3.	Tamil Nadu	578	417
4.	Karnataka	480	741
5.	Kerala	235	175
6.	Puducherry	12	6
<b>TOTAL</b>		2019	3186

**4. Eastern Region and North Eastern region: Not Implemented**

13.4 SRPC noted the above.

#### **14 ROADMAP TO OPERATIONALISE RESERVES IN THE COUNTRY**

14.1 In the 29<sup>th</sup> Meeting of SRPC it had been noted that in the matter of Roadmap to operationalize Reserves in the country, Hon'ble CERC vide Order dated 13.10.2015 on Petition No. 11/SM/2015 had directed as follows:

- (b) *The Commission reiterates the need for mandating Primary Reserves as well as Automatic Generation Control (AGC) for enabling Secondary Reserves.*
- (i) *All generating stations that are regional entities must plan to operationalize AGC along with reliable telemetry and communication by 1<sup>st</sup> April, 2017.*
- (ii) *The **Central Commission** advises the State Commissions to issue orders for intra-state generators in line with this timeline as AGC is essential for reliable operation of India's large inter-connected grid.*
- (c) *To start with, a regulated framework in line with the Ancillary Services Regulations would need be evolved for identification and utilizing of spinning reserves and implemented with effect from 1<sup>st</sup> April, 2016. This framework may continue till 31<sup>st</sup> March, 2017.*
- .....
- (d) *In the long term, however, a market based framework is required for efficient provision of secondary reserves from all generators across the country. For this, NLDC/POSOCO is directed to commission a detailed study through a consultant and suggest a proposal to the Commission for implementation by 1<sup>st</sup> April, 2017, giving due consideration to the experience gained in the implementation of Spinning Reserves w.e.f. 1<sup>st</sup> April, 2016.*

14.2 In earlier Meetings the following had been noted:

- Hon'ble CERC in Petition No. 79/RC/2017 had passed Order dated 6<sup>th</sup> December, 2017 in the matter of 'Automatic Generation Control (AGC) pilot project'.
- NLDC had informed that in respect of AGC at Simhadri, offer had been received from M/s Siemens. They would convene a Meeting with NTPC on 20<sup>th</sup> February and then the Order would be placed with implementation schedule of 5 to 6 months. Regarding AGC at NP Kunta, M/s USAID had agreed to take the AGC implementation under GTG project. On 10.02.2018, after assessment it had been concluded that AGC implementation at NP Kunta was feasible. AP utilities as well as SERC were required to be consulted in this regard.

14.3 A Meeting on AGC issues had been conducted at SRPC on 28<sup>th</sup> March 2018 (MOM available on SRPC website). The following highlights may be kindly noted:

- Better Load Forecasting and RE framework (forecasting, scheduling & settlement) would naturally result in lesser reserve requirement and needs to be pushed through FOR.
- Scheduling software for unit commitment, meeting the ramps (+)/(-), ramps of generators, fast start up and shutdowns of generators, errors in load and RE forecast, technical minimum, meeting peak demand, meeting minimum demand, net load,



pump operation etc is required for resource optimization and proper decision support.

- Forum opined that there was a need for a Procedure to quantify Secondary/Tertiary Reserves. Procedure should also include a mechanism to monitor these reserves in real time manner for replenishment of these reserves.
- Sharing of these secondary/tertiary reserves, and including those available with States, could lead to optimization of reserve requirement. However, the mechanism of sharing and associated cost needs further analysis and discussions.
- While there was lot of focus on positive reserve, during large RE ingress, negative reserve is also required. This needs to be covered prominently in the reserve ambit.
- It was strongly felt that secondary and tertiary reserves should always be available with system operator and cannot be dynamic with URS availability (diminishing during peak hours) or with all units are running in Technical Minimum (no negative reserve). Whether this could be achieved through Market based reserve or through regulatory mandatory market needs to be studied?
- There needs to be a mechanism in place for sharing of secondary/tertiary reserves available with the states. These reserves are to be made available with the system operator.
- A time bound implementation of ABT in the states is also necessary for AGC (Secondary)/Tertiary Reserves to take off.
- Forum (except NLDC/SRLDC) was of the view that Gate Closure already exists (30 minutes prior to the delivery) as per IEGC. This issue needs to be further examined.
- Forum opined that proposed Bias Setting requires further review.
- It was noted that in the Report on National Reference Frequency it has been recommended that the dead band of  $\pm 0.03$  Hz (ripple factor in IEGC) may be gradually phased out as is being done in ERCOT Texas and Europe'. Generators strongly opined that the dead band of  $\pm 0.03$  Hz (ripple factor in IEGC) may need to be retained.
- For SCADA veracity it was noted that it was joint responsibility of all the entities of SRPC forum to take proactive and appropriate steps to ensure consistency in data. The issue needed due attention it deserves as it is critical in grid operation. The entities needed to have dedicated team with 24x7 support specifically at SLDC/RLDC/NLDC/CTU/STU.
- It was noted that the Optical Fibre Connectivity could be assessed and action plan could be finalized by CTU/STU.
- There is a need to have AGC pilot projects in all the SLDCs. It was thus recommended that each SLDC could have a AGC standalone infrastructure with one or two stations wired for AGC as Pilot Project. This approach would enable faster implementation of AGC upto the state level. This would ensure hands on experience at State Level at a faster pace along-with the development of infrastructure facility at SLDCs.
- IEGC provision that the schedules should not exceed capacity on bar less Normative Auxiliary Consumption need to be implemented pan India for all generators- ISGS, State generators, IPPs, MPPs etc.
- The forum strongly advocated for AGC also for RE generators. There would be need

for both positive and negative reserves provision for RE also. There is need to have a well laid down procedure including commercial settlement, which could also be a market based mechanism.

14.4 In the OCC Meetings the following had been noted:

- KPCL had informed that M/s Andritz for Varahi and M/s ABB for Sharavathy have been identified for the AGC implementation by USAID / PRDC for which, KPCL has given approval. This was expected to be completed by December 2018. Further, AGC for 10 MW of Solar project at Sivasamudram was also under consideration.
- Simhadri, NTPC informed that the infrastructure readiness for AGC was likely to be in place by August 2018.
- A Workshop had been conducted on 15<sup>Th</sup> May 2018 at APSLDC by NLDC on AGC at NP Kunta.

14.5 The following had been deliberated in the TCC Meeting:

- APTRANSCO had informed that APGENCO is willing to speed up the AGC activity since more RE has to be integrated. Some lead by SRLDC & SRPC Secretariat would expedite the Pilot Projects.
- KSEBL had suggested to explore the possibility of obtaining funding for implementation of AGC for utility owned generators and to create suitable market mechanism.
- NLDC had informed that States need to take action as per the Regulations/Orders. Simhadri AGC may be in place by mid-September, for Mouda (WR), Barh (ER) & Bongaigaon (NER) tender specification had been rolled out and tender would be floated by end of August 2018. Detailed road map for Phase I & Phase II had been submitted to Hon'ble CERC. For other Pilot Projects, approval of CERC would be sought shortly. NLDC SCADA is being upgraded with AGC software to include Stations for which tariff is determined by the Commission and NLDC would be approaching Commission for approval.
- SRLDC had observed that as per CERC Regulation/Order, the AGC should takeoff in the state generators also. Considering the high RE penetration in SR, TCC could suggest on AGC pilot project implementation in each state.
- NLDC had informed that stand alone AGC software was available. From existing system tie line flow and frequency data was an input. A communication link to the generating station was required along-with the protocol compatibility to be included in LOA. Hardware and software was available. Licensee cost would increase with number of units wired for AGC. The protocol between SCADA and AGC software has to be established.
- NPC had opined that stand alone system may be sufficient for all the generators and not only for those in the Pilot Project.
- **As noted in Meeting held on 28.03.2018, Pilot Project on AGC was agreed to be implemented in all the states. States could approach the State Regulators and commence the Pilot Project.**



- NLDC had agreed to assist on technical aspects in the AGC implementation.
- It was also agreed that a Committee with participation from State SLDCs, GENCOs, SRLDC and NLDC would be formed to facilitate Pilot Project implementation in the states.

14.6 SRPC noted the above.

## 15 **TTC/ATC**

### 15.1 **ATC/TTC computations by SLDCs**

The following had been noted in earlier Meetings:

- APSLDC had assured that the system would be in place before the next SRPC Meeting.
- KAR-SLDC had informed that the converged case was being furnished, while Nodal Officer details would be furnished within a week.

The following is the status in this regard:

State	5 months LGB	Converged PSSE Base case	ATC/TTC Computation furnished to SRLDC	ATC/TTC Computation posted on SLDC website	Nodal Officer Status	Study Group
AP	Yes	No	No	No	No	Yes
TS	Yes	Yes	No	No	Yes	Yes
KAR	Yes	Yes	No	No	No	Yes
TN	Yes	Yes	Yes	No	Yes	Yes
KER	Yes	Yes	Yes	No	Yes	Yes

The following had been noted in the OCC Meetings:

- APSLDC had constituted a Study Group. While one DE had been posted, supporting staff was to be posted.
- SRLDC had assured of cooperation in training of the officials in this regard.

#### ***TCC deliberations***

- APSLDC informed that from August 2018 onwards, PSSSE base case would be furnished.

SRPC noted the above.

### 15.2 **Harmonization of Philosophy of Computation of Total Transfer Capability (TTC) by POSOCO and CTU between ER-SR & WR-SR**

In a Special Meeting convened by NPC on 23<sup>rd</sup> October 2017, members had agreed for the approach for preparing base load flow case to compute TTC/ATC for the purpose of operationalization and grant of MTOA.

SRPC/TCC had requested NPC to similarly kindly finalize procedure for base case preparation by POSOCO, in respect of STOA.

In line with the decision taken in the 32<sup>nd</sup> TCC meeting, SRPC Secretariat had taken up the issue of finalizing the procedure for base case preparation by POSOCO in respect of STOA with NPC vide letter dated 05.03.2018 (**Annexure-XXVI**).

**Record Notes of the meeting on AGC held on 17.09.2018 at WRPC  
Mumbai.**

The meeting on AGC was held on 17.09.2018 at WRPC, Mumbai, the list of participants is enclosed at Annexure-I. MS, WRPC welcomed all the participants. He informed that the meeting is being held in line with the decision taken in 7<sup>th</sup> Nation Power Committee held on 08<sup>th</sup> September, 2017 at Indore and subsequent discussions in 36<sup>th</sup> WRPC meeting on 23<sup>rd</sup> June, 2018 at Ahmedabad.

In his opening remark, MS, WRPC informed that around year 1990 onwards training on AGC concept was imparted to power engineers on DTS (Despatcher Training Simulator) lab at PSTI, Bangalore (then under CEA). The issue of having reserves and AGC was discussed in the 3<sup>rd</sup> meeting of National Reliability Council for Electricity (NRCE) on 1.8.2014. The issue was highlighted by CERC in 2015 by specifying road map for reserves. Many meetings and workshops related to AGC were held in the regions. In the year 2017, there was a petition by NLDC before CERC for AGC implementation, which resulted in a pilot project at NTPC Dadri that is being functional since January, 2018. It is known that after disturbance, system inertia plays a role on frequency, followed by primary response (governor action), secondary response (e.g. AGC) and tertiary response (e.g. RRAS). Though governor action will improve the frequency, but a secondary response is required to restore the frequency to its nominal value. 175 GW of RE is expected by 2022 which would take the penetration level above 50%. So, this issue demands some better control of frequency and interchanges for system reliability and security. The meeting is being conveyed for obtaining the views and feedback from the constituent members for further course of action.

After opening remarks by MS, WRPC, discussion on agenda points followed which is given below:

<b>1</b>	<b>Need for AGC, infrastructure and regulatory requirements, implementation impact etc.</b>
	<p><b>Need for AGC:</b></p> <p>NLDC representative informed that the frequency profile was having wide variations till the first half of this decade and has stabilized recently. However there is no secondary control in place and the primary response is not giving the desired results. The Hon'ble CERC has mandated to have secondary control reserves for all the regions. In WR the secondary reserves to be maintained is 800MW (largest Unit in region) and all India 3600MW. The frequency variation needs to be regulated/smoothened, through secondary control of Generators within a very narrow band to serve quality power to the consumers. Detailed plan has been submitted by NLDC to Hon'ble</p>



	<p>CERC on 14<sup>th</sup> July 2017 for using Secondary Control as an Ancillary Service.</p> <p><b>Infrastructure and regulatory requirements &amp; implementation impact etc.:</b></p> <p>The details of these aspects are covered in the NLDC presentation and are given in the next sections.</p>
<b>2</b>	<p><b>Sharing of experiences of NLDC (POSOCO) pilot projects on AGC at Dadri, Simhadri, and a solar project.</b></p> <p>NLDC representative informed the following regarding implementation of AGC pilot projects of Dadri and Simhadri.</p> <ul style="list-style-type: none"> <li>• Primary (droop) control <ul style="list-style-type: none"> <li>➤ Obligatory, Automatic response</li> </ul> </li> <li>• Secondary (AGC) control <ul style="list-style-type: none"> <li>➤ Spinning reserve, NLDC/RLDC/SLDC controlled, Automatic Generation Control (AGC)</li> </ul> </li> <li>• Tertiary control <ul style="list-style-type: none"> <li>➤ Tertiary Reserve and response from State, Manual.</li> </ul> </li> </ul> <p>He explained in brief about the Dadri NTPC AGC pilot project. Unit 5 &amp; 6 is controlled through AGC. The MW control limit for AGC has been set to ± 50MW for the pilot project. The details of architecture are given in the presentation enclosed at Annexure-II.</p> <p><b>The principle used is given below:</b></p> <p>Region considered as an Area for secondary control.</p> <ul style="list-style-type: none"> <li>• <math>ACE = (I_a - I_s) + 10 * B_f * (F_a - 50)</math> Where: <ul style="list-style-type: none"> <li>○ <math>I_a</math> = Actual net interchange, negative for NR meaning import by NR</li> <li>○ <math>I_s</math> = Scheduled net interchange, negative for NR meaning import by NR</li> <li>○ <math>B_f</math> = Frequency Bias Coefficient in MW/0.1 Hz, positive value</li> <li>○ <math>F_a</math> = Actual System Frequency</li> </ul> </li> <li>• ACE positive means NR is surplus and NR internal generation has to back down</li> <li>• ACE negative means NR is deficit and NR internal generation has to increase</li> <li>• Tie line bias mode and Frequency bias only mode both possible</li> <li>• Interchange scaled using a factor of 15, changeable.</li> </ul>



**The salient points of the NLDC presentation is as follows:**

**Essential requirements for Secondary Control:**

- Generator shall bear the cost of secondary control hardware at the plant end
  - Including the cost of the fibre optic cable
- Shall share DC and Schedule like ISGS generators on day ahead basis
  - Subsequent revisions with RLDCs
- The generating units shall have working control systems for turbine, boiler and governor
  - Governor response plots/graphs of past incidents have to be submitted to RLDC
- Existing wide band communication node
  - Within a radius below 30-40 km from the plant
  - Detailed survey is given in Annexe-VI of the report.

**AGC on other plants:**

- Karnataka Power Transmission Corporation Limited (KPTCL)  
They are in advance stage of implementation of AGC at Varahi , Sharavati & NP Kunta Solar power project.
- NTPC Simhadri
  - Letter of Award issued for the supply, testing and commissioning
  - 18<sup>th</sup> May 2018 LOA, September-October 2018 commissioning
- Mauda, Barh, Bongaigaon
  - Tendering phase
- National Power Committee (NPC) meeting held at Indore on 8<sup>th</sup> September 2017
  - Agenda on AGC sent for discussion in RPCs for preparedness
- Contracting issues
- NLDC SCADA up gradation
  - October 2017 to March 2019

**Target to have AGC on several phase-I plants by 2021**

**3 Proposed plan for implementation of pilot project at NTPC, Mouda.**

NTPC Mouda representative informed the followings:

- Tendering/LOI process will be done within a week's time.
- 800 meter of cable laying is required to be done from switch yard to control room.
- The AGC logic shall be based on Dadri experience.
- The detailed presentation on road map regarding implementation shall be updated in the OCC.

4	<b>States views/participation on implementation of AGC (road map i.e. identification of unit &amp; proposed plant by State Genco.)</b>
	<p>a) Madhya Pradesh representative informed the following:</p> <ul style="list-style-type: none"> <li>• The AGC project is being implemented and is at an initial stage of information gathering like technical data, commercial data etc.</li> <li>• They have selected at present Singhaji Stage-I unit I and II for AGC pilot project. This is based on their MOD (Merit order dispatch)</li> <li>• They have requested for budgetary offer from GE and BHEL and offer is still awaited. Further they have estimated one year for completion of the pilot project.</li> <li>• They have requested NTPC and NLDC to offer guidance and support for the project.</li> </ul> <p>b) SLDC, Chattisgarh, representative informed that the issue of AGC is under discussion with the Management and the outcome of the decision shall be intimated later.</p> <p>c) Mahagenco representative informed that they would discuss with their management and revert back.</p> <p>d) SLDC, Gujarat representative informed that any unit from Wanakbori 4, 5 and 6 or Ukai 6 may be considered for AGC pilot project.</p> <p>e) NLDC representative informed that ISGS whose tariff is determined /adopted by the Hon'ble commission are considered under Phase-I and other IPP's shall be considered under phase-II.</p>

The meeting ended with thanks to chair.

\*\*\*\*\*

- B.13.6 NRLDC representative also mentioned that since, Rihand-III is now connected to WR, outage of inter-regional lines (Rihand III – Vindhyachal pool) would be taken care by NLDC in consultation with NRLDC and WRLDC. In case of constraint in Vindhyachal complex, the curtailment of Rihand stage 3 would be done similar to other stations in Vindhyachal complex. Scheduling of Rihand-III would be continued by NRLDC.
- B.13.7 NRLDC representative informed that based on approvals in OCC, the System Restoration Procedure has been modified to include utilisation of Rihand stage 3 and Rihand stage 2 bus coupler in the similar manner as AC bypass at Vindhyachal back to back.
- B.13.8 However, NRLDC representative emphasized that the issue of higher vibration is Rihand stage 3 units during mono pole ground return operation of Rihand-Dadri HVDC need to be addressed. He said that as decided in OCC meeting, NTPC shall come out with past data as well as grounding measurements at all the stages of Rihand.
- B.13.9 NTPC representative informed the forum that as per report from field officers, they have no past history such vibrations at any of the stages during mono pole ground return HVDC operation.
- B.13.10 TCC recommended formation of a committee with members from POWERGRID, CTU, CEA, NTPC, POSOCO and NRPC to look into the issue of high vibrations during mono pole ground return operation for corrective actions.

#### **NRPC deliberation**

- B.13.11 NRPC noted the deliberation held in TCC and approved the formation of Committee recommend by TCC.

#### **B.14 AGC Implementation TCC deliberation**

- B.14.1 NRLDC representative informed the house that Hon'ble CERC order dated 13<sup>th</sup> October 2015, highlighted the need for implementing Automatic generation control in machines. In this direction, first pilot project of Automatic Generation Control (AGC) in India has been officially commissioned by POSOCO and NTPC. This pilot project is controlling the generation of Dadri Stage 2 (980 MW IC) with reference to the Area Control Error (ACE) of Northern Region from 04.01.2018 onwards.
- B.14.2 Further, Hon'ble CERC has asked POSOCO to replicate similar AGC pilot projects in other regional grids. Implementation of AGC is crucial at this juncture as it would help adding of renewable capacity in the grid which is happening at an unprecedented



scale and speed (both large-scale grid connected projects as well as several distributed energy resources primarily in the form of rooftop solar).

B.14.3 The NRLDC representative also mentioned that there is separate agenda item from NPC on the subject and a detailed presentation on AGC would be made on that agenda.

B.14.4 TCC noted the development.

#### **NRPC deliberation**

B14.5 NRPC noted the information

### **B.15 Summer Preparedness – 2018**

B.15.1 NRLDC representative gave a detailed presentation on the summer preparation. He gave regional and statewise trends of Demand (MW) and Energy for last 4-5 years and based on these drew conclusions on rise in demand with rise in temperature, demand increase trajectory etc. He also put forth the issues specific to summer/monsoon months for Northern Region. He stated that the summer and monsoon months are very crucial months for system in view of highest demand being met in NR during these months. He presented the high temperature forecast by Indian Meteorological Department (IMD) for summer months wherein about 1-2 degrees higher temperatures have been predicted in NR while the same around 1 degree higher in the rest of country. He also mentioned that the hydro generation at present is lower than the past year though reservoir position is almost similar to last year. The representatives of hydro stations also informed that there is less snow and therefore hydro generation is on lower side.

B.15.2 He mentioned following characteristics of summer/monsoon power system operation of NR:

- High Demand
- High loading/ High Reactive Power Requirement
- High hydro generation
- Thunderstorm during summer
- Silt during Summer/Monsoon
- Transfer Capability violations

On each of the above points, NRLDC gave past statistics to highlight the issues. He also stated that fuel shortage this year combined low hydro generation could be difficult and therefore, requested all the utilities to buildup enough fuel stock for increasing the internal generation in NR and for also for keeping reserves in the each of control area.

B.15.3 He also mentioned following Action plans:

- Meticulous load forecasting and portfolio management
- TTC/ATC calculations, keeping margins, Network
- Tower strengthening, New network commissioning
- Keeping fuel reserves
- Keeping reserves (generation in control areas for contingencies)



भारत सरकार/Government of India

विद्युत मंत्रालय/Ministry of Power

केंद्रीय विद्युत प्राधिकरण/Central Electricity Authority

**राष्ट्रीय विद्युत समिति/National Power Committee**

संख्या.: 4/MTGS/NPC/CEA/2019/418-421

दिनांक: 09.05.2019

सेवा में/To

**Chief General Manager,**  
NLDC, POSOCO,  
New Delhi

**विषय: Implementation of Automatic Generation Control (AGC) and proposal of National Energy Account (NEA) -regarding**

**सन्दर्भ: Minutes of 08<sup>th</sup> Meeting of NPC held on 30.11.2018**

महोदय/Sir,


In the 08<sup>th</sup> meeting of NPC, it was decided that all RPCs and NLDC shall provide updated information on status of implementation of Automatic Generation Control (AGC) in India (at Inter-State level), to NPC secretariat.

It was also decided that the issue of National Energy Account (NEA) may be discussed in all the RPCs and the observations of RPCs may be furnished to NPC Secretariat. The observations of RPCs may be put up for consideration in the next meeting of NPC. Accordingly, SRPC has informed that the proposal of NEA was discussed in the Special Meeting held on 11.01.2019. The proposal of NEA was also discussed in the 34<sup>th</sup> TCC / 35<sup>th</sup> SRPC meetings held on 01/02.02.2019 wherein, NLDC had informed that Hon'ble CERC had sought a paper on NEA. NLDC also stated that the observations of SRPC would be duly considered while submitting the final proposal to CERC.

It is, therefore, requested that status of implementation of AGC and a copy of the paper on NEA submitted to CERC, may be provided to NPC Secretariat for deliberations in the 09<sup>th</sup> meeting of NPC to be held shortly.

Thanking You.

Yours faithfully,

  
(इरफ़ान अहमद/Irfan Ahmad) 09/05/2019

निदेशक/Director

प्रति/Copy to:

Director (System Operations), POSOCO, New Delhi

प्रतिसूचनार्थ/Copy for kind information to:

1. अध्यक्ष, के.वि.प्रा., नई दिल्ली/Chairperson, CEA, New Delhi
2. सदस्य(ग्रि.प्र. एवं प्र.), के.वि.प्रा., नई दिल्ली/Member(GO&D), CEA, New Delhi



was in the beginning of the cycle. AERB was continuously monitoring this unit. Any rescheduling request could be accommodated for few days up to a month on a case to case basis. BSD cycle was being determined by Regulatory instructions and in case of LWR it depends on the availability of fuel in the core. KKNPP Unit-2 was running at low PLF due to main generator conductor high vibrations. Unit-1 was having issues in turbine bearing and rehabbing has to be taken up and it may come up in one to one half months (by end of March 2019). Two agencies are working on round the clock shifts to attend to the issues.

- KSEBL had pointed out that NPCIL had confirmed in the last OCC that KKNPP Unit-1 would come back by 28.02.2019 but now it was being deferred upto end of March 2019, which is a matter of concern. All the LGB projections are getting badly affected due to frequent changes in the revival dates. Firm dates of revival of units are required for enabling alternate plans. MS, SRPC had pointed out that this was one key point in the Meeting taken by Chief Engineer (OM), MoP.
- Chairperson, TCC had observed that turbine bearings can be rectified within a month and KKNPP needs to expedite the works.
- APTRANSCO also pointed out that the manner in which nuclear units are being operated (inflexible approach) may only discourage constituent states from agreeing for future nuclear projects, in the present high RE regime.
- TANTRANSCO had suggested that it can be concluded that in case KKNPP unit-1 does not come by March 2019, it should be brought back only during September 2019. Further, Unit-2 should run at 70 % level till May 2019, even if Unit-1 is revived. NPCIL had stated that as per provisions of PPA, power had to be availed by beneficiaries, whenever units are revived. TANTRANSCO had stated that it was getting very difficult to handle the grid with all such uncertainties, DSM provisions etc and it was a big challenge to the system operators.
- NPCIL had stated that the status would be communicated 10 days prior to synchronisation of the unit.
- It had been agreed that NPCIL would communicate the status update on revival of KKNPP Unit-1 on a weekly basis.

SRPC noted the above.

## **17. ROADMAP TO OPERATIONALISE RESERVES IN THE COUNTRY**

17.1 In the 29<sup>th</sup> Meeting of SRPC it had been noted that Hon'ble CERC vide Order dated 13.10.2015 on Petition No. 11/SM/2015 in the matter of Roadmap to operationalize Reserves in the country had stated as follows:

*(b) (ii) The Central Commission advises the State Commissions to issue orders for intra-*

*state generators in line with this timeline as AGC is essential for reliable operation of India's large inter-connected grid.*

- \*\*\*\*\*
- (d) *In the long term, however, a market based framework is required for efficient provision of secondary reserves from all generators across the country. For this, NLDC/POSOCO is directed to commission a detailed study through a consultant and suggest a proposal to the Commission for implementation by 1<sup>st</sup> April, 2017, giving due consideration to the experience gained in the implementation of Spinning Reserves w.e.f. 1<sup>st</sup> April, 2016.*

17.2 In earlier Meetings, the following had been noted:

- Hon'ble CERC in Petition No. 79/RC/2017 had passed Order dated 6<sup>th</sup> December, 2017 in the matter of 'Automatic Generation Control (AGC) pilot project'.
- A Meeting on AGC issues had been conducted at SRPC on 28<sup>th</sup> March 2018 (MOM available on SRPC website).
- NLDC had informed that States need to take action as per the Regulations/Orders. Simhadri AGC may be in place by mid-September, for Mouda (WR), Barh (ER) & Bongaigaon (NER) tender specification had been rolled out and tender would be floated by end of August 2018. Detailed road map for Phase I & Phase II had been submitted to Hon'ble CERC. For other Pilot Projects, approval of CERC would be sought shortly. NLDC SCADA is being upgraded with AGC software to include Stations for which tariff is determined by the Commission and NLDC would be approaching Commission for approval.
- In the 34<sup>th</sup> Meeting of SRPC it had been agreed that Pilot Project on AGC would be implemented in all the states. It had been agreed that a Committee with participation from State SLDCs, GENCOs, SRLDC and NLDC would be formed to facilitate Pilot Project Implementation in the states.
- Subsequently, a Meeting on implementation of AGC in SR states was held on 19<sup>th</sup> September 2018 at SRPC, Bengaluru (MOM available on SRPC website). SRPC vide letter dated 20.09.2018 had taken up this issue with all the states.
- AGC at Simhadri Stage II had been made operational in both the Units from 15:17 hours of 16<sup>th</sup> November 2018.

17.3 The status update after deliberation in 34<sup>th</sup> TCC/Special SRPC Meeting held on 17<sup>th</sup> December 2018/ OCCM is as given below:

- KPCL had informed that Work Order had been placed for Varahi and Sharavathy AGC. OEMs M/s ABB and M/s Andritz are taking up integration works at the generating stations. PRDC is the Nodal agency and USAID is funding the project. Trial operation of AGC at Sharavathy and Varahi was planned during July-September 2019. AGC at 10 MW Solar plant at Sivasamudram was not being envisaged since response was only upto 1 MW. AGC for thermal stations (Bellary and Yermarus) would be considered after gaining experience from these projects.
- In AP, Krishnapattnam STPS had been identified. APGENCO had informed that wrt Krishnapattnam, team had visited Simhadri Stage-II on 10.12.2018 and noted the

requirements. Further course of action would be finalized after consultation with APSLDC. Lower Sileru had been identified which could be taken up later (within one year) after communication link is established.

- KSEBL had informed that technical specifications at SLDC/ Idukki /Kuttiadi were being prepared and AGC implementation may commence from December 2019 after the upgradation works are over. Officials from KSEBL, TSTRANSCO/TSGENCO and TANTRANSCO /TANGEDCO had visited Simhadri Stage-2 on 24.01.2019 to get insights.
- TSTRANSCO / TSGENCO had informed that one unit at Kothagaudem E (500 MW) had been identified for Pilot project under AGC. Other hydro / thermal projects would be identified after gaining experience on AGC from this project. Other technical specifications etc were being worked out. They had requested that AGC for the states could be taken jointly and funded through PSDF.
- AGC was to be implemented by the states as per CERC Order / Regulations. NPC/NLDC had been highlighting the paucity of funds in PSDF and thus it may be prudent to carry out AGC Pilot project in the states through their own funds.
- TANTRANSCO / TANGEDCO had informed that a Meeting was held at NCTPS on 28.12.2018 in which, SRLDC and NLDC had made presentations. Further, on 24.01.2019, TANTRANSCO and TANGEDCO had visited Simhadri-II. AGC would be taken up at NCTPS followed by Mettur Stage-III.
- AGC Pilot project in Karnataka was being funded through USAID. However, NLDC would be appraised whether the AGC Pilot project for AP, TS, TN and KER could be taken up jointly to reduce the cost implications and have uniformity in all the states.
- NTPC, Simhadri had been suggested to take up the issues raised (schedules going below technical minimum, ramp violations, schedules exceeding the restricted schedules (margins kept for RGMO), schedules exceeding the DC etc ) with NLDC with a copy to SRLDC & SRPC by 17.12.2018.
- In the TCC Meeting, NLDC had informed that AGC software at NLDC can accommodate up to 10 generators. For each additional generator, license fee was to be paid. NTPC Simhadri, Barh, Mouda and Bongaigaon were called along with the Corporate NTPC and M/s Siemens had been requested to submit the budgetary quote. NTPC wanted to go on a combined tender. Works which would be carried out by NTPC and works to be carried out by M/s Siemens were clearly demarcated. At Simhadri, the LOA on M/s Siemens was around Rs 32 lakhs. Due to increase in requirements of router, cables etc the cost had gone up to Rs 42 lakhs. Communication was required from the generators to the LDC. The LOA had been awarded by each plant of NTPC itself. The license fee of NLDC was also part of the LOA. Mouda AGC was completed on 30.01.2019 and put in trial operation. Similar approach could be applied to the balance four states of SR. They have given a presentation at North Chennai station of TANGEDCO which was well acknowledged. AP had requested NLDC to make a presentation and presentation would be made shortly. TS had planned to visit NLDC to understand the requirements at LDC. NLDC assured of complete assistance from finalization of specifications, negotiation with vendors, finalization of tender documents, execution of the project etc.



- It had been agreed that a Meeting / VC would be called along-with participation from NLDC, service providers (Siemens / OSI / GE), states (SLDCs) and their identified generators to finalize the technical requirements and to arrange for site visits at the generators and SLDCs. This would be required for the service providers to finalize the scope of works to be carried out by SLDC, identified generators and also works within their scope so as to prepare budgetary offer. LOA could be placed by individual generators/LDCs as per the stipulated guidelines in their states.
- It was also noted that in the 8<sup>th</sup> Meeting of NPC held on 30<sup>th</sup> November 2018, (MOM issued on 28.1.2019), it had been agreed that all RPCs and NLDC would provide updated information on status of implementation of AGC to NPC Secretariat.

SRPC noted the above.

## **18. TTC/ATC**

### **18.1 TTC/ATC enhancement – Operational guidelines issued by NRCE**

- NLDC vide letter dated 31.08.2018 (**Annexure-XXIII**) had requested NPC to take up with Powergrid, STUs and other Transmission Licensees to furnish terminal equipment ratings at all transmission lines at 400 kV and above to ensure that there is no gap in security assessment. NPC letter dated 20.09.2018 in this regard, is given at **Annexure-XXIV**. SRPC vide E-mail dated 24.09.2018 had requested all transmission utilities and states to furnish the required information by 01.10.2018 for onward transmission of consolidated data wrt SR to POSOCO.
- The details are awaited from the entities despite regular follow up.
- SRPC vide letter dated 25.09.2018 had taken up the issues with NLDC regarding the reassessment of transfer capability. Some of the issues are given below:
  - Why similar information for other lines had not been sought (April 2015) while presently data in respect of all the lines including STU lines had been sought?
  - Dynamic line rating was to be implemented within one month as per Order dated 05.08.2015 of Hon'ble CERC in Petition No.009/SM/2015 (CAC Sub Committee on Congestion in Transmission).
  - For achieving the objective in a time bound manner, it had been suggested that confirmation can be obtained on priority/terminal equipment of such transmission lines affecting the transfer capability in the present condition.
  - NLDC vide letter dated 28.01.2019 (**Annexure-XXV**) had sought details of elements affecting the TTC towards SR.

#### ***TTC deliberations***

- CTU had informed that the terminal data for 400 kV had been furnished.
- NLDC had stated that all the data received had been incorporated and the balance data had only been sought from CTU/STU/Transmission Licensees in the recent letter. NLDC assured that once all the details are received, they would revise the TTC accordingly.



भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee



No: NRPC/OPR/107/2019/12924-25

Dated: 22.10.2019

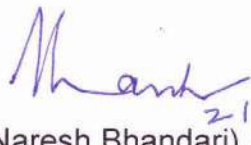
To,  
Shri. Debasis De  
Executive Director (NLDC) &  
Member Secretary of the Appraisal Committee of PSDF  
Power System Operation Corporation Ltd.,  
B-9, Qutub Institutional Area,  
Katwaria Sarai, New Delhi-110016

**Subject: PSDF funding for Development of Protection Database Management System (203) – reg.**

The grant of an amount of Rs. 28 Crore (Rupees Twenty-Eight Crore only) was sanctioned for the project of Development of Protection Database Management System in NR by Ministry of Power vide letter dated 27<sup>th</sup> July, 2018. Subsequently, NRPC sect. has carried out tendering three times to select suitable vendor for the project. However, due to lack of competition vendor for the project could not be finalized.

In 43<sup>rd</sup> TCC/46<sup>th</sup> NRPC meetings held on 23<sup>rd</sup> and 24<sup>th</sup> September, 2019, it was deliberated and agreed that competition can't be enhanced with the current scope of work / tender conditions. Accordingly, it was approved that NLDC to be informed about scrapping of DPR and funding thereon. Further, it was also approved that protection setting data may be submitted by STUs and CTU to SLDCs and NRLDC respectively with a copy to NRPC for maintaining database. The guidelines for data collection in an orderly and time bound manner will be finalized in next Protection sub-committee meeting.

Accordingly, the project of Development of Protection Database Management System in NR wouldn't be proceeded as per the scope of work in the DPR submitted for PSDF funding. Hence, it is requested that grant of Rs. 28 Crore which was sanctioned for the above project from PSDF may be cancelled.

  
(Naresh Bhandari) 21/10/19  
Member Secretary

Copy for kind information to :

1. Chief Engineer (GM&NPC), C. E. A., New Delhi

POWER SYSTEM DEVELOPMENT FUND(PSDF)																
Status of Schemes Submitted by the Entities for funding from PSDF																
Status as on 31.10.2019					Format D-1:Proposals approved under PSDF						All figures in Rs Crore					
SLNo	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
1	POWERGRID	Central	POWERGRID	URTDSM Scheme (Installation of PMUs (001)	23-Jun-14	374.63	27-Aug-14	29-Aug-14	374.63	5.1 (c)	70	7-Oct-14	262.24	8-Oct-14	31-Dec-14	27-Feb-15
2	Kerala	SR	KSEBL	Renovation and Upgradation of protection system of substations (002)	30-Jul-14	97.90	25-Aug-14	29-Aug-14	91.46	5.1 (c)	90	7-Oct-14	82.31	8-Oct-14	31-Dec-14	20-Feb-15
3	Rajasthan	NR	RRVNL	Renovation and Upgradation of protection system of substations (003)	18-Jun-14	159.53	25-Aug-14	29-Aug-14	159.53	5.1 (c)	90	7-Oct-14	143.58	8-Oct-14	31-Dec-14	6-Feb-15
4	Rajasthan	NR	RRVNL	Installation of Bus Reactors (005)	18-Jun-14	23.96	25-Aug-14	29-Aug-14	23.87	5.1(b)	90	7-Oct-14	21.48	8-Oct-14	31-Dec-14	6-Feb-15
5	West Bengal	ER	WBSETCL	Renovation and Upgradation of protection system of substations (007)	30-Jul-14	136.45	25-Aug-14	29-Aug-14	120.67	5.1 (c)	90	7-Oct-14	108.60	8-Oct-14	31-Dec-14	10-Feb-15
6	Odisha	ER	OPTCL	Renovation and Upgradation of protection system of substations (008)	17-Jul-14	184.19	24-Nov-14	25-Nov-14	180.56	5.1 (c)	90	12-Jan-15	162.50	19-Mar-15	11-May-15	5-Aug-15
7	Assam	NER	AEGCL	Renovation and Upgradation of protection system of substations(011)	21-Aug-14	382.48	24-Nov-14	25-Nov-14	299.37	5.1 (c)	100	12-Jan-15	299.37	19-Mar-15	11-May-15	29-Feb-16
8	Karnataka	SR	KPCL	Renovation and Upgradation of protection system of substations (015)	11-Sep-14	26.93	24-Nov-14	25-Nov-14	19.84	5.1 (c)	90	24-Feb-15	17.85	19-Mar-15	11-May-15	12-Jun-15
9	Nagaland	NER	DOP, Nagaland	Renovation and Upgradation of protection system of substations (017)	17-Sep-14	39.96	24-Nov-14	25-Nov-14	39.96	5.1 (c)	100	12-Jan-15	39.96	19-Mar-15	11-May-15	17-Aug-15
10	Bihar	ER	BSPTCL	Renovation and Upgradation of protection system of substations (018)	18-Sep-14	74.13	19-Dec-14	14-Jan-15	71.35	5.1 (c)	90	18-Mar-15	64.22	19-Mar-15	11-May-15	3-Dec-15
11	Uttar Pradesh	NR	UPPTCL	Installation of Capacitors and FSC. (025)	2-Nov-14	176.50	13-Jan-15	14-Jan-15	39.29	5.1(b)	90	18-Mar-15	35.36	19-Mar-15	11-May-15	26-Nov-15
12	Uttar Pradesh	NR	UPPTCL	Renovation and Upgradation of protection system of substations. (026)	2-Nov-14	279.19	13-Jan-15	14-Jan-15	202.94	5.1 (c)	90	18-Mar-15	182.65	19-Mar-15	11-May-15	26-Nov-15
13	Gujarat	WR	GETCO	Automatic Demand Management Scheme. (034)	1-Jan-15	1.72	12-Jan-15	14-Jan-15	1.67	5.1 (c)	90	18-Mar-15	1.50	19-Mar-15	11-May-15	23-Aug-15
14	TamilNadu	SR	TANTRANSO	Renovation and Upgradation of protection system of substations (020)	3-Oct-14	202.00	25-Feb-15	12-Mar-15	138.28	5.1 (c)	90	28-May-15	124.45	14-Jul-15	4-Aug-15	29-Jan-16
15	Gujarat	WR	GETCO	Load Forecasting Scheme (035)	3-Jan-15	3.70	25-Feb-15	12-Mar-15	3.70	5.1 (e)	100	28-May-15	3.70	14-Jul-15	4-Aug-15	24-Feb-16
16	Puducherry	SR	DoP, Puducherry	Renovation and Upgradation of protection system of substations (021)	10-Oct-14	13.98	3-Mar-15	12-Mar-15	10.56	5.1 (c)	90	28-May-15	9.50	14-Jul-15	4-Aug-15	26-Feb-16
17	Meghalaya	NER	MePTCL	Renovation and Upgradation of protection system of substations (042)	22-Feb-15	102.80	3-Mar-15	12-Mar-15	69.19	5.1 (c)	100	28-May-15	69.19	14-Jul-15	4-Aug-15	8-Mar-16
18	NRPC	NR	NRPC	Study Program on the integration of renewable energy resources (054)	15-May-15	6.45	19-May-15	10-Jun-15	6.45	5.1 (e)	100	25-Aug-15	6.45	1-Oct-15	28-Oct-15	24-Nov-15
19	Telangana	SR	TSTRANSO	Renovation and Upgradation of protection system of substations. (016)	8-Sep-14	72.60	19-May-15	10-Jun-15	59.97	5.1(c)	90	25-Aug-15	53.97	1-Oct-15	28-Oct-15	1-Feb-16
20	Assam	NER	AEGCL	Installation of BCU. (047)	7-Jan-15	57.13	25-Feb-15	10-Jun-15	53.52	5.1(c)	100	25-Aug-15	53.52	1-Oct-15	28-Oct-15	29-Feb-16
21	Mizoram	NER	DoP, Mizoram (032)	Renovation and Upgradation of protection system of substations. (32)	1-Dec-14	31.38	6-May-15	10-Jun-15	26.84	5.1(c)	100	25-Aug-15	26.84	1-Oct-15	28-Oct-15	26-Apr-16
22	Jammu & Kashmir	NR	PDD-J&K	Renovation and Upgradation of protection system of substations in Jammu(023)	14-Nov-14	182.44	19-Dec-14	10-Jun-15	140.04	5.1(c)	100	5-Aug-15	140.04	1-Oct-15	28-Oct-15	5-Apr-16
23	Meghalaya	NER	MePGCL	Renovation and upgradation of Protection and Control System. (57)	12-May-15	41.93	27-Jul-15	8-Sep-15	32.53	5.1(c)	100	3-Nov-15	32.53	15-Dec-15	5-Jan-16	10-Jun-16
24	Tripura	NER	TSEBL	Renovation and Upgradation of Protection System (040)	22-Feb-15	79.95	27-07-2015	8-Sep-15	31.05	5.1(C)	100	3-Nov-15	31.05	15-Dec-15	5-Jan-16	30-Mar-16
25	Himachal Pradesh	NR	HPSEBL	Renovation and Upgradation of Protection System (048)	27-Mar-15	68.59	3-Jul-15	8-Sep-15	55.44	5.1(C)	100	3-Nov-15	55.44	15-Dec-15	5-Jan-16	8-Jun-16
26	POWERGRID	ER	POWERGRID	Installation of STATCOMs in ER at Ranchi-New, Rourkela, Kishanganj and Jeypore substations of POWERGRID (056)	5-Jun-15	1,059.50	27-Jul-15	8-Sep-15	700.31	5.1(b)	90	3-Nov-15	630.28	15-Dec-15	5-Jan-16	29-Sep-16

Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SL No	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
27	Jammu & Kashmir	NR	PDD-J&K	Renovation and Upgradation of protection system of substations in Kashmir(024)	14-Nov-14	193.03	19-Dec-14	14-01-2015 10-06-2015	146.12	5.1 (c )	100	10-Feb-16	146.12	22-Feb-16	17-Mar-16	22-Apr-16
28	Karnataka	SR	KPTCL	Renovation and Upgradation of protection system of substations (12)	26-Aug-14	77.46	28-Sep-15	17-Nov-15	67.13	5.1(C)	90	16-Dec-15	60.42	22-Feb-16	17-Mar-16	12-May-16
29	Delhi	NR	DTL	Renovation and Upgradation of Protection System.(049)	24-Mar-15	125.98	16-Oct-15	17-Nov-15	125.98	5.1(c)	90	10-Feb-16	113.38	22-Feb-16	17-Mar-16	4-May-16
30	Uttarakhand	NR	PTCUL	Renovation and Upgradation of Protection System.(051)	9-Apr-15	127.11	16-Oct-15	17-Nov-15	125.05	5.1(c)	100	14-Jan-16	125.05	22-Feb-16	17-Mar-16	8-Jun-16
31	Punjab	NR	PSTCL	Bus bar protection (052)	16-Mar-15	18.21	28-Sep-15	17-Nov-15	18.21	5.1(c)	90	14-Jan-16	16.39	22-Feb-16	17-Mar-16	29-Dec-16
32	Madhya Pradesh	WR	MPPTCL	Renovation and Upgradation of protection system of substations (28)	25-Nov-14	173	4-11-2015	17-Nov-15	103	5.1(C)	90	14-Jan-16	92.70	22-Feb-16	17-Mar-16	22-Jun-16
33	Madhya Pradesh	WR	MP SLDC	Implementation of Integrated system for ABT Open Access and MIS for MPSLDC (061)	1-Aug-15	4	28-Sep-15	17-Nov-15	4	5.1(c)	90	14-Jan-16	3.60	22-Feb-16	17-Mar-16	22-Jun-16
34	Gujarat	WR	GETCO	Wind Generation forecasting for state of Gujarat(58)	6-Jul-15	1.62	28-Sep-15	17-Nov-15	1.62	5.1(e)	100	14-Jan-16	1.62	22-Feb-16	17-Mar-16	5-Dec-16
35	ERPC	ER	ERPC	Creation and Maintenance of web based protection database management (067)	24-Sep-15	20	4-Nov-15	17-Nov-15	20	5.1(e)	100	14-Jan-16	20.00	22-Feb-16	17-Mar-16	26-Apr-16
36	Uttar Pradesh	NR	UPPTCL	Reconductoring of existing line by HTLS conductor for relieving congestion. (027)	2-Nov-14	80	28-Sep-15	17-Nov-15	80	5.1(d)	75	14-Jan-16	60.00	22-Feb-16	17-Mar-16	Scheme withdrawn
37	Chhattisgarh	WR	CSPTCL	Renovation and Upgradation of protection system. (039)	6-Jan-15	176.63	16-Oct-15	8-Mar-16	68.52	5.1 (c )	90	12-Jul-16	61.67	19-Aug-16	5-Sep-16	12-Mar-19
38	Madhya Pradesh	WR	MPPGCL	Installation of 125MVAR Bus Reactor at SSTPP Khandwa substation of MPPGCL (062)	24-Aug-15	18.85	7-Jan-16	8-Mar-16	6.21	5.1(b)	90	12-Jul-16	5.59	19-Aug-16	5-Sep-16	29-Dec-16
39	Telangana	SR	TSTRANSCO	Installation of 5 nos. of 125MVAR at 400kV Mahaboobnagar, Mamidipally, Malkaram, Gajwel and Shankarpalli (059)	7-Jul-15	53.63	7-Jan-16	8-Mar-16	53.63	5.1(b)	90	12-Jul-16	48.27	19-Aug-16	5-Sep-16	21-Nov-16
40	Arunachal Pradesh	NER	APPCL	Renovation and Upgradation of Protection System. (044)	24-Feb-15	33.45	8-Jan-16	8-Mar-16	18.21	5.1 (c )	100	12-Jul-16	18.21	19-Aug-16	5-Sep-16	27-Sep-19
41	Manipur	NER	MSPCL	Renovation and Upgradation of Grid Substation of MSPCL (055)	10-Mar-15	33.50	8-Jan-16	8-Mar-16	33.5	5.1 (c )	100	12-Jul-16	33.50	19-Aug-16	5-Sep-16	9-Nov-17
42	Madhya Pradesh	WR	MPPGCL	Renovation and Upgradation of protection system of substations.(029)	25-Nov-14	88.5	3-Jul-15	8-Mar-16	52.34	5.1 (c )	90	12-Jul-16	47.11	19-Aug-16	5-Sep-16	4-Oct-16
43	Andhra Pradesh	SR	APGENCO	Renovation and Upgradation of protection system of substations (010)	13-Aug-14	40.12	16-Oct-15	8-Mar-16	44.42	5.1 (c )	90	12-Jul-16	39.98	19-Aug-16	5-Sep-16	24-Nov-16
44	Andhra Pradesh	SR	APTRANSCO	Renovation and Upgradation of protection system of substations(009)	7-Aug-14	106.32	16-Oct-15	8-Mar-16	125.27	5.1 (c )	90	12-Jul-16	112.74	19-Aug-16	5-Sep-16	23-Nov-16
45	West Bengal	ER	WBDCL	Renovation and Modernization of 220/ 132 kV STPS switch yard and implementation of Substaion Automation System.(072)	23-Dec-15	28.5	6-May-16	31-May-16	26.09	5.1 (c )	90	5-Aug-16	23.48	19-Aug-16	5-Sep-16	29-Dec-16
46	Bihar	ER	BSPTCL	Installation of Capacitor bank in 20 Nos of Grid Sub Station (074)	1-Sep-16	24.96	6-May-16	31-May-16	20.98	5.1(b)	90	5-Aug-16	18.88	19-Aug-16	5-Sep-16	14-Mar-18

Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SLNo	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
47	Haryana	NR	DHVBVN	Renovation and modernisation of distribution system of DHBVN, Haryana(077)	1-Aug-16	1381.77	6-May-16	31-May-16	364.27	5.1(d)	75	5-Aug-16	273.20	19-Aug-16	2-Jan-17	24-Nov-17
48	Bihar	ER	BSPTCL	Renovation and Upgradation of the protection and control system of 12nos 132/33 Grid Sub Station. (73)	9-Jan-16	63.55	14-Jun-16	6-Sep-16	54.69	5.1 (c )	90	24-Nov-16	49.22	24-Nov-16	2-Jan-17	
49	Punjab	NR	PSTCL	Provision of second DC Source at 220KV & 132KV Grid Sub Station of PSTCL. (70)	8-Dec-15	15.31	1-Aug-16	6-Sep-16	15.3	5.1 (c )	90	24-Nov-16	13.78	24-Nov-16	2-Jan-17	23-Mar-17
50	SRPC	SR	SRPC	Study programme on the Integration of Renewables Enery Resources (RES) into the Grid. (78)	19-Jan-16	6.45	1-Aug-16	6-Sep-16	5.5	5.1 (e )	100	24-Nov-16	5.50	24-Nov-16	2-Jan-17	23-Jan-17
51	SRPC	SR	SRPC	Procurement Web based management software and protection setting calculation tool. (79)	15-Feb-16	28	1-Aug-16	6-Sep-16	25.09	5.1 (e )	100	24-Nov-16	25.09	24-Nov-16	2-Jan-17	15-Feb-17
52	Kerala	SR	KSEBL	Implementation of Automatic Demand Management Scheme (ADMS) at 322 Substations of KSEBL at 33kV level. (80)	29-Feb-16	6.04	1-Aug-16	6-Sep-16	5.3	5.1 (c )	90	24-Nov-16	4.77	24-Nov-16	2-Jan-17	21-Mar-17
53	DVC	ER	DVC	Renovation and Upgradation of the protection and control system of Ramgarh Sub Station. (081)	4-Apr-16	39.87	14-Jun-16	6-Sep-16	28.85	5.1 (c )	90	24-Nov-16	25.96	24-Nov-16	2-Jan-17	11-Apr-17
54	Tamilnadu	SR	TANTRANSCO	Establishment of Technical and IT infrastructure for implementation of intra state ABT in Tamilnadu. (085)	23-May-16	168.10	1-Aug-16	6-Sep-16	13.31	5.1 (c )	90	24-Nov-16	11.98	24-Nov-16	2-Jan-17	24-Nov-17
55	Gujarat	WR	GETCO	220kV Super conducting fault cuurent limiter (SCFCL) project (043)	24-Feb-15	48.13	17-May-16	6-Sep-16	32.37	5.1 (c )	90	24-Nov-16	29.13	24-Nov-16	2-Jan-17	23-Feb-18
56	POWERGRID	Central	POWERGRID	Funding of BNC Agra HVDC (94)	21-Jun-16	5778	5-Jul-16	6-Sep-16	5778	4(3)(A)	50	24-Nov-16	2889.00	24-Nov-16	10-Mar-17	23-May-17
57	RECTPCL	Central	RECTPCL	11kV Rural Feeder Monitoring. (111)	29-Aug-16	233.03	26-Sep-16	28-Oct-16	233.03	5.1 (e)	100	24-Nov-16	233.03	24-Nov-16	10-Mar-17	30-May-17
58	Kerala	SR	KSEBL	Construction of Madakkathara – Areakode 400/220kV Multi-circuit Multi-voltage transmission Line (95km) & Construction of Kizhisseri-Nallalam 220/110kV Multi-Circuit Multi Voltage transmission line. (090)	31-May-16	371.03	5-Aug-16	28-Oct-16	371.03	5.1 (c )	90	16-Feb-17	333.93	10-Apr-17	16-May-17	23-Aug-17
59	Kerala	SR	KSEBL	Up-rating Kakkayam - Nallalam 110kV line (45km) & Upgrading Nallalam- Chevayur-Westhill-Koyilandy110kV Single Circuit line in to Double Circuit line.(96)	31-May-16	89.03	5-Aug-16	28-Oct-16	89.03	5.1 (d)	75	5-May-17	66.85	10-Apr-17	16-May-17	23-Aug-17
60	DVC	ER	DVC	Renovation and Modernization of control and protection system and replacement of equipment at Parulia, Durgapur, Kalyanewari, Giridhi Jamsedpur, Barjora, Burnpur, Dhanbad and Bundwan substation. (106)	8-Aug-16	191.31	28-Sep-16	28-Oct-16	156.11	5.1 (c )	90	16-Feb-17	140.50	10-Apr-17	27-Nov-17	21-Jun-17
61	Tamilnadu	SR	TANTRANSCO	Renovation and Modernisation of Protection System of 400kV, 230kV & 110kV hydro Generating Stations. (084)	18-May-16	203.69	5-Jul-16	28-Oct-16	186.09	5.1 (c )	90	16-Feb-17	167.48	10-Apr-17	16-May-17	8-Jan-18
62	Telangana	SR	TSGENCO	Renovation and Upgradation of protection system of substations (014)	1-Sep-14	32.86	14-Sep-16	28-Oct-16	7.27	5.1 (c )	90	16-Feb-17	6.54	10-Apr-17	16-May-17	11-Jul-17
63	NERPC	NER	NERPC	Study programme on the Integration of Renewables Energy Resources (RES) into the Grid. (118)	30-Sep-16	8	19-Oct-16	28-Oct-16	6.5	5.1 (e)	100	16-Feb-17	6.50	10-Apr-17	16-May-17	1-Jun-17
64	West Bengal	ER	WBPDL	Implementation of Islanding scheme at Bandel Thermal Power Station. (097)	27-Jun-16	1.64	28-Sep-16	28-Oct-16	1.54	5.1( c )	90	5-May-17	1.39	10-Apr-17	16-May-17	10-Aug-17

Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SL.N o	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
65	Maharashtra	WR	MSETCL	Replacement of existing 0.15 ACSR wolf conductor of 132kV Balapur-Patur-Malegoan corridor by High Ampacity Conductor. (098)	1-Jul-16	51.25	16-Feb-17	10-Mar-17	46.15	5.1(d)	75	5-May-17	34.61	10-Apr-17	16-May-17	19-Dec-17
66	Maharashtra	WR	MSETCL	Replacement of existing 0.2 ACSR wolf conductor of 132kV Khapri-Besa (Nagpur Ring Main Line) High Ampacity Conductor. (099)	1-Jul-16		16-Feb-17	10-Mar-17	0	5.1(d)						
67	Maharashtra	WR	MSETCL	Installation of Shunt Bus Reactors at 400KV Solapur, 400 KV Kolhapur and 400kV Karad substations. (100)	18-Jul-16	129.33	16-Feb-17	10-Mar-17	103.38	5.1(b)	90	5-May-17	93.04	10-Apr-17	22-Dec-17	25-Apr-18
68	Maharashtra	WR	MSETCL	Installation of Shunt Bus Reactors at 400KV Akola, 400 KV Bhusawal-II and 400kV Nanded substations. (101)	18-Jul-16		16-Feb-17	10-Mar-17	0	5.1(b)						
69	Maharashtra	WR	MSETCL	Installation of Shunt Bus Reactors at 400KV Koradi, 400 KV Khaparkheda and 400kV Chandrapur-II substations. (102)	18-Jul-16		16-Feb-17	10-Mar-17	0	5.1(b)						
70	Maharashtra	WR	MSETCL	Installation of Shunt Bus Reactors at 400KV Lonikand-II, 400 KV Chakan and 400kV Kudus substations. (103)	18-Jul-16		16-Feb-17	10-Mar-17	0	5.1(b)						
71	Maharashtra	WR	MSETCL	75 Nos. RTUs for 132 kv Substations in Maharashtra (104)	18-Jul-16	32.04	16-Feb-17	10-Mar-17	25.65	5.1(c)	30	5-May-17	7.70	10-Apr-17	16-May-17	
72	Maharashtra	WR	MSETCL	30 Nos. of Data Concentrators in MSETCL networks. (114)	19-Aug-16	13.12	16-Feb-17	10-Mar-17	10.41	5.1(c)	90	5-May-17	9.37	10-Apr-17	16-May-17	10-Oct-17
73	Uttar Pradesh	NR	UPPTCL	Replacement of existing ACSR conductor by HTLS conductor for reliving congestion. (89)	23-May-16	63.31	16-Feb-17	10-Mar-17	63.31	5.1(d)	75	5-May-17	47.48	10-Apr-17	16-May-17	27-Jul-17
74	Chhattisgarh	WR	CSPTCL	Implementation of Automatic Demand Management Scheme (ADMS) in the Chhattisgarh State. (112)	29-Aug-16	5.68	16-Feb-17	10-Mar-17	5.03	5.1(c)	90	5-May-17	4.53	10-Apr-17	16-May-17	3-Sep-19
75	Gujarat	WR	PGVCL	Installation of capacitor banks for reactive power compensation system on 11kV feeders. (121)	10-Nov-16	82.85	19-Jan-17	17-Apr-17	63.32	5.1 (b)	90	15-May-17	56.99	01-May-17	22-May-17	1-Aug-17
76	Gujarat	WR	MGVCL	Installation of capacitor banks for reactive power compensation system on 11kV feeders. (50)	5-Mar-15	37.15	8-Jan-16	17-Apr-17	28.39	5.1 (b)	90	15-May-17	25.55	01-May-17	22-May-17	26-Mar-18
77	Gujarat	WR	UGVCL	Installation of capacitor banks for reactive power compensation system on 11kV feeders. (53)	9-Mar-15	37.51	8-Jan-16	17-Apr-17	15.63	5.1 (b)	90	15-May-17	14.07	01-May-17	22-May-17	10-Jan-18
78	Gujarat	WR	DGVCL	Installation of capacitor banks for reactive power compensation system on 11kV feeders. (71)	10-Dec-15	21.73	8-Jan-16	17-Apr-17	15.77	5.1 (b)	90	15-May-17	14.19	01-May-17	22-May-17	29-Jan-18
79	Maharashtra	WR	MESTCL	Installation of Capacitor Banks at HV & EHV level at various EHV subatations under Nashik & Pune zones in MSETCL. (086)	20-May-16	19.49	19-Jan-17	17-Apr-17	15.72	5.1 (b)	90	15-May-17	14.15	01-May-17	22-May-17	10-Oct-17
80	Maharashtra	WR	MSETCL	Implementation of ADMS scheme on 33/11kV feeders in Maharashtra. (113)	19-Aug-16	43.73	31-Mar-17	17-Apr-17	32.58	5.1(c)	90	15-May-17	29.32	01-May-17	22-May-17	10-Oct-17
81	West Bengal	ER	WBSETCL	Installation of switchable reactor & shunt capacitor for voltage improvement. (88)	3-Feb-16	48.45	8-Jan-16	17-Apr-17	48.19	5.1 (b)	90	15-May-17	43.37	01-May-17	22-May-17	10-Aug-17
82	West Bengal	ER	WBSETCL	Renovation & Modernisation of Transmission System for relieving congestion in intra state transmission system by capacity enhancement of existing network. (087)	3-Feb-2016	72.65	31-Mar-17	17-Apr-17	93.51	5.1(d)	75	15-May-17	70.13	01-May-17	22-May-17	10-Aug-17
83	Manipur	NER	Manipur SLDC	33kV system Integration with SLDC system in manipur. (093)	16-May-17	77.01	31-Mar-17	17-Apr-17	13.37	5.1(c)	100	15-May-17	13.37	01-May-17	22-May-17	9-Nov-17



Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SL.N o	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
84	Odisha	ER	OHPCL	Renovation and Upgradation of protection and control system of OHPC. (109)	23-Aug-16	38.93	31-Mar-17	17-Apr-17	24.83	5.1(c)	90	15-May-17	22.35	01-May-17	22-May-17	19-Sep-17
85	Rajasthan	NR	RRVPNL	" Smart Transmission Operation Management System (STOMS) " in Rajasthan Power System. (110)	29-Aug-16	29.95	31-Mar-17	17-Apr-17	13.18	5.1(c)	90	15-May-17	11.86	01-May-17	19-May-17	10-Oct-17
86	Rajasthan	NR	RRVPNL	Communication Backbone "Smart Transmission Network & Asset Management System " Part-B (136)	20-Feb-17	586.87	31-Mar-17	17-Apr-17	569.77	5.1(c)	50	15-May-17	284.89	01-May-17	22-May-17	10-Oct-17
87	Telangana	SR	TSTRANSCO	Relieving of Transmission Congestion of existing Overloaded 220kV Lines in Hyderabad city. (119)	31-Oct-16	107.40	31-Mar-17	17-Apr-17	78.84	5.1(d)	75	15-May-17	59.13	01-May-17	22-May-17	27-Jun-17
88	Madhya Pradesh	WR	MPPGCL	Installation of : 50 MVAR Line Reactor at 400kV substation at Sarni, Dist. Betul. (123)	14-Dec-16	7.45	31-Mar-17	17-Apr-17	7.45	5.1(b)	60	15-May-17	6.71	01-May-17	22-May-17	19-Jan-18
89	Andhra Pradesh	SR	APTRANSCO	Project on providing of Reliable communication and Data acquisition system upto 132kV SS. (127)	30-Jan-17	383.22	31-Mar-17	17-Apr-17	284.96	5.1(c)	50	15-May-17	142.48	01-May-17	23-May-17	24-Aug-17
90	POWERGRID	SR	POWERGRID	Installation of STATCOM in SR region at Hyderabad, Udumalpet & Trichy substations of Powergrid. (75)	7-Jan-16	472.55	5-May-16	17-Apr-17	472.55	5.1(b)	80	15-May-17	378.04	01-May-17	22-May-17	10-Oct-17
91	BBMB	NR	BBMB(038)	Renovation and Upgradation of protection system of substations. (038)	6-Jan-15	28.48	8-Jan-16	08-Mar-16	25.86	5.1 (c)	90	15-May-17	23.27	25-Aug-17	15-Nov-17	19-Feb-18
92	Telangana	SR	TSTRANSCO	Implementation of OPGW based reliable communication at 132 kv and above substations. (137)	14-Mar-17	185.23	21-Jun-17	04-Jul-17	159.63	5.1(c)	50	4-Oct-17	79.82	25-Aug-17	15-Nov-17	21-Mar-18
93	Rajasthan	NR	RRVPNL	Real Time Data Acquisition System for Monitoring & Control of Transmission Grid under STNAMS (PART A-1) (153)	26-Apr-17	191.72	21-Jun-17	04-Jul-17	185.19	5.1(c)	50	4-Oct-17	92.60	25-Aug-17	15-Nov-17	23-Feb-18
94	Kerala	SR	KSEBL	Renovation & Up gradation of Various 220 kv switchyard Equipment. (126)	25-Jan-17	61.37	21-Jun-17	04-Jul-17	22.42	5.1(c)	90	4-Oct-17	20.18	25-Aug-17	15-Nov-17	15-Feb-18
95	Odisha	ER	OPTCL	Implementation of OPGW based reliable communication at 132 kv and above substations. (128)	9-Feb-17	80.62	21-Jun-17	04-Jul-17	51.22	5.1(c)	50	4-Oct-17	25.61	25-Aug-17	15-Nov-17	3-Jan-18
96	Uttarakhand	NR	PTCUL	Implementation of OPGW based reliable communication at 132 kv and above substations. (129)	10-Feb-17	43.39	21-Jun-17	04-Jul-17	37.46	5.1(c)	50	4-Oct-17	18.73	25-Aug-17	15-Nov-17	28-Nov-18
97	Kerala	SR	KSEBL	Implementation of OPGW based reliable communication at 132 kv and above substations. (141)	16-Mar-17	212.45	21-Jun-17	04-Jul-17	147.52	5.1(c)	50	4-Oct-17	73.76	25-Aug-17	15-Nov-17	16-Apr-19
98	Gujarat	WR	GETCO	Implementation of OPGW based reliable communication at 132 kv and above substations. (143)	27-Mar-17	576.64	21-Jun-17	04-Jul-17	507.89	5.1(c)	50	4-Oct-17	253.95	25-Aug-17	15-Nov-17	12-Feb-18
99	Tamilnadu	SR	TANTRANSCO	Implementation of OPGW based reliable communication at 132 kv and above substations. (151)	24-Apr-17	374.42	21-Jun-17	04-Jul-17	310.96	5.1(c)	50	4-Oct-17	155.48	25-Aug-17	15-Nov-17	3-Jun-19
100	Manipur	NER	MSPCL	Implementation of OPGW based reliable communication at 132 kv and above substations. (152)	26-Apr-17	11.36	21-Jun-17	04-Jul-17	8.15	5.1(c)	50	4-Oct-17	4.08	25-Aug-17	15-Nov-17	29-Jan-18
101	Jharkhand	ER	JUSNL	Renovation and Upgradation of protection system of substations. (161)	5-Jun-17	186.31	21-Jun-17	04-Jul-17	153.48	5.1(c)	90	4-Oct-17	138.13	25-Aug-17	15-Nov-17	3-Jul-18
102	ERPC	ER	ERPC	Study Programme on power trading at NORD POOL Academy for Power System Engineers of Eastern Region. (122)	5-Dec-16	6.2	21-Jun-17	4-Jul-17	5.46	5.1(e)	100	14-Jun-18	5.46	2-May-18	27-Jul-18	21-Sep-18
103	ERPC	ER	ERPC	Traning Program for Power system Engineers of various constituents of Eastern Region. (117)	29-Sep-16	1.01	21-Jun-17	4-Jul-17	0.61	5.1(e)	100	14-Jun-18	0.61	2-May-18	27-Jul-18	21-Sep-18

Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SL No	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
104	Chhattisgarh	WR	CSPTCL	Reliable Communication and data Acquisition System upto 132kV Substation in Chhattisgarh. (125)	25-Jan-17	145.91	29-Sep-17	5-Feb-18	145.91	5.1(c)	50	14-Jun-18	72.96	2-May-18	27-Jul-18	
105	West Bengal	ER	WBPDCL	Renovation and Modernization of switchyard and related protection system of different power stations (BTPS, BKTPS and KTPS) of WBPDCL (155)	26-Apr-17	110.5	29-Sep-17	5-Feb-18	50.18	5.1(c)	90	14-Jun-18	45.16	2-May-18	27-Jul-18	20-Dec-18
106	Karnataka	SR	KPTCL	Reliable Communication and data Acquisition System upto 132kV Substation in Karnataka. (149)	6-Apr-17	292.88	29-Sep-17	5-Feb-18	253.57	5.1(c)	50	14-Jun-18	126.79	2-May-18	27-Jul-18	25-Jan-19
107	Andhra Pradesh	SR	APTRANSCO	Project on Scheduling, accounting, Meeting and Settlement of Transmission in Electricity (SAMAST) IN Transmission Corporation of Andhra Pradesh (147)	6-Apr-17	52.72	15-Nov-17	5-Feb-18	21.48	5.1(c)	90	14-Jun-18	19.33	2-May-18	27-Jul-18	28-Nov-18
108	Punjab	NR	PSTCL	Reliable Communication and data Acquisition System upto 132kV Substation in Punjab. (138)	14-Mar-17	66.8	29-Sep-17	5-Feb-18	66.1	5.1(c)	50	14-Jun-18	33.05	2-May-18	27-Jul-18	14-Nov-18
109	Himachal Pradesh	NR	HPSEBL	Strengthening of Transmission System incidentals to Inter-State- Transmission System in the State of HP (134)	23-Feb-17	106.17	15-Nov-17	5-Feb-18	24.38	5.1(d)	100	14-Jun-18	24.38	2-May-18	27-Jul-18	16-Apr-19
110	Himachal Pradesh	NR	HPSEBL	Reliable Communication and data Acquisition System upto 132kV Substation in Himachal Pradesh (135)	23-Feb-17	10.77	29-Sep-17	5-Feb-18	18.64	5.1(c)	50	14-Jun-18	9.32	2-May-18	27-Jul-18	16-Apr-19
111	Madhya Pradesh	WR	MPPTCL	Reliable Communication and data Acquisition System upto 132kV Substation in Madhya Pradesh. (144)	6-Apr-17	506.51	26-Feb-18	22-Mar-18	413.79	5.1(c)	50	20-Jul-18	206.89	2-May-18	27-Jul-18	16-Mar-19
112	Madhya Pradesh	WR	MPPGCL	Installation of 125MVAR Bus Reactor at 400kV Switchyard Sanjay Gandhi TPS, at Substations at Birsinghpur under PSDF. (167)	9-Jul-17	22.01	26-Feb-18	22-Mar-18	14.52	5.1(b)	90	20-Jul-18	13.07	2-May-18	27-Jul-18	3-Oct-18
113	Madhya Pradesh	WR	MPPGCL	Installation of 125MVAR Bus Reactor at 400kV Switchyard at Shree Singaji TTP Stage-II, Dist: Khandwa. (174)	9-Aug-17		26-Feb-18	22-Mar-18								
114	Odisha	ER	OPTCL	Installation of 125 MVAR Bus Reactor along with construction of associated by each at 400kV Grid S/S of Mendhasal, Meramundali & New Duburi for VAR control & stabilisation of system voltage. (179)	28-Aug-17	31.94	16-Nov-17	22-Mar-18	30.26	5.1(b)	90	20-Jul-18	27.23	2-May-18	27-Jul-18	21-Sep-18
115	Puducherry	SR	DoP, Puducherry	Project on providing of Reliable Communication & Data Acquisition system upto 132kV SS. (180)	28-Aug-17	15.01	26-Feb-18	22-Mar-18	7.37	5.1(c)	50	20-Jul-18	3.69	2-May-18	27-Jul-18	3-Oct-19
116	NERPC	NER	NERPC	Protection Data base management System. The project will be implemented in following States: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland & Tripura. (201)	8-Jan-18	26.74	26-Feb-18	22-Mar-18	18.00	5.1(e)	100	20-Jul-18	18.00	2-May-18	27-Jul-18	20-Aug-18
117	NRPC	NR	NRPC	Creation and Maintanance of Web based Protection Database Management and PC based Protection Setting Calculation Tool for Northern Region Power System Network. (203)	12-Jan-18	35.00	26-Feb-18	22-Mar-18	28.00	5.1(e)	100	20-Jul-18	28.00	2-May-18	27-Jul-18	
118	Manipur	NER	MSPCL	Implementation of Automatic Demand Management Scheme (ADMS) Pilot Projects at Three Power Substation in Manipur(140)	16-Mar-17	6.55	31-May-18	25-Jun-18	2.24	5.1 (c)	100	6-Dec-18	2.24	7-Jan-19	24-May-19	21-Oct-19
119	Arunachal Pradesh	NER	DoP, Arunachal Pradesh	Implementation of Automatic Demand Management System (ADMS) to integrate 33/11kV System with Arunachal Pradesh SLDC. (146)	6-Apr-17	4.99	31-May-18	25-Jun-18	1.97	5.1 (c)	100	6-Dec-18	1.97	7-Jan-19	24-May-19	
120	Nagaland	NER	DOP, Nagaland	33/11kV System integration with SLDC System in Nagaland. (145)	6-Apr-17	5.09	31-May-18	25-Jun-18	2.12	5.1 (c)	100	6-Dec-18	2.12	7-Jan-19	24-May-19	3-Oct-19
121	Mizoram	NER	DOP, Mizoram	33/11kV System integration with SLDC System Automatic Demand Management Scheme (ADMS) in Mizoram. (148)	6-Apr-17	5.40	31-May-18	25-Jun-18	1.97	5.1 (c)	100	6-Dec-18	1.97	7-Jan-19	24-May-19	



Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SL No	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno-Economic clearance	Date of Recommendation by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
122	Assam	NER	APDCL	33/11kV System Integration with SLDC System in Assam. (156)	8-May-17	5.00	31-May-18	25-Jun-18	3.26	5.1 (c)	100	6-Dec-18	3.26	7-Jan-19	24-May-19	
123	Meghalaya	NER	MePDCL	33/11kV System integration with SLDC system in Meghalaya. (166)	10-Jul-17	2.07	31-May-18	25-Jun-18	2.07	5.1 (c)	100	6-Dec-18	2.07	7-Jan-19	24-May-19	21-Aug-19
124	Tripura	NER	TSECL	Implementation of Automatic Demand Management System (ADMS) in SLDC, Tripura. (226)	25-May-18	2.32	31-May-18	25-Jun-18	2.32	5.1 (c)	100	6-Dec-18	2.32	7-Jan-19	24-May-19	
125	Odisha	ER	OPTCL	Implementation of Automatic Demand Management System (ADMS) in SLDC, Odisha. (196)	22-Dec-17	3.26	31-May-18	25-Jun-18	3.26	5.1 (c)	90	6-Dec-18	2.93	7-Jan-19	24-May-19	
126	Jharkhand	ER	JUSNL	Reliable Communication & Data Acquisition System upto 132kV Substaions ER .(177)	23-Aug-17	102.31	31-May-18	25-Jun-18	44.72	5.1 (c)	50	6-Dec-18	22.36	7-Jan-19	24-May-19	
127	Sikkim	ER	ENPD Sikkim	Drawing of optical ground wire (OPGW) cables on existing 132kV & 66kV transmission lines and integration of leftover substations with State Load Despatch Centre, Sikkim. (173)	9-Aug-17	25.36	31-May-18	25-Jun-18	20.00	5.1 (c)	50	6-Dec-18	10.00	7-Jan-19	24-May-19	
128	Meghalaya	NER	MePTCL	Installation of Numerical line differential relays in the 132kV transmission lines. (Short Lines). (186)	30-Oct-17	4.51	30-Oct-18	15-Nov-18	3.27	5.1 (b)	100	13-Mar-19	3.27	7-Jan-19	24-May-19	21-Aug-19
129	West Bengal	ER	WBSETCL	Instaltion of Bus Reactors at different 400kV Substation within the state of West Bengal for reactive power management of the Grid. (210)	12-Mar-18	79.71	30-Oct-18	15-Nov-18	79.71	5.1 (b)	90	13-Mar-19	71.74	7-Jan-19	24-May-19	24-Jun-19
130	Haryana	NR	HVPN	Reliable Communiacation System for 132 kV & above network in Haryana. (224)	22-May-18	219.78	30-Oct-18	15-Nov-18	175.51	5.1 (c)	50	13-Mar-19	87.75	7-Jan-19	24-May-19	16-Aug-19
131	Rajasthan	NR	RRVNL	Installation of 1x25 MVAR, 220kV Bus Reactor each at 400kV GSS Akal, 220kV GSS Suratgarh & 220kV GSS Bikaner. (223)	22-May-18	22.77	30-Oct-18	15-Nov-18	17.58	5.1 (b)	90	13-Mar-19	15.82	7-Jan-19	24-May-19	16-Oct-19
132	Punjab	NR	PSTCL	Provision of Bus Reactors at 400kV Grid Substations of PSTCL. (158)	29-May-17	52.00	30-Oct-18	15-Nov-18	33.92	5.1 (b)	90	13-Mar-19	30.53	7-Jan-19	24-May-19	2-Sep-19
133	Maharashtra	WR	MSETCL	Implementation & Supply of Numerical Line differential as Main-I Protection with inbuilt distance Relays towards Retrofit of existing protection schemes on 400kV lines at various 400kV substations in MSETCL. (238)	3-Jul-18	4.07	30-Oct-18	15-Nov-18	4.07	5.1 (b)	90	13-Mar-19	3.66	7-Jan-19	24-May-19	
134	Andhra Pradesh	SR	AP TRANSCO	Project on commissioning of 125MVAR Bus Reactors on 400kV SS Sattenapalli and 400kV SS Chittoor in Transmission Corporation of Andhra Pradesh. (Part-1) (239)	16-Jul-18	18.78	30-Oct-18	15-Nov-18	16.37	5.1 (b)	90	13-Mar-19	14.73	7-Jan-19	24-May-19	23-Aug-19
135	Tamilnadu	SR	TAN TRANSCO	Supply, Erection, Testing & Commissioning of 2 Nos. of 400kV, 80 MVAR Bus reactor with associated equipments for 400/230-110 kV AIS SS at Kamudhi under total turnkey cintract cintract in Madurai Region of Tamilnadu. (188)	30-Oct-17	17.27	30-Oct-18	15-Nov-18	16.44	5.1 (b)	90	13-Mar-19	14.80	7-Jan-19	24-May-19	
136	Tamilnadu	SR	TAN TRANSCO	Supply, Erection, Testing & Commissioning of 1 Nos. of 400kV, 125 MVAR Bus reactor with associated equipments for 400/230-110 kV SS at Kayathar under total turnkey contract in Tiruneveli Region of Tamilnadu. (193)	6-Dec-17	9.58	30-Oct-18	15-Nov-18	9.12	5.1 (b)	90	13-Mar-19	8.21	7-Jan-19	24-May-19	
137	Tamilnadu	SR	TAN TRANSCO	Supply, Erection, Testing & Commissioning of 1 Nos. of 400kV, 125 MVAR Bus reactor with associated equipments for 400kV SS at Alamathy under total turnkey contract in Chennai North Region of Tamilnadu. (202)	9-Jan-18	11.55	30-Oct-18	15-Nov-18	9.96	5.1 (b)	90	13-Mar-19	8.96	7-Jan-19	24-May-19	
138	Tamilnadu	SR	TAN TRANSCO	Supply, Erection, Testing & Commissioning of 1 Nos. of 400kV, 125 MVAR Bus reactor with associated equipments for MPTS Stage III GIS switchyard under total turnkey contract in Erode Region of Tamilnadu. (205)	29-Jan-18	12.73	30-Oct-18	15-Nov-18	10.60	5.1 (b)	90	13-Mar-19	9.54	7-Jan-19	24-May-19	

Status as on 31.10.2019																
Format D-1:Proposals approved under PSDF																
All figures in Rs Crore																
SL.N o	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Date of Submission of Scheme by Entity	Estimated cost by entity	Date of Techno- Economic clearance	Date of Recommendat ion by Appraisal Committee	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding in %	Date of Concurrence by CERC.	Grant Approved by Monitoring Committee	Date of Approval by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement
I	II		III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
139	Odisha	ER	OPTCL	Protection Upgradation and installation of Substation Automatic System (SAS) for seven nos of 220/132/33kV Substations (Balasore, Bidanasi, Budhipadar, Katapali, Narendrapur, New-Bolangir & Paradeep). (209)	12-Mar-18	41.10	30-Oct-18	15-Nov-18	40.70	5.1 (c)	90	13-Mar-19	36.63	7-Jan-19	24-May-19	
140	West Bengal	ER	WBSETCL	Project for establishment of reliable communication and data acquisition at different substation at WBSETCL. (222)	10-May-18	80.39	30-Oct-18	15-Nov-18	62.39	5.1 (c)	50	13-Mar-19	31.19	7-Jan-19	24-May-19	24-Jun-19
				Total		20,451.12			16,770.19				11,282.09			

**Measures recommended by Enquiry Committee to analyse the causes of grid disturbances during July 2012**

- 1) An extensive review and audit of the Protection Systems should be carried out to avoid their undesirable operation.
- 2) Frequency Control through Generation reserves/Ancillary services should be adopted, as presently employed UI mechanism is sometimes endangering the grid security. The present UI mechanism needs a review in view of its impact on recent disturbances.
- 3) Primary response from generators and operation of defense mechanisms, like Under Frequency & df/dt based load shedding and Special Protection Schemes, should be ensured in accordance with provisions of the grid code so that grid can be saved in case of contingencies.
- 4) A review of Total Transfer Capability (TTC) procedure should be carried out, so that it can also be revised under any significant change in system conditions, such as forced outage. This will also allow congestion charges to be applied to relieve the real time congestion.
- 5) Coordinated outage planning of transmission elements need to be carried out so that depletion of transmission system due to simultaneous outages of several transmission elements could be avoided.
- 6) In order to avoid frequent outages/opening of lines under over voltages and also providing voltage support under steady state and dynamic conditions, installation of adequate static and dynamic reactive power compensators should be planned.
- 7) Penal provisions of the Electricity Act, 2003 need to be reviewed to ensure better compliance of instructions of Load Despatch Centres and directions of Central Commission.
- 8) Available assets, providing system security support such as HVDC, TCSC, SVC controls, should be optimally utilized, so that they provide necessary support in case of contingencies.
- 9) Synchrophasor based WAMS should be widely employed across the network to improve the visibility, real time monitoring, protection and control of the system.
- 10) Load Despatch Centres should be equipped with Dynamic Security Assessment and faster State Estimation tools.
- 11) There is need to plan islanding schemes to ensure supply to essential services and faster recovery in case of grid disruptions.
- 12) There is need to grant more autonomy to all the Load Despatch Centres so that they can take and implement decisions relating to operation and security of the grid
- 13) To avoid congestion in intra-State transmission system, planning and investment at State level need to be improved.
- 14) Proper telemetry and communication should be ensured to Load Despatch Centres from various transmission elements and generating stations. No new transmission

element/generation should be commissioned without the requisite telemetry facilities.

- 15) Start up time of generating stations need to be shortened to facilitate faster recovery in case of grid disruptions.
- 16) There is a need to review transmission planning criteria in view of the growing complexity of the system.
- 17) System study groups must be strengthened in various power sector organizations.
- 18) It was also felt that a separate task force may be formed, involving experts from academics, power utilities and system operators, to carry out a detailed analysis of the present grid conditions and anticipated scenarios which might lead to any such disturbances in future. The committee may identify medium and long term corrective measures as well as technological solutions to improve the health of the grid.



**Status of the Implementation of the Recommendations of the Enquiry Committee on  
Grid Disturbance in NR, ER & NER during 2012 in Southern Region**

Recommendation		Fully completed / Partially Completed / Not Completed	Responsible Entity	SRPC Comments
No.	Content of recommendation	SR		
<b>1</b>	<b>Review of Protection System</b>			
1.1	Third party protection audit	PC	Powergrid, STU, GEN	91.64 as on 14.02.2019
1.2	Review of zone-3 philosophy	FC	Powergrid, STU, GEN	
1.3	Synchro phasor measurements /PMUs & deploy of SPSs	FC	RPC, RLDC, Powergrid, STU, GEN	
1.4	Time synchronization of DRs/ELs/PMUs	FC	Powergrid, STU, GEN	
<b>3</b>	<b>Defense mechanism - <math>f_{min}</math> and <math>df/dt</math> - load shedding schemes</b>	FC	STUs, RPCs, POSOCO	
<b>4</b>	<b>Ensuring primary frequency response from generators</b>	PC	POSOCO, RPC, Generators	
<b>5</b>	<b>Revising TTC based on change in system conditions</b>			
5.2	Real-time security desk caring TTC calculations	FC	NLDC and RLDCs	
<b>6</b>	<b>Coordinated outage planning of transmission elements</b>	FC	NLDC and RLDCs	
<b>7</b>	<b>Reactive power planning -</b>	FC	Powergrid, STU, GEN	
<b>9</b>	<b>Optimum utilization of availability assets</b>			
9.1	Regulatory provision - absorption of reactive power by generators	FC	POSOCO, RPC, Generators	
9.2	Audit of HVDC, TCSC, SVA and PSS	PC	CTU, STUs, Generators	Ongoing exercise
9.3	Functioning of existing PMU and availability of their output to RLDC	FC	CTU, POSOCO	
<b>10</b>	<b>Deployments of WAMS</b>			
10.1	Synchro phasor based WASM employing PMUs	FC	CTU	
10.2	Possible of voltage collapse	NC	RPCs	May be taken



Recommendation		Fully completed / Partially Completed / Not Completed	Responsible Entity	SRPC Comments
No.	Content of recommendation	SR		
	prediction			up with specialized consultants/ research
11	Dynamic security assessment and review of state estimation	FC	POSOCO	
12	Implementation of islanding schemes	FC	CEA, RPCs, Powergrid, STUs, SLDCs, Generators	
13	Autonomy to Load Dispatch Centers			
13.1	Organization of the Load Dispatch Centers reviewed and entrusted to ISO	PC	Govt. Of India, State Govt.	Policy matter
13.2	Training and certification of system operators need to be given focused attention	PC	Govt. Of India, State Govt.	Ongoing exercise
14	Development of Intra-state transmission system	PC	STUs	Ongoing exercise
15	Network visualization			
15.2	Fiber optic communication system	PC	CTU, STUs	Ongoing exercise
15.3	RTUs and communication equipment should have uninterruptible power supply with proper battery back up	FC	CTU, STUs	
15.4	Telemetry facilities will be install for all generation station and transmission element without these	PC	RPCs, POSOCO	Ongoing exercise
16	Reduction in Start-up time Generators	PC	CEA, Generators, RLDCs	Taken up with generators
18	Strengthening of system study groups in various power sector organization	FC	CEA, CTU, STU	
20	Improved telecom infrastructure for cyber security	PC	MOP, CEA	Ongoing exercise

### Status of Implementation in Eastern Region

Recommendation		Fully completed / Partially Completed / Not Completed							Remarks
No.	Content of recommendation	Bihar (STU/SLDC/State Controlled Generators)	Jharkhand (STU/SLDC/State Controlled Generators)	West Bengal (STU/SLDC/State Controlled Generators)	DVC (STU/SLDC/State Controlled Generators)	Odisha (STU/SLDC/State Controlled Generators)	Sikkim (STU/SLDC/State Controlled Generators)	RPC/RLDC/PGCIL/ISGS	
1	<b>Review of Protection System</b>								
1.1	Third party protection audit	PC	PC	PC	PC	PC	PC	FC	
1.2	Review of zone-3 philosophy	FC	FC	FC	FC	FC	FC	FC	
1.3	Synchro phasor measurements /PMUs & deploy of SPSs							FC	
1.4	Time synchronization of DRs/ELs/PMUs	PC	PC	FC	PC	PC	PC	FC	
3	<b>Defense mechanism - <math>f_{min}</math> and <math>df/dt</math> - load shedding schemes</b>	FC	FC	FC	FC	FC	FC	FC	
4	<b>Ensuring primary frequency response from generators</b>	PC	PC	PC	PC	PC	PC	PC	Status is regularly deliberated in OCC however only one or two generators exhibit satisfactory response, further a special meeting is being organized on 31-Jan-2019 at ERPC specially for emphasizing the importance and discussing the issue related to non-satisfactory performance
5	<b>Revising TTC based on change in system conditions</b>			FC				FC	TTC figures are published by POSOCO 3 months in advance. In cases of change in system conditions (Network or load-generation balance), TTC revisions are done to appropriately represent real-time conditions
5.2	Real-time security desk caring TTC calculations							FC	RTSD regularly calculates the TTC in realtime for emergency shutdown or other real time contingency
6	<b>Coordinated outage planning of transmission elements</b>			FC				FC	Coordinated outage planning of transmission elements is done RPC level where all planned shutdown is discussed every monthly OCC before finalization
7	<b>Reactive power planning -</b>	PC		PC				FC	
9	<b>Optimum utilization of availability assets</b>								
9.1	Regulatory provision - absorption of reactive power by generators			PC				PC	Status is regularly deliberated in OCC and only some of the generators are observed to absorb adequate reactive power(at high voltage)
9.2	Audit of HVDC, TCSC, SVA and PSS							PC	
9.3	Functioning of existing PMU and availability of their output to RLDC							FC	
10	<b>Deployments of WAMS</b>								

### Status of Implementation in Eastern Region

Recommendation		Fully completed / Partially Completed / Not Completed							Remarks
No.	Content of recommendation	Bihar	Jharkhand	West Bengal	DVC	Odisha	Sikkim	RPC/RLDC/PGCIL/ISGS	
		(STU/SLDC/State Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/State Controlled Generators)		
10.1	Synchro phasor based WASM employing PMUs							FC	Around 8 PMUs are installed as part of Pilot project for WAMS in ER region and is reporting to ERLDC and NLDC control centers. As part of ER-URTDSM project, implemented by POWERGRID, 281 PMUs are installed out of 298 in the phase -I. At present 251 PMUs are reporting to ERLDC control center.
10.2	Possible of voltage collapse prediction							NC	
11	Dynamic security assessment and review of state estimation								May be collected from NLDC, as this is planned under upcoming SCADA/EMS project at NLDC
12	Implementation of islanding schemes	NC	FC	FC	FC			PC	
13	Autonomy to Load Dispatch Centers	NC	NC	NC		NC	NC	FC	
13.1	Organization of the Load Dispatch Centers reviewed and entrusted to ISO	NC	NC	NC		NC		FC	
13.2	Training and certification of system operators need to be given focused attention	PC	PC	NC	FC	FC		FC	
14	Development of Intra-state transmission system							FC	
15	Network visualization	PC	PC			FC		PC	
15.2	Fiber optic communication system	PC	PC	PC		PC		PC	
15.3	RTUs and communication equipment should have uninterruptible power supply with proper battery back up	PC	FC	FC		FC		PC	
15.4	Telemetry facilities will be install for all generation station and transmission element without these	PC	PC	FC		FC		PC	As per NLDC's Procedure to grant trial operation certificate requires the transmission licensee/Generator to keep in service all necessary metering, telemetry, and protection facilities. This ensures telemetry of MW, MVar, Voltage/Frequency, status of CB, Isolator, transformer taps etc. for transmission elements commissioned . In some generation stations and older transmission systems, complete telemetry is yet to be ensured. Telemetry status is regularly deliberated in regional SCADA O&M meeting and OCC Meeting in RPC fora.

**Status of Implementation in Eastern Region**

Recommendation		Fully completed / Partially Completed / Not Completed							Remarks
No.	Content of recommendation	Bihar	Jharkhand	West Bengal	DVC	Odisha	Sikkim	RPC/RLDC /PGCIL/IS GS	
		(STU/SLDC/St ate Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/Sta te Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/State Controlled Generators)	(STU/SLDC/St ate Controlled Generators)		
16	Reduction in Start-up time Generators							PC	
18	Strengthening of system study groups in various power sector organization	NC	NC	NC		NC		FC	
20	Improved telecom infrastructure for cyber security	NC	NC	NC		PC		PC	



CE NPC &lt;cenpccea@gmail.com&gt;

---

**Status of Implementation of Enquiry Committee Recommendation-reg**

1 message

**SE(Protection), WRPC** <prc-wrpc@nic.in>

19 February 2019 at 17:14

To: cenpccea@gmail.com











Cc: jkrathod.cea@gov.in, pramod.lone@gmail.com, protectionwrpc@gmail.com, bvsandeep@nic.in, prc-wrpc@nic.in

Sir,  
please find enclosed herewith the soft copies of the status received from utilities as requested by you vide mail dated 06.02.2019.

Regards  
WRPC, Protection Division

---

**10 attachments**

-  **Adani Mundra and Tiroda Annexure II Indicative\_Format.xlsx**  
13K
-  **Annexure II Indicative\_Format OF MP.xlsx**  
14K
-  **WR 2 enquiry committe indicative format 300118.xlsx**  
13K
-  **japee nigrie Annexure II Indicative\_Format.xlsx**  
13K
-  **lanco amarkantak Annexure II Indicative\_Format.xlsx**  
13K
-  **Maharashtra.pdf**  
2526K
-  **Rinfra\_Mohan Waingankar.pdf**  
79K
-  **TAPS 12 Status of implementation in Region -Compilation of data related to NPC.xls**  
30K
-  **WR 1 enquiry committe indicative format 300118.xlsx**  
13K
-  **prc-wrpc.vcf**  
1K

पावर सिस्टम ऑपरेशन कॉर्पोरेशन लिमिटेड  
(भारत सरकार का उद्यम)  
**POWER SYSTEM OPERATION CORPORATION LIMITED**  
(A Govt. of India Enterprise)



पंजीकृत एवं केन्द्रीय कार्यालय : प्रथम तल, बी-9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110016  
Registered & Corporate Office : 1st Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016  
CIN : U40105DL2009GOI188682, Website : www.posoco.in, E-mail : posocccc@posoco.in, Tel.: 011- 41035696, Fax : 011- 26536901

संदर्भ संख्या: पोसोको/एनएलडीसी/2018/

दिनांक: 09<sup>th</sup> November, 2018

सेवा मे,

Director,  
National Power Committee,  
NRPC Building,  
3<sup>rd</sup> Floor, Katwaria Sarai,  
New Delhi-110016

(Kind Attn: Sh. Irfan Ahmad)

विषय: Agenda Note on National Energy Account & National Deviation Pool Account  
for 8<sup>th</sup> Meeting of National Power Committee.

संदर्भ: NPC letter no: 4/MTGS/NPC/CEA/2018/1122-1123 dtd. 01<sup>st</sup> Nov, 2018

महोदय,

With reference to the above mentioned NPC communication dated 01<sup>st</sup> November 2018, an Agenda note on National Energy Account & National Deviation Pool Account for the forthcoming 8<sup>th</sup> Meeting of National Power Committee is enclosed.

सादर धन्यवाद,

भवदीय,

समीर सक्सेना  
09/11/18.

(एस. सी. सक्सेना)

उप महाप्रबंधक (एन एल डी सी)

Encl: As above

Copy to: Chief Engineer, National Power Committee, NRPC Building, 3<sup>rd</sup> Floor,  
Katwaria Sarai, New Delhi-110016



**National Energy Account & National Deviation Pool Account**  
*Agenda Note for 8<sup>th</sup> Meeting of the National Power Committee (NPC)*  
*30<sup>th</sup> November 2018, Guwahati*

**1. Establishment of National Grid**

In the sixties, the country's electricity grid was demarcated into five electrical regions and Regional Electricity Boards were formed. In order to facilitate inter-state power transactions and the development of regional grids, Govt. of India funded construction of a number of inter-state lines. Subsequently multi-beneficiary Central Sector generating stations were developed by utilities like NTPC, NHPC etc. along with associated transmission system for evacuation of power. The concept of regional energy accounting (earlier known as global accounting) was developed with boundary metering of all control areas.

Till late nineties, power system was planned on regional self-sufficiency basis and there were very few inter-regional links. With more and more inter-regional inter-connections coming up, the focus now shifted to formation of a strong National Grid. Initially, HVDC was used to interconnect two regions, e.g., NR-WR, NR-ER, WR-SR, etc. Gradually, AC interconnections also came up and by August 2006, all regional grids except SR were interconnected synchronously into two synchronous systems known as NEW and SR Grids. The strong HVDC links connecting the NEW grid to Southern region are extensively used for optimizing power flows in the NEW grid. With strong AC connections between the regions constituting the NEW grid as well as extensive use of HVDC links in real time operation, inter-regional schedules lost any physical relevance. All the five regional grids in the country were progressively interconnected using AC links and these are now operating as one synchronism system since December 2013. The situation has become more complicated with direct HVDC connections between NER and NR.

**2. Existing Scheduling, Metering, Accounting and Settlement Systems**

Availability Based Tariff (ABT) was implemented in stages, starting with Western Region in July 2002. With implementation of ABT, the concept of Unscheduled Interchange (UI) pool came up and all RLDCs started operating regional UI pool accounts, which were subsequently known as the "Regional Deviation Accounts". Deviations from the schedules are computed using the net injection/drawal for using boundary metering for each control area. Based on deviations from schedule, utilities pay UI charges to or receive UI charges from the regional UI pool account.

Short-term open access in inter-state transmission was introduced in May 2006 and with this, scheduling of market-based trades/transactions also commenced. Further, in 2008, multiple Power Exchanges were also implemented. Corridor wise margin declaration for market-based transactions was carried out along with net import/export capability for regions for administering the short-term open access transactions. Later from 2009 onwards, long-term and medium-term transactions also commenced within one region and between different regions. Corresponding scheduling on the inter-regional links was carried out for these transactions on a corridor-wise basis e.g., WR-NR, ER-SR, etc. Presently, while corridor wise TTC/ATC are being declared, net import/export margins for the region are being used for administration of short-term transactions.

Special energy meters have been installed at both ends of inter-regional / inter-state tie lines and all inter-connections of CTU system with ISGS as well as states / other entities whose accounting is done at regional level. As specified in the IEGC, meter readings are sent to respective RLDCs by different sub-stations of CTU / ISGS / states. The meter readings are processed at RLDCs and forwarded to respective RPC secretariat for preparation of weekly deviation account. The RPC secretariats issue deviation accounts based on which different utilities pay /receive deviation charges to / from deviation pool account. These also included settlement of inter-regional deviations between neighboring regions. The regional UI pools are being operated satisfactorily and have successfully served the purpose for the last many years.

The deviation rate vector is declared upfront by the CERC from time to time. Prior to 2008, with uniform rates for deviation, the total payable and receivables were supposed to be equal making it a zero-sum game. However, due to difference in estimated loss and actual loss as well as metering errors, total UI/deviation charges payable did not match with total UI/deviation charges receivable. Based on methodology decided in RPC forum, suitable adjustment is done to make total UI charges payable equal to the UI charges receivable. Thus, the UI pool accounts had been zero balance accounts traditionally since introduction of ABT up to 2008.

Regional UI pool accounts became a non-zero sum game since 7<sup>th</sup> January 2008 with introduction of UI rate cap for Central generating stations with coal or lignite firing and stations burning only APM gas. UI rate cap was retained in the UI regulations, 2009. Further, as per the UI regulations, 2009, additional UI charge is payable by over-drawing or under-injecting utilities based on specified volume limits and frequency bands. Thus a surplus is generated in the UI/deviation pool.

An important feature of the UI accounts issued by RPCs is treatment of inter-regional transactions. The following methodology is followed by the RPCs in this regard:

- No adjustment is done in UI charges payable to / receivable from other regions (otherwise this may lead to an iterative process)
- UI charges payable to other regions has highest priority i.e. UI charges received in UI pool account is used first to clear dues to other regions.

Schedules are reconciled between RLDCs and thereafter final schedules are issued. Moreover, same meter readings are used by both connected regions for computation of UI/deviations. Hence it is expected that normally there should not be any mismatch between UI charges payable / receivable by adjacent regions connected through AC links.

At present, RPCs of each region prepare and issue UI/deviation accounts considering neighboring region as control areas (similar to states within the region). Sometimes, there are cases of mismatch between UI/deviation payable/receivable as per accounts issued by two RPCs of adjacent Regions and reconciliation of accounts by RPCs prior to issuance is required to be done.

Settlement of UI/deviation charges is done between the regions on one to one basis. For example, UI/deviation pool of ER has to pay to or receive from 4 different UI pools (NER, NR, SR, WR). This leads to multiple financial transactions in terms of money flow between regions. There are

instances of circular flows of funds between regions which needs to be avoided. An example of such circular flow of funds between the regions is illustrated in Annex – 1.

The above methodology is gradually losing its relevance with the five regions connected synchronously as power can flow from one region to another via a third region leading to circular and multiple fund transactions. These ‘tandem’ money transactions between the regions at times also leads to issues in disbursal within the regions.

### 3. Mandate for NLDC

Section 26 of Electricity Act, 2003 mandates the following:

*“Section 26. (National Load Despatch Centre): --- (1) The Central Government may establish a centre at the national level, to be known as the National Load Despatch Centre for optimum scheduling and despatch of electricity among the Regional Load Despatch Centres.*

*(2) The constitution and functions of the National Load Despatch Centre shall be such as may be prescribed by the Central Government:*

*Provided that the National Load Despatch Centre shall not engage in the business of trading in electricity.*

*(3) The National Load Despatch Centre shall be operated by a Government company or any authority or corporation established or constituted by or under any Central Act, as may be notified by the Central Government.”*

Subsequently vide notification dated 2<sup>nd</sup> March 2005, the Central Government has notified National Load Despatch Centre Rules 2004, which prescribes functions of NLDC. The functions include following (relevant extracts):

- *Scheduling and dispatch of electricity over inter-regional links in accordance with grid standards specified by the Authority and Grid Code specified by the Central Commission in coordination with Regional Load Despatch Centres.*
- *Coordination with Regional Load Despatch Centres for achieving maximum economy and efficiency in the operation of National Grid.*
- *Supervision and control over the inter-regional links as may be required for ensuring stability of the power system under its control*
- *Coordination with Regional Load Despatch Centres for the energy accounting of inter-regional exchange of power*
- *Coordination for trans-national exchange of power*

From the above mandate it is evident that just as the RLDCs/RPCs are responsible for scheduling, metering, accounting and settlement at the Regional level, NLDC has been made responsible at the inter-regional and trans-national levels. The corresponding roles pertaining to inter-regional and trans-national transactions accounting and settlement need to be taken up at the National level by the NLDC and NPC.

### 4. Trans-National/Cross-Border Interconnections

At present, India has cross-border interconnections with Nepal, Bhutan, Bangladesh and Myanmar. Briefly, the connectivity of these countries with various regional grids in India is as follows:

- Nepal: With Northern region and Eastern Region
- Bhutan: With Eastern region
- Bangladesh: With Eastern region and North-Eastern region
- Myanmar: With North-Eastern region

In future, other neighboring SAARC countries like Bangladesh and Pakistan may have connectivity with two different regions of India. For the purpose of cross-border interconnections, the country needs to be treated as a single control area for the purpose of transnational exchanges and transactions have to be reconciled on National basis. Further, in line with the mandate provided, NLDC is responsible for all trans-national exchanges.

## 5. Changing Scenario & Increasing Complexities

A vibrant electricity market is functioning in the country and many regulatory changes have been implemented to address new challenges from the changing scenario which is also leading to increased complexities. Some of the significant changes that have already been implemented at the National level and some future challenges are briefly discussed below.

- Collective Transactions through Power Exchanges:** Open Access Regulations, 2008 issued by CERC paved the way for functioning of power exchanges. As per the Regulations and procedures issued pursuant to the Regulations, collective (i.e. power exchange) transactions are coordinated by NLDC. Two Power Exchanges are functioning at present and another is in the offing. NLDC accepts scheduling request for collective transactions after checking for congestions, and forwards the same to RLDCs for scheduling. Curtailment, if any, has to be done by NLDC in coordination with RLDCs. Accounting and settlement of the Collective Transactions is carried out by NLDC.
- Ancillary Services (RRAS):** The Regulatory Framework for implementation of Ancillary Services has been provided by the Hon'ble CERC in August 2015 and these have been implemented from April 2016. As per the present framework for ancillary services, available generation (thermal) reserves are dispatched by NLDC across regions on a pan-India basis. In the scheduling process, a virtual entity has been created in each regional pool to act as a counterparty to the ancillary schedules (beneficiaries schedules are not disturbed in the ancillary despatch process). Settlement of ancillary transactions is carried out on a regional basis from the DSM Pool. There are times, when the regional DSM pool faces shortfall and NLDC facilitates transfer of funds from a surplus regional pool to the deficit regional pool as per the provisions of the relevant CERC regulations. Again, this involves multiple fund transfers at times.
- Fast Response Ancillary Services (FRAS):** CERC vide suo-motu order dated 16<sup>th</sup> July 2018 has directed the implementation of FRAS and pilot project for 5-minute metering. The framework for FRAS provides for fast response ancillary services using the flexibility of hydro generation. The dispatch under FRAS is with the primary objective of obtaining regulation services from hydro while at the same time honoring all the hydro constraints. Scheduling, accounting and settlement of FRAS is to be carried out by NLDC across multiple regions (NR, ER and NER).

- (d) **Secondary Frequency Control through Automatic Generation Control (AGC):** Based on the directions of CERC a pilot project for AGC has been implemented at Dadri – Stage II in January 2018. The AGC signals are being sent to the generating station from NLDC and the accounting and settlement for the AGC is being facilitated by NLDC. Based on the experience gained by this pilot project, AGC implementation is being taken up at one generating station in each of the other regions. A second pilot implementation of AGC is expected to be commissioned at Simhadri in November 2018. Implementations in other regions are also coming up progressively. Accounting and settlement of all such implementations have to be facilitated at the national level.
- (e) **Proposals under various stages of implementation/deliberations:** Some of the other proposals which are under various stages of deliberations or implementation are as follows:
- Replacement of thermal generation by RE generation (Ministry of Power, April 2018)
  - Real Time Markets (CERC, July 2018) for facilitating balancing closer to the time of delivery
  - Flexibility in scheduling of thermal generation (Ministry of Power, August 2018) to achieve economy in despatch at the national level
  - Security Constrained Economic Despatch (POSOCO, September 2018) to achieve economy in despatch at the national level

Almost all of the above-mentioned proposals are intended for scheduling, despatch, accounting and settlement at the national level. The complexity in settlement needs to be streamlined at the national level keeping in view the changing paradigm and new challenges.

## 6. National Energy Account and National Deviation Pool Account

In order to streamline the accounting and settlement at the national level there is a need for implementing a National Deviation Pool based on the National Energy Account. In this regard, the following methodology is proposed.

- (a) **Scheduling:** Corridor-wise (e.g., ER-NR, etc.) scheduling of inter-regional transactions is presently being carried out. However, actual power flows as per the laws of physics. In case of collective transactions, one to one correspondence of source and sink is not there and scheduling on a particular inter-regional corridor may at best be notional. Hence, there is a need to migrate to scheduling inter-regional transactions on a net basis for each region. However, while accepting the transactions for scheduling, corridor-wise TTC/ATC/available margin etc. may be duly taken care of. Inter-regional corridor-wise schedules may also be continued based on the physical power flow patterns as the same is useful for grid security monitoring and checking for any discrepancies. NLDC shall communicate the net inter-regional schedules to the NPC for the purpose of accounting.

Schedules for cross-border transactions shall also be prepared by NLDC on a net-basis to facilitate accounting of cross-border transactions by the NPC. However, individual schedules of

the concerned neighboring country with different region regions shall also be continued at RLDC level for the purpose of grid security monitoring and checking for discrepancies.

- (b) **Metering:** The existing practice for metering of the inter-regional points shall continue as per the IEGC and the SEM data shall be collected by the RLDCs, processed and made available to the RPCs. In addition, the processed meter data shall also be made available to the NPC through NLDC. A similar practice shall be adopted for the cross-border metering locations, where the processed meter data shall be provided by the respected RLDCs to the RPCs and NPC (through NLDC).
- (c) **Accounting & Settlement:** Based on the scheduling and meter data provided, NPC shall prepare the National Energy Account (NEA) including the National Deviation Account for the inter-regional and trans-national transactions. The NEA will reflect the payables/receivables for each region on a net-basis and this amount shall be payable/receivable to the National Deviation Pool Account which shall be operated by NLDC. The NEA shall also reflect the cross-border or trans-national transactions and the neighboring countries shall be paying/receiving to/from the National Deviation Pool Account operated by NLDC. Payment to the National DSM Pool shall have the highest priority.

In the future, multi-lateral transaction between neighboring countries are also envisaged under the SAARC framework e.g., Bangladesh may purchase power from Nepal or Bhutan through India. Neighboring countries may also participate in a designated Power Exchange for cross-border transactions in the future. For scheduling and settlement of such transactions, the all-India loss figures would need to be declared upfront by NLDC.

- (d) **Handling Surplus/Deficit in Regional Pool Accounts and transfer of residual to PSDF:** As has already been mentioned above, sometimes the regional DSM pool may face shortfalls on account of disbursements for reliability support such as RRAS, FRAS, AGC, etc. in accordance with the relevant regulations of CERC. Once the National DSM Pool becomes operational, all residual/surplus amount in the regional DSM pools shall be transferred to the National DSM pool account. The NPC accounts would also facilitate the transfer of funds from the surplus available in the National DSM pool to the deficit regional DSM pool accounts as a single transaction thereby simplifying the process. Once all liabilities have been met, any residual in National DSM Pool shall be transferred periodically to the PSDF in accordance with the extant CERC Regulations.

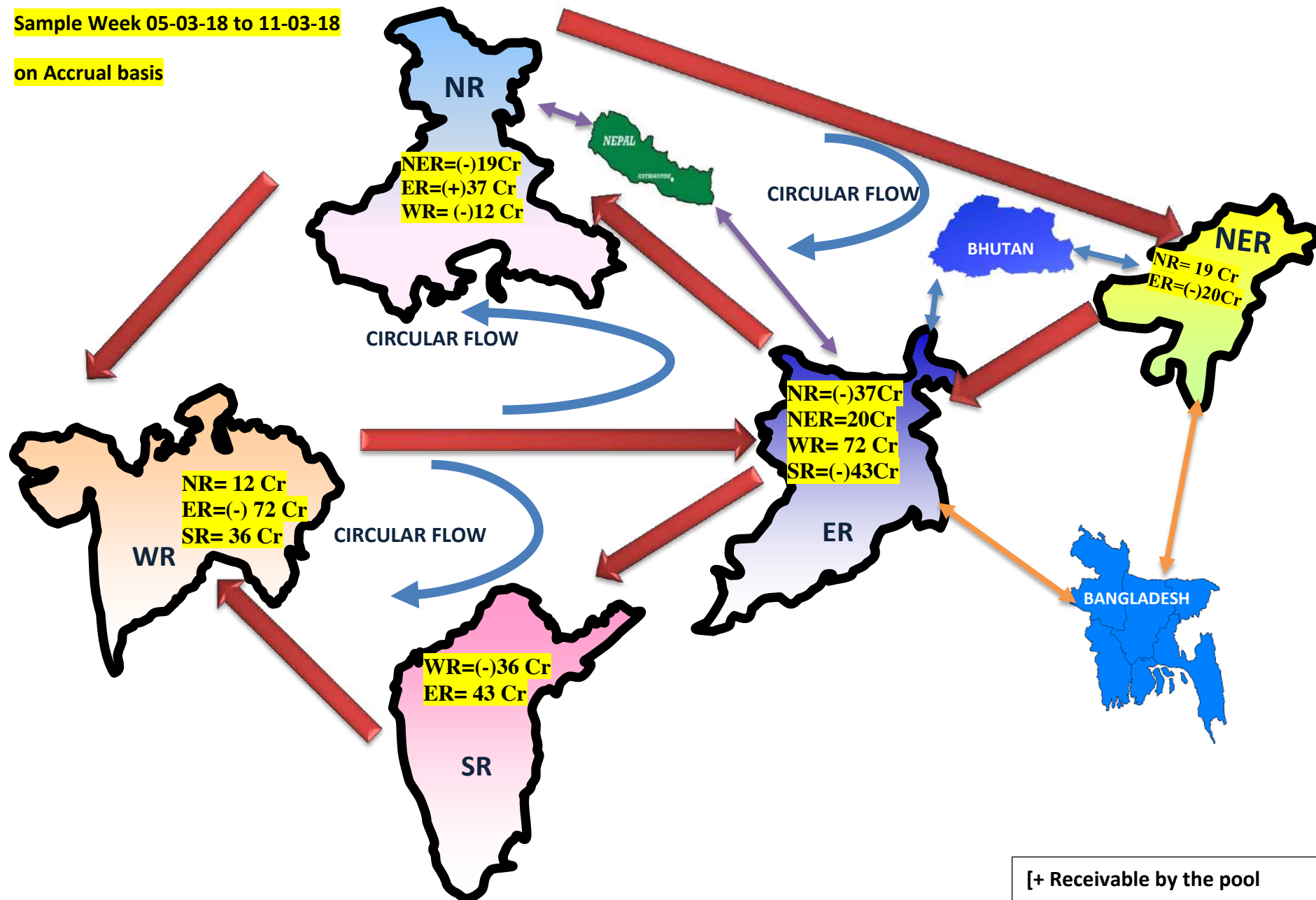
A sample illustration of the flow of funds between different regional DSM pool accounts to the national DSM pool account and that with the neighboring countries is shown at Annex – II.

Suitable changes/modifications are required to be carried out in the IEGC and DSM Regulations and the functions of NPC also need to be recognized in the regulatory framework.



Sample Week 05-03-18 to 11-03-18

on Accrual basis

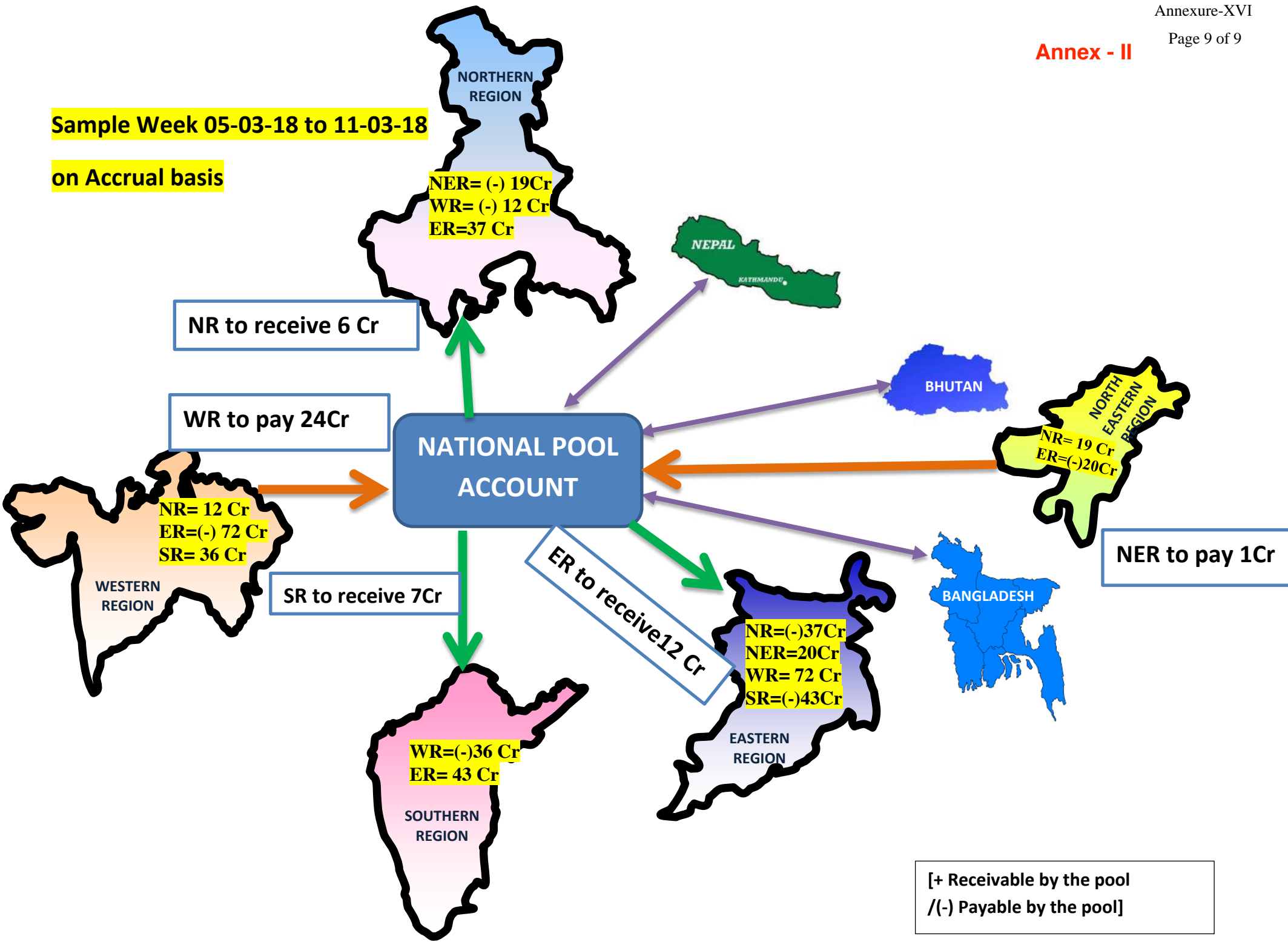


[+ Receivable by the pool  
/(-) Payable by the pool]

Annex - II

Sample Week 05-03-18 to 11-03-18

on Accrual basis



## ANNEXURE - II

(1/3)

**Southern Regional Power Committee, Bengaluru**  
**Addendum to the Minutes of the Meeting on Certification of non ISTS for**  
**POC and on NEA held on 11.01.2019 at SRPC, Bengaluru**

Further to the Minutes of the Meeting issued on 11.01.2019, NLDC vide mail dated 17.01.2019 have stated that their views have not been incorporated in the minutes. The discussions were more of explanatory in nature.

The following are the views of NLDC and the deliberations in the Meeting:

**a) Nomenclature**

Discussions in the meeting: It was pointed out that the proposal was mostly on National Deviation Account and not on National Energy Account and thus proposal needs clarity. Based on net inter-regional schedule (as proposed by NLDC) only the deviation account could be issued.

NLDC: The nomenclature could be re-visited and alternate could be thought of.

**b) Interregional and cross border scheduling account and settlement**

NLDC: The mandate and the need for inter-regional and cross-border scheduling accounting and settlement was deliberated and explained by NLDC. The proposed methodology of scheduling on net of region basis was explained.

Discussions in the meeting: It was noted that as per Section 26 (1) of Electricity Act, NLDC is responsible for optimum scheduling and despatch of Electricity among RLDCs. The same can also be noted from MoP notification dated 2.3.2005 in clause 3. It was fully appreciated that NLDC would be carrying out scheduling, dispatch and coordinating inter-regional transactions in line with provisions of Electricity Act / NLDC rules, however accounting is to be carried out by RLDCs/RPCs. Further, cross-border deviation accounting could be carried out by one of the RLDCs/RPCs.

It was also noted that accounting on net basis for inter-regional deviations could even be taken up in the present frame work where only the net deviation account would be computed by each RPCs.

Further, in case one account is maintained, it was explained that there may not be any need for computing inter-regional deviations at all. Accounting and settlement are to be carried out in respect of 'regional entities' and not for a region as it is neither buyer / seller.

**c) Country as a control area**

NLDC: The rationale and need for considering the country as a single control area in reference to the cross-border transactions was deliberated and explained. The anticipated growth in cross-border transactions was also highlighted.

Discussions in the meeting: It was pointed out that even if country is considered as a single control area with reference to cross-border transactions, the same can be taken up by one of the RLDCs / RPCs (Nodal) with the particular country.

Further, if country is to be considered as single control area, there may not be any inter-regional deviations and all the deviations of regional entities / other countries could be settled through a single account.

**d) Circular flows of funds**

NLDC: The phenomenon of circular flow of funds between regions was also deliberated and explained.

Discussions in the meeting: It was noted that circular flow could also be curtailed in the present framework itself if each RPC computes only one inter-regional deviation account (for example: SR would compute only one inter-regional deviation by combining WR-SR and ER-SR schedules and actuals).

Further by maintaining a single bank account for all deviation account settlement across the country there would be no requirement for computing inter-regional deviations. Further with a single bank account, the 'circular

flow of funds' will totally vanish. There would also be no requirement for 'transfer' of funds from one regional DSM pool account to another regional DSM pool account, due to shortfall in account etc. This would also help minimise 'issues in disbursal within the region'.

**e) Ease and convenience at Regional level**

NLDC: A concern was raised by the constituents that ease and convenience of settlement at Regional level should be available to avoid any inconvenience to the constituents. Regarding this, it was clarified by NLDC that it is only the Regional DSM Pools that shall be interacting with the National Pool Account and as such the ease of settlement at Regional level shall be available to the Constituents. Further, an analogy inter-bank settlement systems drawn from the financial world was also used by NLDC to explain the need for multi-tiered settlement system envisaged under the proposal for National Pool Account in this regard.

Discussions in the meeting: Constituents pointed out that ease and convenience of settlement at Regional level may get affected in case accounting is also taken up at national level. Some of the states pointed out that it was duplication of accounts, which may create ambiguity.

Further, it was noted that there are multiple revisions (involving two regional entities in different regions) in accounts in each of the regions, on account of changes in data submitted by the RLDCs. These could thus affect the accounts at national level.

NLDC agreed that the above deliberations would be appropriately considered while formulating the final proposal. The matter would be further discussed in the forthcoming SRPC Meeting.

\*\*\*\*\*





भारत सरकार/Government of India

विद्युत मंत्रालय/Ministry of Power

केंद्रीय विद्युत प्राधिकरण/Central Electricity Authority

**राष्ट्रीय विद्युत समिति/National Power Committee**

संख्या.: 4/MTGS/NPC/CEA/2019/418-421

दिनांक:09.05.2019

सेवा में/To

**Chief General Manager,**  
NLDC, POSOCO,  
New Delhi

**विषय: Implementation of Automatic Generation Control (AGC) and proposal of National Energy Account (NEA) -regarding**

**सन्दर्भ: Minutes of 08<sup>th</sup> Meeting of NPC held on 30.11.2018**

महोदय/Sir,


In the 08<sup>th</sup> meeting of NPC, it was decided that all RPCs and NLDC shall provide updated information on status of implementation of Automatic Generation Control (AGC) in India (at Inter-State level), to NPC secretariat.

It was also decided that the issue of National Energy Account (NEA) may be discussed in all the RPCs and the observations of RPCs may be furnished to NPC Secretariat. The observations of RPCs may be put up for consideration in the next meeting of NPC. Accordingly, SRPC has informed that the proposal of NEA was discussed in the Special Meeting held on 11.01.2019. The proposal of NEA was also discussed in the 34<sup>th</sup> TCC / 35<sup>th</sup> SRPC meetings held on 01/02.02.2019 wherein, NLDC had informed that Hon'ble CERC had sought a paper on NEA. NLDC also stated that the observations of SRPC would be duly considered while submitting the final proposal to CERC.

It is, therefore, requested that status of implementation of AGC and a copy of the paper on NEA submitted to CERC, may be provided to NPC Secretariat for deliberations in the 09<sup>th</sup> meeting of NPC to be held shortly.

Thanking You.

Yours faithfully,

  
(इरफ़ान अहमद/Irfan Ahmad) 09/05/2019

निदेशक/Director

प्रति/Copy to:

Director (System Operations), POSOCO, New Delhi

प्रतिसूचनार्थ/Copy for kind information to:

1. अध्यक्ष, के.वि.प्रा., नई दिल्ली/Chairperson, CEA, New Delhi
2. सदस्य(ग्रि.प्र. एवं प्र.), के.वि.प्रा., नई दिल्ली/Member(GO&D), CEA, New Delhi



Northern Regional Power Committee

**Subject:** Additional Agenda for 4<sup>th</sup> meeting of NPC.

Following agenda items may be included in the agenda for forthcoming meeting of NPC:

(i) **Certification of healthiness of UFR and df/dt relays**

One of the recommendations of the Enquiry Committee constituted by GOI to enquire into grid disturbances of July 2012 was to ensure healthiness of defense mechanism. In this context, in the 27<sup>th</sup> meeting of NRPC held on 30<sup>th</sup> November, 2012, it was decided that mock exercise for healthiness of UFRs would be carried out by utilities themselves on quarterly basis and report would be submitted to NRPC Secretariat and NRLDC. This exercise is being done at the end of March, June, September and December months.

The issue was again discussed in the 18<sup>th</sup> TCC/ 31<sup>st</sup> NRPC meetings held on 23<sup>rd</sup> and 24<sup>th</sup> July 2014, it was inter-alia decided that OCC would finalize a procedure for testing and self-certification of UFR by utilities. Accordingly, the procedure finalized by OCC was discussed and finalized in the 29<sup>th</sup> TCC/33<sup>rd</sup> NRPC held on 10/11 November 2014. It was decided by NRPC that the approved procedure should be submitted to NPC so that uniformity can be brought across all the regions. The procedure approved by NRPC is enclosed at Annex-A.

\*The procedure may be deliberated by members of NPC for consistency in all the regions.

(ii) **PSS tuning**

One of the recommendations of the Enquiry Committee constituted by GOI to enquire into grid disturbances of July 2012 was to ensure proper tuning of electronic devices and PSS of generators. In this regard, in the 27<sup>th</sup> TCC/30<sup>th</sup> NRPC meeting, it was decided to constitute a group to make suitable recommendations with regard to PSS tuning. The group consisted of one member each from NRPC secretariat, CTU, NRLDC, IPGCL, NTPC, BHEL and NHPC. The report of group was deliberated in the 29<sup>th</sup> TCC/33<sup>rd</sup> NRPC held on 10/11 November 2014. The recommendations of the group approved by NRPC are as under:

- 1) All generating units with capacity over 50 MW, for which PSS have not been tuned or Step Response Test has not been carried out during last 12 months, should do so within next 12 months and submit to NRPC, NRLDC and CTU, the results of the Step Response Test.

- 2) If PSS has been tuned or Step Response Test has been carried out during last 12 months, the generating company should submit to NRPC, NRLDC and CTU, the results of the Step Response Test within one month.
- 3) If results of Step Response Test indicate sufficient damping, generating company would performed next Step Test after three year or at the time of major overhauling of the machine, whichever will be earlier.
- 4) Generating Companies would arrange for re-tuning of PSS, if Step Response Test indicates insufficient damping or oscillations.
- 5) All new units with capacity over 50 MW must carry out PSS tuning before declaration of Date of Commercial Operation (COD). A report along with model parameters shall be submitted to CTU, RLDC/SLDC and NRPC for taking the correct modeling in the system study software (s).
- 6) NRLDC will observe and analyze the changing grid conditions based on the output of PMUs and will inform the generating Company concerned if oscillations are observed. On receipt of the information, the generating company would arrange for re-tuning of PSS at the earliest.
- 7) In some of the generating units it may not be feasible to tune PSS. Generating Companies would furnish details of such units (Year of Commercial operation, capacity, OEM, reason as to why PSS cannot be tuned etc), which in their opinion are not amenable to PSS tuning. These would then be discussed in the OCC and TCC/NRPC. In cases where there is general agreement that it may not be feasible to carry out PSS tuning, the matter may be taken to CERC for seeking exemption.

Status of implementation of these recommendations is being monitored at NRPC forum.

The recommendations may be deliberated by the NPC for consistency in all the regions.

**(iii) Target fixed for Load Relief from operation of Defense Mechanism**

NPC, in its 2<sup>nd</sup> meeting held on 16.07.2013, had agreed for the four stage UFR based automatic load shedding scheme. A combined reading of agenda and minutes of the 2<sup>nd</sup> meeting of NPC reveals targets were fixed based on peak loads with the assumption that average load will be of the order of 60-70% of peak loads.

Further, the regional load shedding target for each stage was allocated to each state of Northern Region pro-rata to their peak demands.

In recently held OCC meeting of NRPC, Punjab has submitted following details of various automatic load shedding required to be carried out in Punjab:

Sr. No.	Type of Defense Mechanism	Target Load Relief (Available at NRPC website)	
1.	df/dt (Stage-1 49.9 Hz & 0.1 Hz/sec)	430	1410
2.	df/dt (Stage-2 49.9 Hz & 0.2 Hz/sec)	490	
3.	df/dt (Stage-3 49.9 Hz & 0.3 Hz/sec)	490	
4.	UFR (49.2 Hz)	400	1616
5.	UFR (49.0 Hz)	402	
6.	UFR (48.8 Hz)	406	
7.	UFR (48.6 Hz)	408	496
8.	SPS (Group-A)	35	
9.	SPS (Group-C)	71	
10.	SPS (Group-D)	90	
11.	SPS (Group-E)	100	
12.	SPS (Group-F)	100	
13.	SPS (Group-G)	100	
Total Load Relief		3522	

Punjab has further submitted details of maximum and minimum load recorded in Punjab during 2014-15. The maximum load was 10155 MW in June 2014 whereas minimum load was 1236 MW in March 2014. Average load for FY 2014-15 was 5444 MW. Also some of the loads such as defence establishments, Hospitals, courts and continuous process industries are uninterruptible. Further, IEGC also requires that there should be no overlapping of feeders between various load shedding schemes.

In view of this, Punjab had expressed difficulty that load relief from UFRs will be much less than target fixed for them. This difficulty may be faced by other states also which have high ratio of maximum to minimum load.

NPC may deliberate so as to decide on the criteria for fixing target for UFR based load shedding for individual states.

07-12-2015  
(Ajay Talegaonkar)  
SE(O)

Chief Engineer, NPC Division, CEA

No NRPC/119/01/2015/1154

Dated 07.12.2015

**Annex-A**

**Procedure for carrying out quarterly certification of healthiness of UFRs and df/dt Relays**

**1.0 Background:**

- 1.1 Section 9 of Grid Standard 2010 notified by CEA requires all Entities to set their Under Frequency Relays (UFR) and rate of change of frequency with respect to time (df/dt) Relays in their respective systems, in accordance with the plan made by the Regional Power Committee, to provide adequate load relief for grid security and ensure the operation of these relays at the pre-set value of frequencies.
- 1.2 Further, the Section 5.2 (n) of IEGC stipulates that all STUs/distribution licensees shall provide automatic under-frequency and df/dt relays for load shedding in their respective systems, to arrest frequency decline that could result in a collapse/disintegration of the grid, as per plan separately finalized by concerned RPC and shall ensure its effective application to prevent cascade tripping of generating units in case of any contingency.
- 1.3 In order to ensure healthiness of under-frequency and df/dt relays, It was decided in the 31<sup>st</sup> meeting of NRPC held on 24<sup>th</sup> July, 2014 that all STUs/SLDCs shall carry out mock testing of these relays and submit quarterly self-certification regarding healthiness of these relays. In 28<sup>th</sup> TCC/31<sup>st</sup> NRPC meeting held on 23<sup>rd</sup>/24<sup>th</sup> July, 2014 at New Delhi it was decided that OCC shall develop guidelines to be followed by STUs for testing and self-certification.

**2.0 Definition:**

- 2.1 **df/dt Relay:** It is a relay meant to trip pre-selected feeders/transformer (where it is connected) on a pre-set value of rate of change of frequency (with time) to obtain targeted load relief in order to enhance security to the grid. In accordance with decision taken by NRPC, df/dt relays are required to be of numerical type and the scheme is required to be of non-rotational type.
- 2.2 **Frequency Generator:** Frequency Generator is an equipment which can generate signal of desired frequencies and also capable of generating signal of varying frequency with desired rate of change of frequency with respect to time.
- 2.3 **Mock testing:** It is a test which applies on UFR or df/dt relay after disconnecting the relay (under test) from the circuit breaker of the feeder/transformer.
- 2.4 **Radial feeders:** Means the feeder in which, the source of injection of power is at one end only under normal operating conditions.
- 2.5 **Targeted Load Relief:** Sum of peak loads on each of the feeder/transformer which is required to be tripped when frequency or rate of change of frequency (as the case may be) reaches the pre-set value. The present Targeted Relief for UFR and df/dt relay based automatic load shedding scheme is enclosed at Annex-I of procedure.

**2.6 UFR Relay:** It is a relay meant to trip of pre-selected feeder on a pre-set value of frequency to obtain targeted load relief in order to enhance security to the grid. In accordance with decision taken by NRPC, UFRs are required to be of numerical type and the scheme is required to be of non-rotational/flat type.

**3.0 Certification of healthiness of the UFRs and df/dt Relays and methodology of testing**

- 3.1 The STU should carry out mock test of UFR & df/dt Relays once in six months.
- 3.2 The STU should carry out actual tripping of the feeder through df/dt or UFR at least once in a year.
- 3.3 Sub-station In-charge should inform the SLDC before carrying out the testing of UFRs and df/dt relays.
- 3.4 Just before testing, the UFR or df/dt relay should be decoupled from the grid frequency input and should couple it with output of Frequency Generator.
- 3.5 Results of the test should be recorded and conveyed to SLDC of the state. The SLDC after verification should submit quarterly report in respect of the entire state system to NRPC Secretariat within 15 days of the end of the quarter. The format for submission of the report is enclosed as Annex-II.
- 3.6 In case of tripping of feeders on UFR and df/dt based load shedding scheme, the STUs will submit the information in the format submitted as Annex-III.

## Annex-I

S.No.	State/UT	Peak Met during 2012-13 (MW) (Source:CEA)	Load shedding Target for four stages (MW)- Based on maximum load on the feeders			
			49.2 Hz	49.0 Hz	48.8 Hz	48.6 Hz
1	Chandigarh	340	16	16	16	16
2	Delhi	5642	258	259	262	263
3	Haryana	6725	308	309	312	314
4	Himachal Pradesh	1672	77	77	78	78
5	Jammu & Kashmir	1817	83	84	84	85
6	Punjab	8751	400	402	406	408
7	Rajasthan	8515	390	392	395	397
8	Uttar Pradesh	12048	551	554	559	561
9	Uttarakhand	1674	77	77	78	78
	Total	47184	2160	2170	2190	2200



**Format for submission of report of inspection & checking of UFR and/or df/dt rely by SLDC to NRPC Secretariat**

## Name of state control area:

[illegible]

### **Annexure-III**

Annexure-III

Format for submission of report of Tripping/operating of UFR and/or df/dt relay by SLDC to NRPC Secretariat

Name of State Control Area:

[illegible]

## PSS Tuning: Sharing of the experience of WR

### Introduction and Motivation:

PSS Tuning exercise was attempted in the Western Region of India and 23 generating units were taken up for tuning. While the individual testing and reports were made available to the concerned generating stations immediately, a combined report of the full exercise after completion could not be produced. This was partly because of the fact that as the project moved into the next phase, newer situations were emerging and took the focus.

At present an attempt is made to compile all the information from memory about the testing and sharing of the experience gained by the PSS Tuning exercise. So this report is more like sharing of the experiences of PSS Tuning exercise in WR, from an **individual perspective**.

PSS field tuning began in WR in 2003. During the field trials of PSS Tuning exercise in WR, Dr A.M.Kulkarni, IIT-B (consultant) and Shri K.Parthasarathy, Manager, BHEL and Shri Satyanarayan.S, SE WRPC, were associated in the PSS tuning field trials at all the stations in WR. The generating station excitation team gave all the support and made the tuning a great success. In the initial stages, all utility engineers would participate in the tuning exercise. Two training sessions were organized in IIT-B, Electrical Engg Dept, by Dr A.M.Kulkarni and their team, for familiarization with all the issues involved. The progress of PSS Tuning exercise was regularly reported in the WREB/WRPC meetings.

After the grid disturbance of 2012, the role and importance of tuning PSS on generators, tuning TCSC damping controllers, HVDC damping controllers has been increasingly felt. While these controllers can positively influence the stability **when done correctly** they can, equally harm, if not correctly tuned or be not

efficacious if they are ill-tuned. Hence the tuning of these complex controllers, should be done systematically and properly and with a scientific approach.

**Scope of PSS Tuning:** PSS Tuning can be done to improve the poor damping observed in the inter-area modes of oscillations or local mode oscillations without destabilizing the synchronous torque or interfering into the scope of the functions of the AVR. Further PSS comes into action only when there are changes that originate from the grid side. Manual changes in generation *usually* bypass the PSS controller by design for power input PSS. Similarly PSS can be set to be bypassed for very low load levels of generation. Such a well tuned PSS can stabilize the oscillations and also improve the power transfer accordingly.

**Benefits of PSS Tuning:** The PSS is a standard circuitry that is found invariably shipped even in the early machines( late 60s-early 70s). It is also known as the slip stabilizer. And therefore would be certainly available in newer machines. By properly tuning it, damping of poorly observed modes can be done. The cost of tuning is negligible compared to other modes of enhancing stability, and so the PSS Tuning is a very cost effective solution to the oscillatory stability issue. The PSS Tuning exercise in WR also enhanced the academic-industry interaction. It also improved the general understanding of the stability issues of the operation of the grid.

**Wrongly tuned PSS:** If the PSS is set keeping the above scope in mind, it usually results in a smooth operation. However if set randomly or erroneously ( not as per the scope), it **does have** the potential to destabilize a stable operation. In the past, prior to the PSS Tuning exercise, PSS were enabled at some generating units to enhance stability. The PSS Tuning exercise undertaken in WR is the first one to study the tuning problem from a regional perspective. It is also known that individual attempts in the past, to switch on the PSS has been partly successful and partly failure and if unstable operation is observed in the generator, usually such a PSS would be switched off in the field. Such a sorry situation can occur, if either the gains or limits are set incorrectly. Ambitiously trying to improve the



step response with PSS in field trials, can also lead to problems, as one can lose sight of the inter-area oscillatory problems in field testing. Hence the frequency response approach helps in the tuning. It is also known that PSS requires retuning when there are major changes in the grid.

**Approach of PSS Tuning in WR:** In the present approach, initially two worst case grid scenarios of high MW and high MVAR dispatches were initially given. Linear analysis of the same was done by IIT-B and analytically modes of oscillations and their damping were quantized. The frequency response of the generators was simulated. Then during field trials, an apt value of the gains was chosen such that the conditions mentioned in the scope are satisfied. By plotting the frequency response curves as a function of the gains, the possible behavior of the machine during such oscillations was predictable. Finally transient response was done to check that the settings were indeed acceptable. The theory of the method is given in K.R.Padiyar's book in detail and the interested reader can pursue the same.

We conclude the introduction and motivation with a brief outline of the exercise.

#### **A Brief outline of the exercise of PSS Tuning in WR:**

- 1) The Vijay Kumar Committee in April and May 1994 twin grid disturbances in WR had then recommended that the possibility of tuning of PSS on generating machines to enhance stability should be explored.
- 2) WREB ( now WRPC ) then handed over the studies to CPRI to examine this aspect. CPRI completed the exercise of carrying out system studies and in 1998-99 had recommended that by tuning PSS on all 210 MW and 500 MW units the stability is enhanced, as seen for the cases of the grid disturbances of April and May 1995 ( under the Vijay Kumar Committee)
- 3) It has to be remembered that in those days( around 1997-98), the Windows version of power system stability studies packages were not available. CPRI had performed the studies on SIMPOW package of ABB. Since at that time

the simulation had modeled all distance relays for the grid, this was probably the first attempt then to simulate the situation and see what the distance relays were seeing and was novel in that aspect.

- 4) So as per the recommendations of CPRI studies, the task of tuning the PSS on 210 MW and 500 MW units were decided to be undertaken. A search for vendors who could do that task was then explored. There were many discussions and foreign vendors was sought for PSS Tuning work. However it could not materialize. At about the same time ( around 1999-2000 ) Northern region had undertaken PSS Tuning of 4 machines with the help of PTI, USA. But before WR could finalize some sort of agreement the same could go through to the final stage. It was also clear that involving a foreign consultant would be expensive from the project cost point of view. The confidence from the discussions that was emerging in WR at that time, was WR could attempt the PSS Tuning exercise using our own engineers and taking academic support from IIT-B.
- 5) In WR, it was finally decided in the 114<sup>th</sup> WREB meeting in November 2000, that this exercise can be undertaken with academic support from IIT-B and so the exercise of doing the PSS tuning was entrusted to IIT-B.
- 6) Almost two years went in getting data from the generating units. This led to a large gestation period during which the data had to be literally mined and checked. System studies were done again as per the revised grid conditions, and the pilot project to tune 4 generating stations was proposed by IIT-B. It was then decided by WREB to carry out the pilot project at twelve units in the first phase involving two generating units from Gujarat, MP, Maharashtra, Chhatisgarh, RPL and NTPC.
- 7) In the first phase, the two units chosen were from Wanakbori(Gujarat), Nasik(Maharashtra), Satpura(MP), Korba-W(Chhattisgarh), Dahanu (RPL) and Korba(NTPC). All these units incidentally had BHEL as the manufacturer and all were 200/210/250 MW units.
- 8) In the initial stage of field exercise itself it became clear that the manufacturer's representative is needed while doing the field test. So BHEL was involved during the field PSS Tuning.



- 9) The first phase of field testing was completed at all the stations successfully as shown in the table below.

Station	Units	Dates	Excitation	Remarks
NTPC Korba	2,3 (200 MW)	28.6.03- 30.6.03	Static DVR	Testing done for fixed gain PSS successfully. But since the DVR had adaptive PSS, the fixed PSS settings could not be used. The DVR's adaptive PSS was however enabled.
Wanakbori Gujarat	4,5 (210 MW)	14.6.04- 16.06.04	Static AVR	Successfully tested and PSS enabled.
Nasik-Maharashtra	3,5 (210 MW)	18.6.04- 20.6.04	Static AVR	Successfully tested and PSS enabled.
Dahanu-RPL	1,2 (250 MW)	9.12.04	Static AVR	Successfully tested and PSS enabled.
Korba West-Chhattisgarh	1,3(210 MW)	21.7.05- 22.7.05	Static AVR	Successfully tested and PSS enabled.
Satpura-MP	8,9(210 MW)	12.9.06- 13.9.06	Static AVR	Successfully tested and PSS enabled.

\* Please note that the PSS were enabled and continued for some time.

Since these were analog old units, at most places, they were also planning retrofitting with Digital version of AVR's.

- 10) The success of the first phase led to the second phase of PSS Tuning in WR. The second phase planned for PSS Tuning at 29 units. In addition with new DVRs coming, and DVRs usually ( depending on the manufacturer ) provide for a default PSS enabled and at that time 11 units were proposed for status checking. This meant to study whether the PSS settings were optimal. The PSS Testing exercise was also extended to 500 MW tuning in this phase. The units planned were divided in two parts .

Station	Units	Dates	Excitation	Remarks
NTPC Korba	4,5,6(500	Sept 06	Static DVR	Cards Checked.

	MW)	22.08.08		PSS Tuned.
MSEB Parli	3 units (210 MW)	12.12.06	Static AVR	Successfully tested and PSS enabled.
SGTPS-MP	4 units (210 MW)		Static AVR	Successfully tested and PSS enabled.
Korba West- Chhattisgarh	4(210 MW)		Static AVR	Successfully tested and PSS enabled.
Gandhinagar- Gujarat	3 units			Could not undertake this PSS Tuning.

Thus 11 units were tuned in the second phase. A total of 23 units were tuned in this project.

- 11) Eastern region also adopted the same methodology and IIT-B was associated. It is understood that ER had completed at least 8 units at that time.
- 12) The exercise finished at Part-1 of the Second Phase. The status verification proposed earlier could not be done.
- 13) So to conclude the brief history, the PSS Tuning exercise in WR was largely successful. It had given excellent academic-industry interaction. Both sides benefitted from the exercise. During the first phase the testing/excitation group of generators were involved from all states in each PSS Tuning. One or two training sessions were also arranged at IIT-B. The approach followed in the PSS Tuning is what is already explained in papers and today is also available in standard post-graduate text book levels.

## 2. Knowing the PSS and AVR – its role and scope

### **AVR:**

The modern generators have high performance excitation systems. This is essential for steady state operation and also for transient stability. It provides fast control of terminal voltage. However the fast acting exciters with high gain AVR can contribute to oscillatory instability. This type of instability is low frequency oscillations (0.2 Hz to 2. Hz) which can appear/persist for no apparent reason. By tuning a PSS, we can get a good stable response.

### **2.1 What is the PSS ?**

PSS or Power system stabilizer is a controller in the Voltage Regulator ( AVR or DVR). Its input signals are either

- (a) Power
- (b) Frequency or speed
- (c) A combination of both
- (d) A combination of other signals ( newer delta-P omega type).

Its output is a voltage signal. This signal is added into the AVR reference voltage. Thus a PSS modulates the AVR reference voltage. Fig 2.1 gives the AVR block diagram at a 210 MW plant.

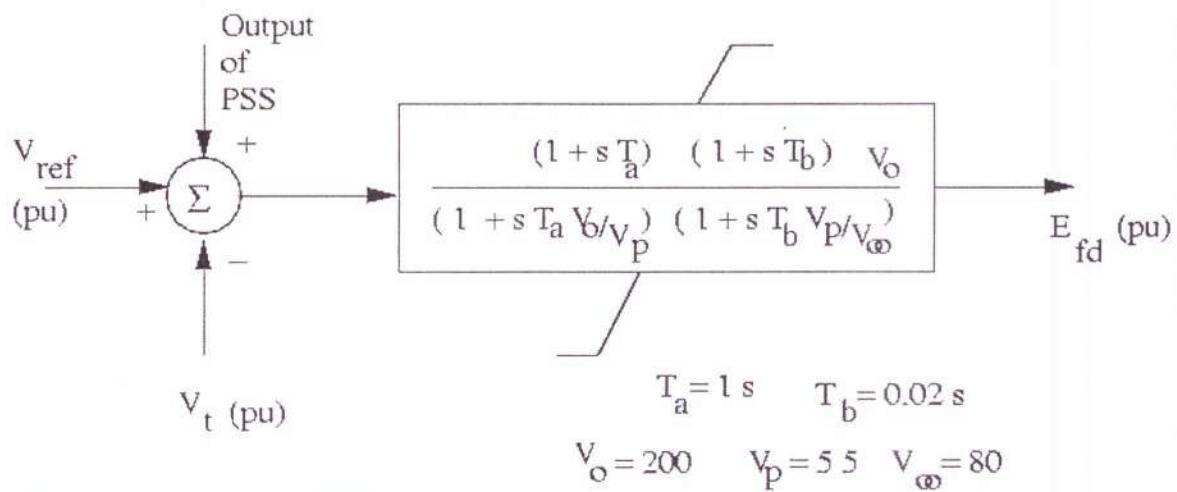


Fig 2.1 AVR Block Diagram

The structure of the PSS is shown in Fig 2.2. This is the transfer function version.

## Structure of PSS

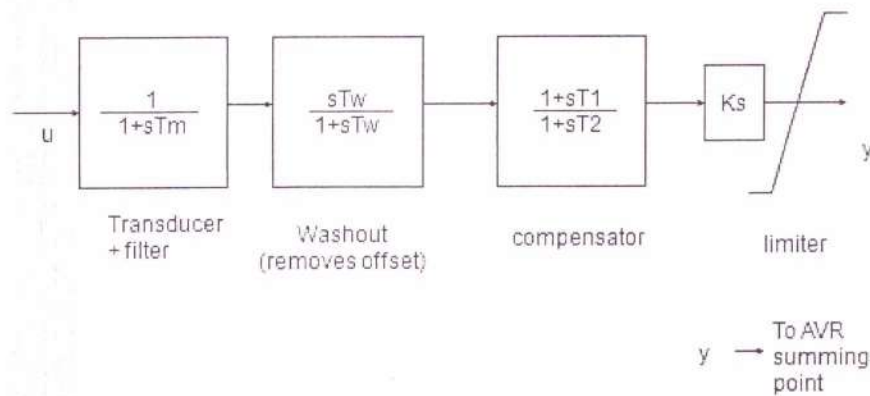


Fig 2.2 Structure of PSS

It contains

1. **Transducer or filter:** The input transducer or filter. The input signal  $u$  is applied to the PSS.



2. **Washout** : The block removes any dc offset. In other words it allows changes to be passed. It is because of this the PSS does not respond to steady state. For example if the input signal is Power, and if the value of P is constant, the output is zero. It is mathematically a practical differentiator.
3. **The main compensator**: At the heart of it, the PSS is a lead compensator. It lifts the lag or compensates for the AVR lag response. This improves the stability in small signal stability conditions. The above controller with one input shown say P. Let us look at the PSS card (Fig 2.2)

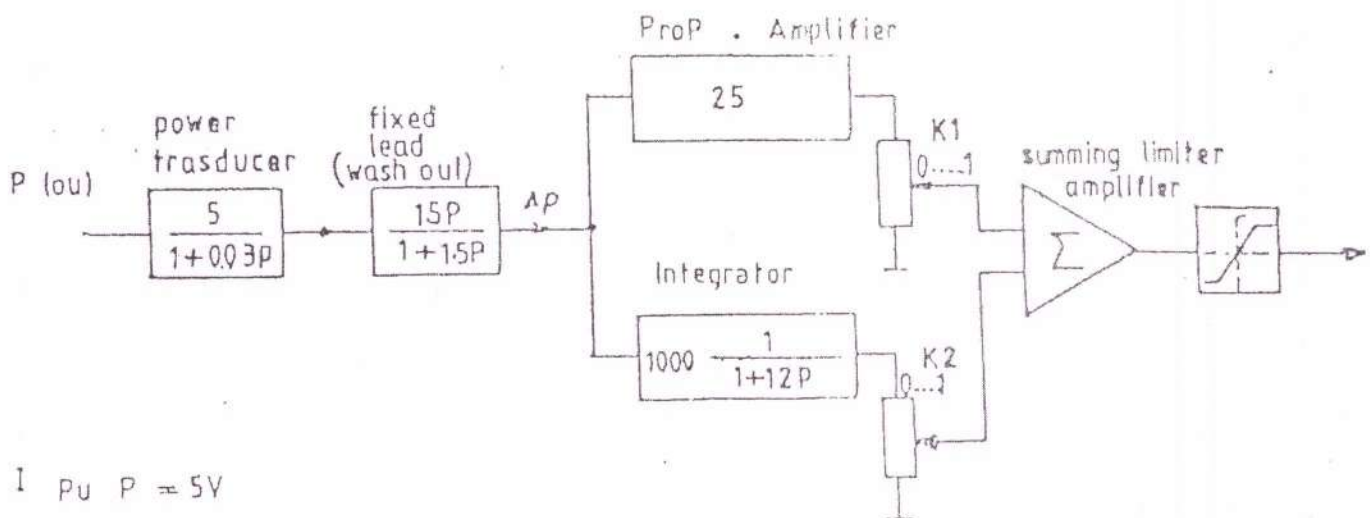


Fig 2.2 PSS Card transfer function

We can reduce the same as

$$\frac{\Delta V_{PSS}(s)}{\Delta P(s)} = -25k_1 - \frac{1000k_2}{1+12s}$$

$$= -\frac{(25k_1 + 1000k_2) + 300k_1s}{1+12s} = -K \frac{(1+sT)}{1+12s}$$

$$T = \frac{300k_1}{25k_1 + 1000k_2}$$

$$K = 25k_1 + 1000k_2$$

By changing the ratio of  $K_1/K_2$  we can change the response of  $\Delta V_{PSS}/\Delta P$ .

4. **Limiter:** The output of  $\Delta V_{PSS}$  can be limited  $V_{REF}$  of AVR. Typically this is set to +0.1 or -0.05 of  $V_{REF}$ . **This is done to prevent/control the PSS excessively modulating  $V_{REF}$ .**

## 2.2 Will the PSS act always?

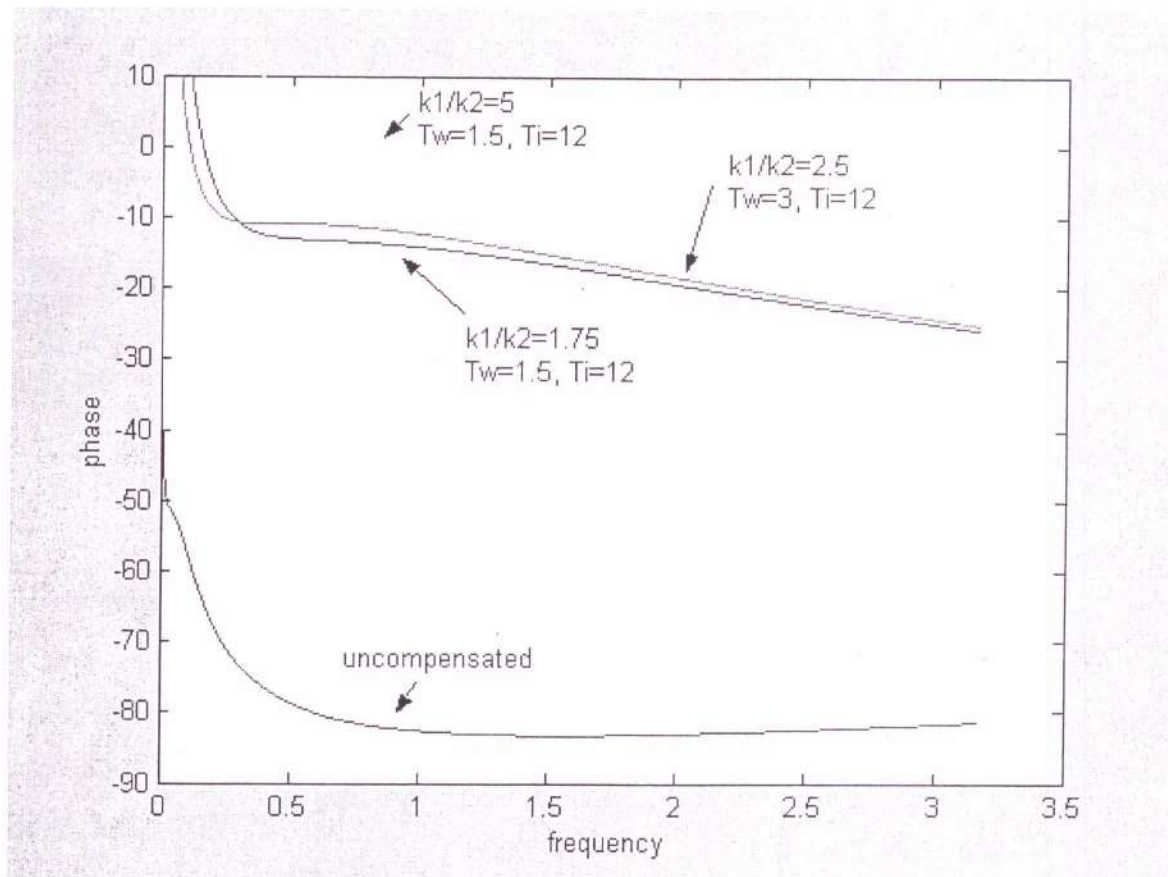
The PSS is supposed to act only when there are changes in the input signal. However the PSS is deliberately made ineffective under the following conditions:

- Manual changes made by operator. For eg a power input PSS will not respond to changes in power done from the operator's desk through say the speeder gear. As the changes were done manually, design control logic exists to pass these changes to PSS.
- PSS can also be disabled if power of the machine is below a certain percentage of the unit rating. This is settable. Usually 40% or below Power setting. Refer manual for details.

Except such restrictions, PSS will always act if the changes of power are passed to the PSS controller.



**2.3 Logic of PSS Tuning:** The Fig 2.3 shows the logic of PSS Tuning. The ratio of  $K_1/K_2$  controls the phase of the voltage injected into the AVR. As we can see the PSS is some form of a lead compensation that if added to the pure AVR frequency response, will lift the AVR response upwards.



**Fig 2.3 Logic of PSS Tuning**

The compensated final curve will be above the AVR response which is shown for various values of  $K_1/K_2$ . Settings around 1.75 nicely lifts the curve **and more importantly keeps the compensated curve in first quadrant only**. This ensures  $T_s$  (synchronizing torque) is not made negative which is another important factor.

For example the cyan colored curve for  $k_1/k_2 = 5$  is to be avoided, as for frequencies below 1 Hz, it makes  $T_s$  negative. At frequencies around 2 to 2.5 Hz this is very nice. The step response of AVR may show a very good damping. But

this is bad for inter-area modes as  $T_s$  is negative. Hence the plotting of frequency response curve helps in choosing PSS gains.

**Fixed Gain vs Adaptive PSS:** Fixed gain PSS are equally adequate in their role for providing damping requirements. If we have an adaptive PSS then the mechanism of adaptation must be known to comment on the same. Excepting one machine, all PSS tuned in this project were fixed gain PSS.

**DVR vs AVR:** DVR is the digital version of the AVR. It is easy to know the parameters easily. In AVR the parameters have to be read from the link positions on the card. Apart from that there is no major difference.

#### **Getting Frequency response curves:**

This is achieved by a proprietary program developed by IIT-B on the lines of theory given in Padiyar's book. It is beyond the scope of this little report to explain the logic of the same.

#### **Acknowledgements**

- (1) WREB/WRPC for sponsoring the projects
- (2) IIT-B and Dr A.M.Kulkarni for consultancy
- (3) BHEL and Shri K.Parthasarathy, Manager, BEHL in field trials/testing
- (4) Generating utilities in WR for all their support

It is hoped that this little report combined with other pdf references enclosed and the textbook of Padiyar, should whet the appetite for tuning of PSS. A short movie is also prepared for education purposes.

#### **Document prepared by:**

Satyanarayan.S, SE, WRPC Mumbai email: [satyaguru@yahoo.com](mailto:satyaguru@yahoo.com)

15-12-2016

**Textbook References:** (1) "Power system dynamics, stability and control", K.R.Padiyar, BS Publications, Hyderabad



## ENERGY MANAGEMENT

**To**  
**Eastern Region Power Committee**  
**14, Golf Club Road , Tollygunge**  
**Kolkata-700033**

**Name:** Archik Byabortta  
**Designation:** RC IN EM S ER  
 (Energy Management – Sales )  
**Mobile:** 8910894204  
**Email:** Archik.byabortta@siemens.com

**Kind Attention: Mr J. Bandyopadhyay**  
**Member Secretary**

**Date:** 20/03/2019

**Subject:** Request for coordination of Maintenance & support (AMC) renewal of PSS@E supplied Licenses through Power grid for state transmission utilities (STU's), State load dispatch center's for Eastern Region.

**Reference PGCIL Contract No:** NO. CC-CS/357-CC/ITSW-1900/3/G2/CA/4394 DATED 13.8.2012 FOR PROCUREMENT OF UPGRADED VERSION OF POWER SYSTEM ANALYSIS SOFTWARE (PSS/E), IMPARTING EXPERT PRODUCT TRAININGS AND PROVIDING MAINTENANCE & SUPPORT - MAINTENANCE & SUPPORT RENEWAL & CC-CS/357-CC/ITSW-1900/3/G2/CA/4394/AMEND-1 DATED 30.04.2013.

Dear Sir,

As you are aware, Power grid had done One-time Capacity Building exercise for different stake holders under which 249 no's of PSS@E Licenses were distributed to Power grid, STU's, SLDC's RLDC's, CEA, CERC, SERC etc. in the year 2012 that includes 6 years of maintenance & Support for supplied licenses which has ended on 30<sup>th</sup> Nov, 2018.

In this regard, we would like to request Regional Power Committees (RPC's) to act as an coordinator/aggregator and get the maintenance & support renewed of all the existing supplied licenses for the entities falling under your jurisdiction so that all these licenses can be upgraded with new features and we can continue to support seamlessly **the way they have been doing it on annual basis since Dec, 2012**

**With ERPC playing the role of a coordinator/aggregator, following challenges can be avoided;**

- Supporting PGCIL/CEA/NLDC to have a common platform of PSS@E across all states and seamless integration of network models. If all stakeholders are not current on M&S then they will not have same version of PSS@E which would create difficulties to PGCIL/CEA/NLDC to synchronize with other state utilities because of version mismatch issues.
- STU's and SLDC's would find it difficult to justify & purchase M&S separately as original contract was not decided by them.
- M&S price approval at each state (even for the interested states) would be a long-time process.
- Conducting PSS@E UGM every year would be difficult as only few entities would be current on M&S.
- The implementation of a country wide network model management centrally (for e.g. Model on Demand (MOD) kind of application) for long term planning across India becomes more challenging if other stakeholders are not current in M&S with the latest version of the software
- PTI supporting entities by providing free training sessions across all regions (on quarterly basis) thus supporting them -in the implementation of updates as well as other PSS@E related topics would not be possible if some STU's do not renew the M&S.
- Conducting quarterly webinars to resolve PSS@E specific user issues or highlighting new features would be difficult if some STU's do not renew the M&S



## Role of Maintenance & Support Programme for supplied PSS®E licenses.

The M&S program has its goal to seamless usage of PSS®E at PGCIL and other stakeholders for productive use by all its engineers in more than one hundred different locations spread across the country. Siemens is firmly committed to this and the comprehensive program offered to PGCIL goes well beyond the standard M&S components of software support and product upgrades. It is a comprehensive program intended to address the specific requirements of PGCIL and other stakeholders so that the continuous usage of updated PSS®E is ensured at PGCIL and other stakeholders in the country.

Please note Maintenance & support is a full featured programme that provides significant additional value to the end users and majorly include the following inherent benefits which shall be covered as part of these services.

- **Free Software subscription:** This keeps PSS®E users current with the most up-to-date PSS®E features and functions. With this service PSS®E users automatically get the latest release of PSS®E with all its new features, models, and bug fixes. In addition, to the latest version releases, users who have reported a bug that needs to be fixed can download software patches. All new releases during the maintenance & support (M&S) period, **two new versions are released every year free of cost with enhanced features based on customer feedback.**
- **Technical Support:** Specific features include **free unlimited 24-hour access to Siemens PTI Support website for 24-hour web-based reporting and case tracking**, 24/7 technical support by expert product engineers with guaranteed response within 24 hours.
- **Direct link to product managers & roadmaps** through access to PSS® Ideas Portal ([www.siemens.com/pss-ideas](http://www.siemens.com/pss-ideas)) community for submitting, voting, and commenting on PSS® product ideas.
- **Beta test participant:** Licensee may be invited to participate in Beta testing of future releases.
- **Free updates and patches to the current and previous versions of the program.**
- Access to the "users-only" area of our World Wide Website where you get details of all the updates of the software and details recently added new models (e.g. renewable) which can be directly downloaded
- **Conducting the Indian Users Group Meetings (UGM)** and address the key topics, issues, performance review and best practice. The following is included.

**Performance Review:** This will include a meeting with a senior PSS®E support engineer on site in India. It will be an open forum discussion on the PSS®E product roadmap, and any PSS®E operational topics. Engineers will be able to engage with the PSS®E support expert to get many of their questions and issues resolved instantaneously.

**Best practice Check:** This is an appraisal of all aspects of STU's implementation of PSS®E by experienced Siemens technical staff. This program is intended to help utilities establish best-in-class operational procedures and optimal use of PSS®E

- **Free License support even in case of broken dongles**
- A reasonable amount of support in the installation and operation of the program for the current revision and last previous revision of the program. Support requests are accepted via telephone or email or personnel visit

**Additional M&S Support:** Siemens PTI would also conduct a survey on an all-India basis where every stakeholder would be approached for any support and training needs for PSS®E software. However, Siemens PTI is committed to support the stakeholders as following:

- Siemens PTI to conduct **one basic PSS®E training per quarter in all 4 regions** across the country to cater to the needs of various regions on planning & operational planning studies.
- Siemens PTI to support entities who are currently not using PSS®E by providing the required support to migrate to PSS®E.
- Siemens PTI would also be in touch with Power Grid on a quarterly basis for addressing any issues in PSS®E and provide possible resolutions to the issues



We would once again request ERPC to lead the M&S Renewal Contract for jurisdiction entities (as per below) and exploit the benefit of bulk pricing discount from Siemens.


**Upon the confirmation of ERPC, we would submit a maintenance & support price considering the discount of a bulk order for below 20 no's licenses for next 5 years.**

The list of PSS®E Licenses which were distributed in ER States will be as following:

S.No	Entity Name	Number of PSS®E licenses
1	Damodar Valley Corporation	2
2	Damodar Valley Corporation (SLDC)	2
3	Jharkhand State Electricity Board	2
4	Jharkhand State Electricity Board (SLDC)	2
5	Odisha Power Transmission Company Ltd	2
6	Odisha Power Transmission Company Ltd (SLDC)	2
7	West Bengal State Electricity Transmission Company Ltd	2
8	West Bengal State Electricity Transmission Company Ltd (SLDC)	2
9	Bihar State Power Transmission Company Ltd	4
<b>Total: 20 Licenses</b>		

(Name)

(Designation)

  
Brajesh Malviya  
Regional Head- Sales  
Siemens Limited







भारत सरकार/Government of India  
विद्युत मंत्रालय/Ministry of Power  
केंद्रीय विद्युत प्राधिकरण/Central Electricity Authority  
**राष्ट्रीय विद्युत समिति /National Power Committee**

सं.: 4/MTGS/NPC/CEA/2018/ 06-09

दिनांक: 07.01.2019

To

**The Joint Secretary (Adm/Trans),**  
Ministry of Power  
Shram Shakti Bhavan,  
Rafi Marg, New Delhi-110001

**विषय: Establishment of NPC - amendment in Composition of NPC- Reg.**

- सन्दर्भ:** 1. MoP order No.A-60016/24/2012-Adm-I dated 25.03.2013  
2. CEA letter No.4/MTGS/NPC/CEA/2016/191 dated 19.01.2016  
3. CEA letter No.4/MTGS/NPC/CEA/2016/63 dated 19.02.2016  
4. MoP letter No.A-60016/24/2012-Adm-I dated 29.03.2016  
5. CEA letter No.4/MTGS/NPC/CEA/2016/517 dated 01.06.2016  
6. CEA letter No.4/MTGS/NPC/CEA/2016/154 dated 20.09.2016  
7. MoP letter No.A-60016/24/2012-Adm-I dated 30.11.2016  
8. CEA letter No.4/MTGS/NPC/CEA/2016/216 dated 05.12.2016  
9. CEA letter No.4/MTGS/NPC/CEA/2018/218-19 dated 09.03.2018 (copies enclosed)

Madam/Sir,

Kind reference is invited to this office letter No.4/MTGS/NPC/CEA/2018/218-19 dated 09.03.2018, requesting to issue necessary amendment in the NPC (Conduct of Business) Rules incorporating the additional function of NPC along with modification in its composition. In this regard, the following is submitted:

1. NPC in its fourth meeting held on 10<sup>th</sup> December 2015, agreed on the proposal to include NLDC as the Member of NPC. A letter dated 19.01.2016 (vide reference No.2) was addressed to JS(Trans.), MoP requesting necessary orders amending the composition of National Power Committee to include NLDC as member of NPC and Chief Engineer (NPC Div, CEA) to be the Member Secretary of NPC.
2. In the 08<sup>th</sup> meeting of NPC held on 30<sup>th</sup> November 2018 at Guwahati, a proposal to include CTU as a member of NPC was deliberated and the same was accepted by the Committee.
3. In this regard, a draft order for amending the composition of National Power Committee to include NLDC and CTU, as member of NPC and Chief Engineer (NPC Division, CEA) as Member Secretary of NPC is enclosed.



4. It is, therefore, requested that necessary amendment in the composition of NPC, may please be issued.

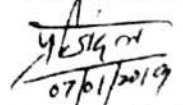
5. Regarding National Energy Accounting (NEA), following is submitted for information:

- i. While processing the proposal of membership of NLDC in NPC, MoP had raised some queries/observations and sought comments of CEA. One of the observation was that "considering the changing scenarios, the functions of NPC may also be broadened including the function of maintaining the National Energy Account involving the inter-national and inter-regional transmission transactions".
- ii. In this regard, a letter dated 05.12.2016 (vide reference No.8) was addressed to JS (Trans.), MoP mentioning the inclusion of additional function of NPC in the revised draft of Conduct of Business Rules (CBR). The proposed additional functions of NPC Secretariat regarding NEA are (i) collection of data from NLDC on weekly basis (Interregional and International scheduled energy and actual energy data), (ii) preparation of Weekly NDSM & Reactive Energy Account (if required) and (iii) preparation of monthly NEA.
- iii. It may please also be noted that the functioning of Energy Accounting is presently carried out by respective RPC's as per Grid code IEGC of CERC. However, Regulations of CERC, based on which energy accounting is being done, at present do not mention about NEA and NDSM. Therefore, necessary policy guidelines by MoP would also be required, to be given to CERC for incorporating necessary changes in the relevant Regulations for National Deviations Settlement Mechanism Account (NDSM) and National Energy Account (NEA).
- iv. This issue was discussed in the 08<sup>th</sup> meeting of NPC held on 30<sup>th</sup> November 2018 at Guwahati, wherein, a presentation by NLDC (POSOCO) on this subject was made (a copy enclosed for information). It was decided that this subject would be discussed in the RPCs and then put up for deliberation in the next meeting of NPC.

Thanking You.

Encl.: As above.

Yours faithfully,

  
07/01/2019

(प्रदीप जिंदल/Pardeep Jindal)

मुख्य अभियन्ता एवं सदस्य सचिव, रा.वि.स /  
Chief Engineer & Member Secretary, NPC

Copy to:

Director (Trans.), MoP, New Delhi

Copy for kind information to:

1. Chairperson, CEA, New Delhi
2. Member (GO&D), CEA, New Delhi



भारत सरकार / Government of India  
विद्युत मंत्रालय / Ministry of Power  
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority  
**राष्ट्रीय विद्युत समिति / National Power Committee**

सं.: 4/MTGS/NPC/CEA/2019/ 224-231

दिनांक/Date: 28<sup>th</sup> February 2019

सेवा में/To

**सचिव/Secretary**

Central Electricity Regulatory Commission  
3<sup>rd</sup> & 4<sup>th</sup> Floor, Chanderlok Building  
36, Janpath  
New Delhi - 110001

**विषय/Subject: Guidelines on Availability of Communication System - reg**

**संदर्भ/Ref.:** 1) CERC (Communication System for Inter-State transmission of Electricity), Regulations, 2017  
2) CERC letter No. CERC/Engg./X/Cs regulation/2017-18 dated 27.06.2017

महोदय/Sir,

1. As per Regulation 7.3(i) of CERC (Communication System for Inter-State transmission of Electricity), Regulations, 2017 and CERC letter dated 27.06.2017, National Power Committee (NPC) has been entrusted to prepare Guidelines on Availability of Communication System in consultation with RPCs, NLDC, RLDC and other stakeholders. Accordingly, a Working group was constituted under Chief Engineer/ Member Secretary (NPC). Three (03) meetings of the Working Group have been held and a draft of 'Guidelines on Availability of Communication System' has been finalized.
2. The draft 'Guidelines on Availability of Communication System' were put up on CEA's website for seeking comments of the stakeholders and general public. Comments were received from NRPC (vide letter dated 08.10.2018), NERPC (vide email dated 08.10.2018) and SRPC (vide email dated 20.11.2018).
3. The same was also put up to the National Power Committee (NPC) in its eighth (08<sup>th</sup>) meeting held on 30<sup>th</sup> November 2018. On the request of members in NPC meeting, Chairperson, NPC & CEA decided to give more time to furnish comments, if any, by RPCs and their constituents. Accordingly, NPC Secretariat vide letter dated 05.12.2018



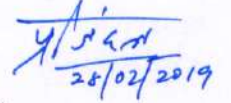
requested RPCs and their constituents to furnish comments by 20.12.2018. Subsequently, comments were received from NERPC (08<sup>th</sup> January 2019), TSTRANSCO (19<sup>th</sup> December 2018), WRPC (20<sup>th</sup> December 2018), PGCIL (20<sup>th</sup> December 2018) and NLDC (31<sup>st</sup> December 2018).

4. The Guidelines on Availability of Communication System, have been finalized suitably incorporating above comments, as given at **Annexure-I**. A statement indicating NPC's views on the comments received from the stakeholders is also submitted at **Annexure-II**.

This issues with the approval of Chairperson, NPC/ Chairperson, CEA.

Thanking You.

भवदीय/Yours faithfully,

  
28/02/2019

(प्रदीप जिंदल/Pardeep Jindal)

सदस्य सचिव (रा.वि.स) एवं मुख्य अभियंता(रा.वि.स)/  
Member Secretary (NPC) & Chief Engineer (NPC)

संलग्न/Encl.: यथोपरि/As above.

**प्रति सूचनार्थः**

1. अध्यक्ष/Chairperson, CEA, New Delhi
2. सदस्य (ग्रि.प्र. एवं वि.)/Member(GO&D), CEA, New Delhi
3. सदस्य सचिव/Member Secretary, NRPC, New Delhi
4. सदस्य सचिव/ Member Secretary, WRPC, Mumbai
5. सदस्य सचिव/ Member Secretary, SRPC, Bengaluru
6. सदस्य सचिव/ Member Secretary, ERPC, Kolkata
7. सदस्य सचिव/ Member Secretary, NERPC, Shillong

**GUIDELINES  
ON  
AVAILABILITY OF COMMUNICATION SYSTEMS  
FOR  
INTER-STATE TRANSMISSION OF ELECTRICITY**

**NATIONAL POWER COMMITTEE  
CENTRAL ELECTRICITY AUTHORITY**

**FEBRUARY 2019  
NEW DELHI**

## **GUIDELINES ON AVAILABILITY OF COMMUNICATION SYSTEM FOR INTER-STATE TRANSMISSION OF ELECTRICITY**

### **1. INTRODUCTION:**

1.1 As per regulation 7.3 (i) of Central Electricity Regulatory Commission (Communication System for Inter-State transmission of Electricity), Regulations, 2017, National Power Committee (NPC) has been entrusted to prepare Guidelines on Availability of Communication System in consultation with RPCs, NLDC, RLDC and other stakeholders.

1.2 The relevant provisions in the CERC (Indian Electricity Grid Code) Regulations, 2010 and Central Electricity Authority (CEA) (Technical Standards for Connectivity to the Grid), Regulations, 2007 in respect of Communication System as follows:

1.2.1 **Regulation 4.6.2 of the Indian Electricity Grid Code (IEGC)** stipulates that *‘Reliable and efficient speech and data communication systems shall be provided to facilitate necessary communication and data exchange, and supervision/ control of the grid by the RLDC, under normal and abnormal conditions. All Users, STUs and CTU shall provide Systems to telemeter power system parameter such as flow, voltage and status of switches/ transformer taps etc. in line with interface requirements and other guideline made available by RLDC. The associated communication system to facilitate data flow up to appropriate data collection point on CTU's system shall also be established by the concerned User or STU as specified by CTU in the Connection Agreement. All Users/STUs in coordination with CTU shall provide the required facilities at their respective ends as specified in the Connection Agreement. ’*

1.2.2 **Regulation 6(3) of the CEA (Technical Standards for Connectivity to the Grid)** stipulates that *‘the requester and user shall provide necessary facilities for voice and data communication and transfer of online operational data, such as voltage, frequency, line flows and status of breaker and isolator position and other parameters as prescribed by the appropriate load dispatch centre.’*



## **2. DEFINITIONS:**

- 2.1 Words and expressions used in these guidelines shall have the same meaning assigned in the Electricity Act, Central Electricity Authority (Technical Standards for Connectivity of the Grid) Regulation, 2007, CEA (Technical Standards for Communication System in Power System Operation) Regulations, 2018, CERC (Indian Electricity Grid Code) Regulations, 2010 & (Communication System for Inter-State transmission of Electricity), Regulations, 2017 and amendments thereof.
- 2.2 Other words have been explained as per the context in these guidelines.

## **3. SCOPE AND APPLICABILITY:**

- 3.1 As per Regulation 5. (i) of CERC (Communication System for Inter-State transmission of Electricity), Regulations, 2017, *“These regulations shall apply to the communication infrastructure to be used for data communication and tele-protection for the power system at National, Regional and inter-State level and shall also include the power system at the State level till appropriate regulation on Communication is framed by the respective State Electricity Regulatory Commissions.”*
- 3.2 As such, in case of ISTS i.e. for the communication system to be provided at RLDCs/NLDC, these guidelines shall be applicable for CTU. And in case of State Transmission System i.e. for the communication system to be provided at SLDC, these guidelines shall be applicable to the respective State Transmission Utility (STU) as applicable.
- [The CTU (or STU as the case may be) shall have back to back co-ordination/agreement with transmission licensees, generators, dedicated transmission line owners for providing power system communication on their network]
- 3.3 Demarcation of responsibility:
- a) CTU (or STU as the case may be) shall be responsible for submission of the details of communication channels including the redundant channels configured for use of voice / data / video exchange, protection, Teleprotection / SPS to respective RLDC

(SLDC as the case may be) on monthly basis incorporating the details of new channels configured during previous month. The total number of communication channels ( $N$ ) is based on the requirement of RLDCs/NLDC and the same would be decided in consultation with respective RPCs/NPC.

- b) CTU (or STU as the case may be) shall be responsible for submission of the performance/availability of configured channels of the previous month to respective RLDCs for verification by RLDCs and onward submission to respective RPC for computation of availability of the communication system for previous month.
- c) CTU (or STU as the case may be) shall submit availability reports of configured channel including the redundant channels in format prescribed by RLDC/RPC, generated from the centralized NMS (Meta NMS). The availability report of the call logging facility (with time stamp) may be provided till commissioning of META NMS for availability computation.

#### **4. TREATMENT OF COMMUNICATION SYSTEM OUTAGES:**

4.1 Outage time of communication system elements (i.e. channels) due to acts of God and force majeure events beyond the control of the communication provider shall be considered as deemed available. However, onus of satisfying the Member Secretary, RPC that element outage was due to aforesaid events shall rest with the communication provider.

4.2 Any outage of duration less than or equal to one (01) minute in a time-block as defined in IEGC shall be treated as deemed available provided such outages are not more than ten (10) times in a day.

(Explanation: (a) If a channel is out for a duration of more than one (01) minute in a time-block, the channel shall be considered not available for the whole time-block. (b) If a channel is out for a duration less than or equal to one (01) minute in a time-block, and such outages are more than ten (10) times in a day, all the time-blocks with such outages shall be treated as not available).

4.3 All other outages not covered under 4.1 and 4.2 shall be considered as not available during the whole block for the computation of channel availability.

## **5. METHODOLOGY FOR COMPUTATION OF AVAILABILITY OF COMMUNICATION SYSTEM:**

5.1 Availability of Communication System (**A<sub>CS</sub>**) shall be calculated as under:

$$A_{CS} = \frac{\sum_{i=1}^N (A_i)}{N}$$

Where - **N** is total number of communication channels as specified in 3.3(a) above

- **A<sub>i</sub>** is Availability of *i<sup>th</sup>* Channel which shall be calculated as given in 5.2

5.2 Availability of *i<sup>th</sup>* Channel (**A<sub>i</sub>**) shall be arrived as under:

$$A_i = \frac{B_T - B_{Ni}}{B_T} \times 100$$

Where **B<sub>T</sub>** is Total number of time-blocks in a month

**B<sub>Ni</sub>** is the total number of time-blocks, in which *i<sup>th</sup>* channel was not available after considering deemed availability status of 4.1 & 4.2 above.

$$B_{Ni} = B_{ANi} - B_{Gi} - B_{LTTi}$$

Where-**B<sub>ANi</sub>** is absolute number of time-blocks in which the *i<sup>th</sup>* channel was 'not available' on account of any reason.

-**B<sub>Gi</sub>** is Number of time-blocks out of **B<sub>ANi</sub>**, in which *i<sup>th</sup>* channel was 'not available' on account of act of God as specified in 4.1 above.

-**B<sub>LTTi</sub>** is Number of time-blocks out of **B<sub>ANi</sub>**, in which *i<sup>th</sup>* channel was 'not available' for a duration less than or equal to one (01) minute in a time-block and not more than ten (10) times in a day as specified in 4.2 above.

### **[Illustration:**

**Case1:** if there are 2880 time-blocks (**B<sub>T</sub>**) in a month, and a particular channel is not available for a total of 70 time-blocks; and out of this, this channel was not available for 20 (**B<sub>Gi</sub>**) time-block due to act of God, six (06) time-blocks for less than one (01) minute (**B<sub>LTTi</sub>**), then **B<sub>ANi</sub>**=70, **B<sub>LTTi</sub>**=06, **B<sub>Ni</sub>**=70-06-20 = 44, and **A<sub>i</sub>** = (2880-44)/2880 = 98.47%

**Case 2:** if there are 2880 time-blocks (**B<sub>T</sub>**) in a month, and a particular channel is not available for a total of 70 time-blocks; and out of this, this channel was not available for 20 (**B<sub>Gi</sub>**) time-block due to act of God, 11 time-blocks for less than 1 minute, then **B<sub>ANi</sub>**=70-0=70, **B<sub>LTTi</sub>** = 0, **B<sub>Ni</sub>**=70-0-20=50, and **A<sub>i</sub>** = (2880-50)/2880 = 98.26% ]

\*\*\*

**Statement indicating NPC's views on the comments received from the stakeholders on draft 'Guidelines on Availability of Communication System'**

Comments received from stakeholders are as per the following communication:

1. NRPC - 08<sup>th</sup> October 2018
2. NERPC - 08<sup>th</sup> October 2018 and 08<sup>th</sup> January 2019
3. SRPC - 20<sup>th</sup> November 2018
4. TSTRANSCO – 19<sup>th</sup> December 2018
5. WRPC – 20<sup>th</sup> December 2018
6. PGCIL – 20<sup>th</sup> December 2018
7. NLDC – 31<sup>st</sup> December 2018

**Issue 1: TREATMENT OF COMMUNICATION SYSTEM OUTAGES (Clause 4.1 of the Guidelines)**

**Comments from Stakeholders and General Public:**

NERPC: Deemed Availability for preventive maintenance or emergency maintenance to be considered for communication channels (may be limited to 24hrs/per OPGW per year).

PGCIL: Availability for communication system should be considered 98% instead of 99.9% to incorporate suitable provisions/margins for Preventive Maintenance. Preventive maintenance of OPGW includes Re-splicing work, restringing of OPGW, sag management, fiber loss rectification etc. Preventive maintenance of Communication Equipment include; Earthing conditions, alarm measurement verifications, tightening of Connectors etc.

Deemed availability for carrying out OPGW work for LILO formation, Line crossing, outages due to faults attributable to others to be considered.

TSTRANSCO: The following two scenarios should not be considered as non-availability:

- 1) While making a transmission line LILO, OPGW is made cut and also made LILO.
- 2) When a new transmission line crossing an existing line with OPGW, sometimes OPGW on existing made cut for clearance and is restored after stringing of new line is completed.

WRPC: i) Draft Guidelines doesn't speak about the treatment for outages of one user's channel due to outages availed by others in case of upgradation/addition/alteration in network.

ii) Treatment for maintaining redundant path.

iii) Either force majeure/act of God events are unambiguously defined or an adequate percentage may be allowed.

NLDC: Inclusion of the following para:

"4.3 All other outages not included under 4.1 and 4.2 shall be considered for the calculation of channel availability"

**Comments of NPC Secretariat:**

1. In power communication system, the shutdown is generally not taken for maintenance. There is no such standards, which suggests maintenance time of 24 hrs/per OPGW per

year to be given. NERPC have not provided documents (codes/standard/specification etc., if any) for supporting their proposal to allow maintenance shutdown of 24 hrs per Optical OPGW/FO end to end Link per year

2. Maintenance activities, if any, may be embedded in 99.9% availability i.e. margin of 0.1 % unavailability is already given for carrying out any maintenance activities.
3. Further, for emergency, maintenance etc., re-routing of links need to be carried out. Hence, no availability is to be given for outages on account of preventive maintenance.
4. As per clause 7.3(iv) of CERC(Communication System for inter-State transmission of electricity) Regulations, 2017:  
*“The RPC Secretariat shall be responsible for outage planning for communication system in its region. RPC Secretariat shall process outage planning such that uninterrupted communication system is ensured.”*
5. Availability shall be computed for each channel including the redundant channels.
6. Definition of force majeure/act of God will be same as defined in IEGC or other regulations of CERC.

**Issue 2:** If a channel is out for some time in a particular time-block as defined in IEGC (presently 15 minutes), for calculation of availability of communication system, it would be considered as not available during the whole block. (Clause 5.2 a) of Guidelines)

**Comments from Stakeholders and General Public:**

NERPC: The availability shall be calculated on a continuous basis and actual available time shall be summed up annually.

PGCIL: Channel availability need to be calculated based on computing the %age of Available hours from the total hours in a year and not with Time Block.

WRPC: The computation of block wise availability that too on precise minute to minute basis is not at all practicable. It is proposed that the availability may be computed monthly with outage of total number of hours in a month (%age outage in a month).

**Comments of NPC Secretariat:**

To address the intermittency of outages of communication channel, it was felt that if a channel is out for more than one minute in a time block, it may be considered that it was out for the entire block. This in turn would facilitate to increase the availability of ISTS communication system for state utilities. The issue was duration of computation of outage.

(For example, if a channel is out for 2 minutes for 15 times in different time blocks in a month. Its monthly availability will be 99.48 %. Where as if it is computed 15x2=30 minutes outage, then availability will be 99.93%)

Here it is important to note that “outage for 2 minute-15 times” is a more serious matter as compared to “outage for 30 minutes in one stretch”. As such, to take care of the intermittent outages of communication channel, the provision of considering outage for entire block was made in the draft Guidelines.

**Issue 3:** Periodicity of Computation of Availability of the Communication System (Clause 5.2 of the Guidelines)

**Comments from Stakeholders and General Public:**

NERPC: As per CERC Regulations 99.9% annual availability is to be maintained. Further AMC contract is given to diff parties are reported to be operated considering



availability on yearly basis. Hence availability may be calculated on annual basis preferably.

PGCIL: AMCs are signed for one (1) plus six (6) years with the respective vendors. Annual availability is certified by the employer as per contract agreement and accordingly payments are regulated to the vendor.

#### **Comments of NPC Secretariat:**

The working group has agreed to compute the availability of communication system on a monthly & on regional basis in line with the transmission availability computation. In this regard, it may please be noted that NPC has been entrusted to make guidelines/methodology for computation of Availability of Communication System and treatment of the availability, lies in the purview of CERC (Terms and Conditions of Tariff) Regulations, as applicable from time to time.

#### **Issue 4: METHODOLOGY FOR COMPUTATION OF AVAILABILITY OF COMMUNICATION SYSTEM** (Clause 5 of the Guidelines)

#### **Comments from Stakeholders and General Public:**

TSTRANSCO: Data availability and channel availability must be treated as separate. Data may or may not be available even when Channel is available.

WRPC: 1)  $Availability\ of\ i^{th}\ channel = \frac{(BT-BG)-(Bni)}{(BT-BG)} \times 100$

- 2) Guidelines on list of elements to be considered as a part of virtual path (as per definition of channel defined in regulation) starting from data origination point to terminating point.
- 3) Some channels are most critical whereas some are least critical and therefore there should be different criteria for calculating availability of these most and least important channels.
- 4) All the elements from sending end signal source to destination shall be included as per some proportional wattage.
- 5) A communication channel consists of a set of individual communication networks, communication media, relaying stations, tributary stations, terminal equipment, which constitutes a path. Therefore, availability of individual communication network/path is required to be computed first and “n” number of such paths shall constitute a communication channel.  
Any component unavailable in the communication path would constitute non availability of that path.
- 6) It is suggested that instead of the phrase “communication channel” the phrase “physical communication path/medium” could be used as similar to transmission line availability which is given for physical element.

NRPC: The actual availability (duration for which the communication system was actually available) & deemed availability of the communication system may be calculated separately. However, for commercial purposes, the sum of the two shall be used.

PGCIL: Existing NMSs are multiple (and not a unified one for the complete regional/ national system) and they do not have this unified end-to-end channel monitoring capability, as it was not part of any project requirements.

In order to work out the availability of these channels, it would need manual intervention and collating data from different NMSs shall be required and concluding

the same would be a tedious and complex task, as one channel would comprise of 10s of links of different NMSs.

In the existing communication system, the computation of availability needs to be based on the features of the NMS system. The existing NMS System facilitates node-wise availability calculation and for simple automatic and dispute free computation, it is proposed to adopt the same.

#### **Comments of NPC Secretariat:**

1. In Communication System for Power Sector, the impact of losing data, due to any reasons (including Act of God) can be very widespread. The data should be available for 24x7. Hence, the availability is computed considering all the time blocks (including the time of outage due to Acts of God).
2. In any Communication System, there are basically three components: source, channel and end point. For communication to take place, the channel is to get data and transmit to the end point. The availability of RTU (source) and SCADA (End Point) could not be ensured by Communication Provider. The availability of channel is independent of availability of node. End point connectivity is ensured by availability of channel. Hence, availability of channel is appropriate for computing the availability of Communication System.
3. The objective of the guidelines is to suggest a methodology which should be measurable, practical and dispute-free. It is informed that monitoring the availability of RTUs, terminal Equipment, etc. would be difficult and would not be feasible. It is stated that if both, the end equipment and OPGW were to be considered, then there would be an issue of what weightage should be given to each of them. Also, if say, end equipment is available but OPGW is not available, the communication provider would get some part of its charges, though the information/data would not reach its destination. Further considering the draft CEA's Regulations on Communication Standards, it is suggested to consider the availability of Channel only for computing the availability of Communication System. This is measurable and practical also.
4. As per suggestions of WRPC, the phrase "physical communication path/medium" could be used in place of the phrase "communication channel" as similar to transmission line availability which is given for physical element. Here, it is to note that, as per CERC (Communication System for inter-State transmission of electricity) Regulations, 2017: *"Communication Channel" means a dedicated virtual path configured from one users' node to another user's node, either directly or through intermediary node(s) to facilitate voice, video and data communication and tele-protection system*'. As such, the phrase 'physical communication path/medium' contradicts the provisions of CERC Regulations.
5. In response to NRPC comments, it is informed that RPC Secretariat shall be having the data (as to be furnished by RLDCs) which will include all the details like availability, unavailability/outages, act of god, force majeure, preventive maintenance etc. As per the formula suggested in the guidelines, both the values (i.e. actual availability and deemed availability) could be derived out.
6. In response to PGCIL's comments, it is to inform that the Communication Infrastructure which is currently in place, shall have to get modified/customized according to the system needs and CERC's Regulation.

#### **Issue 5: SCOPE AND APPLICABILITY** (Clause 3 of Guidelines)

**NLDC:** A new clause "Demarcation of responsibility" may be added to include the following:

- a) CTU shall be responsible for submission of the details of communication channels including the redundant channels configured for use of voice / data / video exchange,

protection, Teleprotection / SPS to respective RLDCs on monthly basis incorporating the details of new channels configured during previous month.

b) CTU shall be responsible for submission of the performance/availability of configured channels of the previous month to respective RLDCs for verification by RLDCs and onward submission to respective RPC for calculation of availability of the communication system for previous month.

c) CTU shall submit availability reports of configured channel including the redundant channels in prescribed format generated from the centralized NMS (Meta NMS). The availability report of the call logging facility (with time stamp) may be provided till commissioning of META NMS for availability calculation.

PGCIL: Tele protection channel provisioning is only applicable between S/s hence its availability shall be between SS and not upto Control Centers.

**Comments of NPC Secretariat:**

1. The comments of NLDC are justified and shall be incorporated in the draft guidelines accordingly.
2. The comments of PGCIL pertains to Clause 5(i) of CERC Regulations (Communication System for inter-State transmission of electricity) Regulations, 2017 and the scope and applicability clause 3.1 in guidelines have been taken same as Clause 5.(i) of CERC Regulations.

**Issue 6: Miscellaneous**

SRPC: A new clause 4.1 to be added as given below (Other clauses of 4 to be numbered accordingly):

The RPC Secretariat shall certify the availability of communication equipment for CTU, ISGS, RLDCs, NLDC, SLDCs based on the data furnished by RLDC. For the concerned entities for whom the Availability of Communication System is to be certified by RPC, RLDC shall verify the outage details and availability and submit to RPC.

WRPC: Criteria for rerouting.

**Comments of NPC Secretariat:**

1. The clause suggested by SRPC is already a part of CERC (Communication System for inter-State transmission of electricity) Regulations, 2017 as Regulations 7.3(ii). Insertion will create duplication. Hence, it is not incorporated as part of guidelines.
2. Criteria for rerouting is to be decided by the Standing Committee as proposed in clause 7.1(iii) of CERC (Communication System for inter-State transmission of electricity) Regulations, 2017.

\*\*\*