

Annexure

of 43rd TCC Agenda

LAN Integration with AMR in ER

SL No.	Uitility	Substation Name	LAN Integration Date
1	Power Grid	Subhashgram	15-Jun-2017
2	Power Grid	Binaguri	20-Jul-2017
3	Power Grid	Malda	06-Jun-2018
4	Power Grid	Kishanganj	15-Jul-2018
5	Power Grid	Siliguri	12-Sep-2018
6	Power Grid	Gangtok	15-Sep-2018
7	Power Grid	Rourkela	03-Oct-2018
8	Power Grid	Gaya	25-Dec-2018
9	Power Grid	Biharshariff	27-Dec-2018
10	Power Grid	Arah	29-Oct-2018
11	Power Grid	Jamshedpur	02-Nov-2018
12	Power Grid	Rangpo	01-Nov-2018
13	Power Grid	Rangpo	05-Dec-2018
14	Power Grid	Durgapur	07-Dec-2018
15	Power Grid	Jeypore	10-Dec-2018
16	Power Grid	Maithon	11-Dec-2018
17	Power Grid	Pusaul	19-Dec-2018
18	Power Grid	Muzaffarpur	20-Dec-2018
19	NTPC	Barh	21-Dec-2018
20	NTPC	Kahalgaon	21-Dec-2018
21	Power Grid	Purnea	24-Dec-2018
22	Power Grid	Banka	27-Dec-2018
23	NHPC	Teesta	01-Jan-2019
24	NHPC	Rangit	02-Jan-2019
25	Power Grid	Baripada	15-Nov-2018
26	Power Grid	Ranchi	10-Jan-2019
27	NTPC	Talcher	16-Jan-2019
28	NTPC	Farakka	22-Jan-2019
29	Power Grid	Chaibasa	28-Jan-2019
30	Power Grid	Dalkhola	28-Jan-2019
31	Power Grid	Birpara	29-Jan-2019
32	Power Grid	Rajarhat	18-Apr-2019
33	NTPC	Kanti	28-May-2019
34	Power Grid	Patna	20-Sep-2019
35	Power Grid	Behrampore	18-Nov-2019
36	Power Grid	Pandiabil	30-Jan-2020
37	DVC	Mejia	30-Sep-2020
38	DVC	RTPS	25-Feb-2021
39	Power Grid	Bolangir	26-Feb-2021
40 Power Grid		New Melli	04-Mar-2021

Review of recommendations for strengthening of Communication network based on data and voice communication failure in Eastern Region.



Committee meeting held through MS Team dated 26.02.2021

Recommendation:

There are three major pillars of Indian power sector these are Generation, Transmission, and Distribution. For smooth running of the Indian Power System, real time system operators are entrusted for ensuring effective and efficient management of the generation, transmission and distributionresources within the region and under their control. Real time operator takes all real time decision based on available real time SCADA and URTDSM data and reliable communication system, dedicated for Indian Power System, plays pivotal role in ensuring availability of SCADA & URTDSM for front line grid operator. Any event, which may cause partial or complete outage of real time data and voice communication, is a potential threat for Indian Power system and its integrated operation. It is therefore imperative to take precautionary measures based on the events, occurred on 10th February 2020 and 25th February 2020. The event has pointed out requirement of implementing cyber security norms in every corner of interconnected communication network, revamping &strengthening of OPGW network by installing next generation firewall or manageable network switches, implementing redundancy in OPGW ring network. Based on the information in detailed report, shared by POWERGRID, and presentation of ERLDC the committee recommended followings with further action plan:

SL No	Recommendation	Details
01	*RTU/SAS specification regarding	RTUs/SAS gateway should be having separate NIC card for
	NIC card and Ethernet Port.	each required Ethernet port
02	Interfacing of Main and Standby	Main and stand by channel interfacing at each site is to
	channel in MUX	be done in separate Ethernet card in MUX
03	Connectivity of LDMS at Substations	LDMS network IP series different from LDCs SCADA RTU
		network and to be connected to RTU/SAS gateway in
		dedicated Ethernet port.
04	Unused ethernet/LAN ports shall be	Cyber Security norm also mandates that to keep IT/OT
	kept administratively down.	system secure in cyber space all unused Ethernet/LAN
		ports shall be kept administratively down. Authorized log
		in to all the devices connected to the communication
		network is also mandatory to safeguard OT/IT system.

Review of recommendations for strengthening of Communication network based on data and voice communication failure in Eastern Region.

	Review of recommendations for str	engthening of Communication network based on data and voice communication failure in Eastern Region.
05	Installation of Firewall or Ingress	Firewall or manageable switches with storm control (like
	broadcast-storm feature in ethernet	ingress broadcast-storm feature) feature is to installed at
	switches	interfacing point. This will restrict the broadcast packet to
		certain limit which will prevent communication network
		being flooded with MAC broadcast kind of traffic.
06	**Implementation of a parallel ring	Existing OPGW fiber and additional new MUX (different
	network	make with that of existing MUX make) at specific nodes
		will be used to configure a parallel Communication ring
		network. These two networks will work as redundant to
		each other.
07	Periodic Audit for Communication	Periodic audit must be carried out in all sub-stations,
	system in line with CERC regulation	Generating stations, SLDCs, RLDC, RTAMCs etc. in line
		with CERC Communication regulation-2017.Detailed
		procedure and checklist for the audit is attached in
		Annexure C1 and Annexure C2 respectively.
		Cyber security audit shall also be conducted out
		periodically for the Communication System as decided by
		RPC in line with CERC Communication regulation-2017.
		The audit shall be conducted by CERT-In certified third
		party auditors.
08	Guidelines for utilization of Inter-	Any services, other than the listed OT applications, needs
	state OPGW network.	permission of ERPC. Further, usage of the Inter-state
		OPGW network for the purpose of internet access, which
		is a public network, will have an extremely high security
		threat to the power operation.
		 SCADA Inter-Control Centre Communication Protocol(ICCP) Phase Measurement Unit Digital Protection used by Substation
		 5. Travening wave Fault Locator 6. Voce Over Intranet Phone 7. EPAX
		8. Automatic (Energy) Meter Reading
		9. Automatic Gain Control (of Gen. Stations)
		10. Video Conferencing (between users) 11. Security Constrained Economic Dispatch

Review of recommendations for strengthening of Communication network based on data and voice communication failure in Eastern Region.

		12. Disturbance Recorder relay data for centralize
		acquisition.
		13. ADMS
		14. SAMAST
		15. UNMS
		16. Centralize monitoring of Firewall in all site
		locations.
		Note: Any of the above OT system LAN should not be
		having connection with IT network.
09	Dedicated Communication network	Provision of separate dedicated SDH at State Control
	of Central Sector at State Control	Centers for Central Sector services. Existing SDH will be
	Centers	used for Intra-State Communication Services.Scheme
		enclosed in Annexure-D1.
10	Implementation of MPLS based	Implementation of MPLS based system with the existing
	system with the existing SDH and	SDH and proposed parallel SDH network will improve the
	proposed parallel SDH network	overall communication system flexibility, reliability and
		availability. MPLS is an upgraded technology having the
		automatic switching capability in the shortest path. ***

Note: * Owner of the RTU/SAS will implement the same in upcoming RTU/SAS replacement project after consultation with RTU/SAS Vendors.

**POWERGRID has already shared list of nodes along with OPGW path, where new set of MUX will be installed. Schematic diagram & list of nodes enclosed. Regarding OPGW fiber availability in state sector OPTCL, BSPTCL, JUSNL& DVC informed that dark OPGW fiber is available forthe listed OPGW link. WBSETCL informed that they will explore the possibility for providing 4 dark fiber cores for listed OPGW links.

*** POWERGRID proposed the implementation of MPLS system for Central Sector network and also welcomed all constituents to implement the same in their network as per their requirement. All constituents agreed for the implementation of MPLS system for Central Sector. DVC agreed for implementation in their portion. JUSNL intimated that they have already rolled out the MPLS system. Sikkim has also gone ahead with MPLS system implementation. WBSETCL, OPTCL & BSPTCL will study their state network and will decide for implementation in their state.

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Communication Audit Procedure for Eastern Regional Inter-state communication system

1. Introduction

- 1.1 This procedure has been prepared in compliance to Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017. As per clause 10 of the Regulation, RPC shall conduct annual audit of the communication system annually as per the procedure finalized in the forum of the concerned RPC. It also mandates that RPC Secretariat shall issue necessary instructions to all stakeholders to comply with the audit requirements within the time stipulated by the RPC Secretariat based on the audit report. An Annual Report on the audit carried out by respective RPC is to be submitted to the Commission within one month of closing of the financial year.
- 1.2 "Communication system" is a collection of individual communication networks, communication media, relaying stations, tributary stations, terminal equipment usually capable of inter-connection and inter-operation to form an integrated communication backbone for power sector. It also includes existing communication system of Inter State Transmission System, Satellite and Radio Communication System and their auxiliary power supply system, etc. used for regulation of inter-State and intra-State transmission of electricity.
- 1.3 "User" means a person such as a Generating Company including Captive Generating Plant, RE Generator, Transmission Licensee [other than the Central Transmission Utility (CTU) and State Transmission Utility (STU)], Distribution Licensee, a Bulk Consumer, whose electrical system is connected to the ISTS or the intra-State transmission system.
- 1.4 "Control Centre" means NLDC or RLDC or REMC or SLDC or Area LDC or Sub-LDC or DISCOM LDC including main and backup as applicable.
- 1.5 Words and expressions used in this procedure shall have the meanings assigned to them in the Act or Regulations by CERC.

2. Scope

- 2.1 This procedure shall be applicable to all Users of the communication infrastructure to be used for data & voice communication, tele -protection and other applications in line with the guidelines issued by CEA for the power system in Eastern Region at Regional, inter-State and State level.
- 2.2 All Users, Control Centers and other concerned agencies shall abide by the procedures as applicable to them.
- 2.3 The Audit should be carried out at Regional, inter-State and intra-state level incidental to inter-state transmission of electricity and shall be carried out by audit team constituted by ERPC.
- 2.4 ERPC Secretariat shall issue necessary instructions to all stakeholders to comply with the audit requirements, as per relevant CERC and CEA Regulations, within the stipulated time.
- 2.5 The Audit for the communication infrastructure at intra-state level in line with this Procedure shall be carried out by respective SLDC. SLDC may seek assistance of other stake holders or any other third party for the audit. SLDC shall issue necessary instructions to all stakeholders to comply with the audit requirements as per relevant CERC and CEA Regulations, within the stipulated time.

3. Audit Procedure

- 3.1 The Audit would be conducted in two phases. In first phase scrutiny of the reports, documents etc. In the second phase physical verification shall be carried out.
- 3.2 Each User, using inter-state transmission or the intra-state transmission incidental to inter-state, shall submit the detailed report to ERPC Secretariat and ERLDC, as per Annex-I on half yearly basis. The detailed report shall be submitted by 15th October for the period April-September and by 15th April for the period October-March of the respective year. This report shall be considered as self-certificate regarding availability and healthiness of the Communication system of respective user.

- 3.3 Each concerned User shall submit Report by 15th October for the period April-September and by 15th April for the period October-March of the FY Completion of periodic testing of the communication system in accordance with procedure for maintenance and testing prepared by CTU. The detailed.
- 3.4 In respect of intra-state users SLDC shall submit half yearly reports, to ERPC Secretariat and ERLDC, by 15th October for the period April-September and by 15th April for the period October-March of the respective year.
- 3.5 The Network Management System (NMS) report for a month shall be submitted by the Users to ERLDC and respective SLDCs, on monthly basis, by 7th day of the next month. ERLDC and SLDCs after verifying the NMS data shall submit report to ERPC Secretariat by 15th day.
- 3.6 All users and Control Canters shall get the third party cyber security audits done once in a financial year from a Cert-in certified vendor in compliance to Regulation 13 (iii) of Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017. The detailed report of the Cyber Security Audit shall be submitted by 15th April for the previous financial Year.
- 3.7 ERPC Secretariat may ask any other information required for Audit of the Communication system in addition to these periodic reports.

4. Phase-I Audit : Scrutiny of the Information

- 4.1 A Communication System Audit Sub-Group comprising one member each from ERPC, ERLDC, CEA and One of the Eastern Region SLDCs shall be constituted by ERPC Secretariat with the approval of Member Secretary, ERPC. The sub-group may co-opt any other member from any organization for facilitating the activities of the sub-group.
- 4.2 ERPC Secretariat may also engage a third party for carrying out Audit Activities.
- 4.3 The Communication System Audit Sub-group shall scrutinize the information received in ERPC Secretariat as mentioned in Clause 3 of this procedure. The Sub-group may also ask any additional information necessary for its activities. All the users, ERLDC, SLDCs shall provide the information to the sub-group on priority with the stipulated time period.

- 4.4 The sub-group shall also identify the nodes for physical inspection based on the scrutiny of the information.
- 4.5 The Audit would include but not limited to following aspects:
 - a) Availability of communication channels. The outage reason needs to be clearly specified whether it is on account of the concerned entity or on account of any other entity, force majeure etc. The list of communication channels would be finalized by Communication System Sub Group in consultation with other stakeholders.
 - b) Availability of terminal equipment. The outage reason needs to be clearly specified whether it is on account of the concerned entity or on account of any other entity, force majeure etc. The list of terminal equipment would be finalized by Communication System Sub Group. Part outage like failure of specific cards etc. would also be furnished along-with reasons.
 - c) Availability of Auxiliary System e.g. Battery Charger, Battery bank, sufficient cooling equipment etc.
 - d) Compliance of CERC and CEA Regulations and the procedures under these Regulations.
 - e) Completion of periodic testing of the communication system in accordance with procedure for maintenance and testing prepared by CTU.
 - Audit of all newly commissioned communication equipment within six month of its commissioning.

5. Phase-II Audit : Physical Verification

- 5.1 Based on the recommendations of the sub-group Audit committee (s) shall be constituted and the physical inspection Audit plan shall be prepared by ERPC Secretariat.
- 5.2 Audit Committee (s) shall be formed on regional basis.
- 5.3 Audit shall be carried out in a planned manner as included in this document by a team of three auditors. The audit committee shall comprise of one representative from the ERPC Secretariat, one representative from ERLDC and one representative from any of the Utilities or SLDCs of Eastern Region. The

Audit team shall be formed excluding the member for the Organization/Utility who's system is to be Audited.

- 5.4 Once the plan is finalized, 3 days advance notice shall be served to the concerned Auditee intimating the detailed plan so that availability of required testing equipment and the required documents is ensured by Auditee and is made available to the Audit committee during the site visit.
- 5.5 Member Secretary, ERPC may decide on any additional nodes/locations for physical inspection if a location is very critical in view of performance of the communication network at any time of the year.
- 5.6 The Scope of the physical verification shall include but not limited to the following:
 - a) Available communication Network for its redundancy
 - b) Availability of channel redundancy for all the functions for which it is configured
 - c) Communication equipment (hardware and software configuration) of all the nodes including repeater stations for its recommended performance.
 - d) Documentation of the configuration of the respective site and its updation.
 - e) Fibre layout / usage of fibre / Availability of dark fibre and its healthiness
 - f) Cable Schedule and identification / tagging
 - g) Healthiness of Auxiliary supply including the healthiness of Battery backup
 - h) Healthiness of Earthing / Earth protection for communication system.
 - Availability of sufficient cooling equipment at the User's premises to maintain the stipulated temperature for the communication equipment.
- 5.7 Audit Committee (s) shall submit report including recommendations for action on deficiencies, if any, found during the inspection, within 15 days from the date of inspection to Member Secretary, ERPC. A copy of the report shall also be submitted to convener of Communication System Audit Sub-group and ERLDC.

6. Audit Compliance Monitoring

ERPC secretariat, Communication Sub Group, ERLDC and SLDC would monitor the compliance of audit observations as applicable. The Audit outcome and the compliance of Audit recommendations shall be put up to TeST Sub-committee, TCC and ERPC for deliberations.

7. Approval and Review of the Procedure

- 7.1 This procedure shall be made effective after approval of TCC and ERPC.
- 7.2 This procedure shall be reviewed based on the feedback received by ERPC Secretariat.
- 7.3 Any amendment in the procedure shall be made effective only after approval of TCC and ERPC.

<u>Communication Channels and Equipments Audit Format</u>

Name of User:Name of Node / Location:Period of Inspection:

(A) List of channels in usage for data (64 kbps, 104, PMU, VC, 101) / Voice / Protection circuits / Others :

Sl	Description (64 kbps, 104, PMU, VC, 101) / Voice / Protection circuits / Others)	Source	Destination	Channel Routing	Interfacing device and its MAC & IP (Local end)	Ownership details of terminal equipment / Links
1						
2						
3						
4						
5						
6						
7						

(B) List of terminal communication equipments :

Sl	Name of Station	Equipment Type (SDH / PDH / Radio / VSAT / EPABX)	Make / Model	Ownership
1				
2				
3				
4				
5				
6				
7				

(C) Communication System Details:

I. SDH Equipment

(1) (Card Details:								
Slot No	MAC & IP Address & Path / Direction Name	Card Details	Place a ✓mark if on usage, else Write as "Spare"	Whether Card is healthy / Faulty? (H/F)	Cards Redundancy available (Yes / No)	Power Supply Card / Optical Card (Yes / No)	MSP configured? (Yes / No)	Action Plan for faulty cards	Other Information, if any
1									
2									
3									
And so on									

(2) Whether equipment is time synchronized

: Yes / No	If Yes, how is it being done?

(3) Failures during last Fin. year / since last Audit :

Particulars	Number of failures of Card / Power Supply	Reason for failures	Measures taken for rectification
Card		(i)	(i)
		(ii)	(ii)
		(iii)	(iii)
Power Supply		(i)	(i)
		(ii)	(ii)
		(iii)	(iii)

(4) Configuration of the Node:

Name of Equipment	Number of Nodes	Number of directions	Name of Directions	Number of links down, with details	Details of corrective action, if any, taken

(5) **Preventive maintenance schedule and its compliance:**

Date of Last Preventive	Maintenance carried out as per schedule?	Whether all the defects have been attended? (Yes / No)
maintenance	(Yes / No)	Give details

<u>II. PDH Equipment</u>

(1) Card Details :

Slot No	IP Address with MAC	Card Details	Place a ✓mark if on usage, else Write as "Spare"	Whether Card is healthy / Faulty? (H/F)	Cards Redundancy available (Yes / No)	Power Supply Card / Optical Card (Yes / No)	MSP configured? (Yes / No)	Action Plan for faulty cards	Other Information, if any
1									
2									
3									
And so on									

(2) Whether equipment is time synchronized

: Yes / No	If Yes, how is it being done?

(3) Failures during last Fin. year / since last Audit :

Particulars	Number of failures of Card / Power Supply	Reason for failures	Measures taken for rectification
Card		(i)	(i)
		(ii)	(ii)
		(iii)	(iii)
Power Supply		(i)	(i)
		(ii)	(ii)
		(iii)	(iii)

(4) Configuration of the Node:

Name of Equipment	Number of Nodes	Number of directions	Name of Directions	Number of links down, with details	Details of corrective action, if any, taken

(5) **Preventive maintenance schedule and its compliance:**

Date of Last Preventive	Maintenance carried out as per schedule?	Whether all the defects have been attended? (Yes / No)
maintenance	(Yes / No)	Give details

III. OPGW / Optical Fibre Details

Number of Directions	Name of Direction	No. of Pairs	No. of Fibers used	No. of spare & healthy Fibers	Unarmored cable laid within PVC/Hume duct pipe ?	Fibre Count in OPGW? Whether matching with Approach cable to FODP?	Overall Optical Fibre Path Attenuation (dB/km)	Power Received	Conformation to Compliance of CEA Standards

IV. Healthiness of Auxiliary System:

(1) Details of 2 independent Power Sources :

Source	Commissioning Date	Battery Back up (Hour)	Battery capacity (AH)	Supply Voltage (V)	Healthiness of Battery (Yes / No)	Make of Charger	Charger Capacity (A)	Periodicity of Maintenance Schedule	Date of Last 2 Actual Maintenance carried out	Remarks
1										
2										

(2) Conformation to Compliance of CEA Standards :

V. Healthiness of Earthing of each equipment:

Sl	Equipment	Status on Healthiness of Earthing

VI. Details of Voice communication available between Sub-station and Control Centre:

SI	Voice communication (Sub-station - Control Centre)	Status on Healthiness of Voice communication	Healthiness of air-conditioning of communication room as per OEM recommendation

VII. PLCC Details :

Number of Panels	Make and Model	and lel Direction	Frequency (Tx & Rx)	x) Status on Healthiness	Last preventive maintenance		Details of defects, if any,	Status of A vailability	Conformation to Compliance
			KHz		Schedule	Actual	attended	of Spares	of CEA Standards

VIII. Radio Communication Details :

Number of Equipments	Make and Model	Status on Healthiness	Last preventive maintenance		Details of defects, if	Status of Availability of Spares	Conformation to Compliance of CEA	
		incurtinitess	Schedule	Actual	any, attenueu		Standards	

IX.	Data Retention	:	(i)	Earliest Date of availability of data:	
			(11)	Historical data availability : days.	
Х.	Control Command Delay	:	(i)	Time delay in seconds from Control Centre : for SCADA	Seconds
			(ii)	Time delay in seconds from Control Centre : for WAMS	Seconds
XI.	Wide Band Network	:	(i)	Absolute channel delay in protection applications	:ms
			(ii)	Channel delay asymmetry in protection applications	:ms
			(iii)	Switching Time delay to alternate path/route during failure of one path	: ms

XII. Any other information :

Audit Team Member ERPC Audit Team Member ERLDC Audit Team Member PGCIL (Internal / External) Audit Team Member State (Internal / External)

ERPC :: KOLKATA

Minutes of the meeting of the committee constituted to discuss on "Metering issue of 220kV Bolangir (PG) – Katapalli (OPTCL) line" held on 16.07.2019 at ERPC, Kolkata

OPTCL, POWERGRID (Odisha projects), ERLDC and ERPC participated in the meeting. List of the participants is attached in Annexure-A.

SE, ERPC welcomed the participants. The metering issue of 220kV Bolangir (PG) – Katapalli (OPTCL) line was put up as an agenda item for discussion in the 40th Commercial Sub-Committee meeting held on 02.07.19 at ERPC, Kolkata wherein, it was decided to constitute a committee with SE, ERPC (as Convenor) and one member each from OPTCL, ERLDC and PGCIL (Odisha Projects). Accordingly, first meeting of the committee has been convened on 16.07.2019 and following points have been finalized:

- The period of erroneous metering at Bolangir end of 220kV Bolangir (PG) Katapalli (OPTCL) line as submitted by OPTCL is from 04.05.2016 to 02.12.2018. As per Clause 6.4.22 of CERC IEGC Regulations, 2010 and amendments thereof "All computations carried out by RLDC shall be open to all regional entities for checking/verifications for a period of 15 days....". Hence the compliance with this clause would have helped to bring the issue for resolution at the right time. However, it has been brought to notice of ERPC after a lapse of more than 2.5 years by OPTCL and considering the fact that the period of DSM account revision, as requested, is quite significant, OPTCL is advised to submit a detailed justification along with necessary documents for such delay.
- 2. PGCIL (Odisha projects) representative explained that they checked the meter at their end and found that R phase of 220kV Bolangir (PG) – Katapalli (OPTCL) line was continuously recording less current. They replaced the CT on 06.06.2018 and also took the line to the transfer bus. The metering issue was still not resolved. He further informed that the line went under shutdown on translent fault on 07.01.19 and subsequently restored on 08.01.2019. After restoration of the line, the metering issue was found to be resolved. However, he and OPTCL representative could not ascertain the reasons for automatic rectification of the metering issue after restoration of the line. Hence, OPTCL is advised to submit a detailed report of the causes of the less current on R phase prior to transient fault on 07.01.2019 and subsequent corrective measures taken during shutdown which helped in resolution of the metering issue. PGCIL representative is requested to assist OPTCL in this regard.
- OPTCL & PGCIL (Odisha projects) representatives were requested to share CT & PT details including test reports since the time of initial operation of LILO of Katapalli – Sadeipalli line at Bolangir S/S of PGCIL for verification.

OPTCL & PGCIL (Odisha Projects) representatives are requested to submit all the documents within a week from today i.e. 16.07.2019 so that next meeting of the committee can be convened for further discussion on the issue.

Meeting ended with vote of thanks to the chair.

(AGM, Electrical) OPTCL

PGCIL, Odisha Projects

(Chief Manager) 16 3119 (SE ERLDC

(SE, Commercial) ERPC

Minutes of Meeting of the Committee constituted to discuss on "Metering Issue of 220kV Bolangir(PG)-Katapali(OPTCL) line" held on 16/07/19 at ERPC Conference hall, Kolkata

From : it.skpattanayak <it.skpattanayak@optcl.co.in> Wed, Jul 24, 2019 07:16 AM Subject : Minutes of Meeting of the Committee constituted to discuss on 7 attachments "Metering Issue of 220kV Bolangir(PG)-Katapali(OPTCL) line" held on 16/07/19 at ERPC Conference hall, Kolkata **To :** Mserpc power <mserpc-power@nic.in>, Dsmerpc <dsmerpc@gmail.com> Cc: lenin nitc <lenin.nitc@gmail.com>, Erldcomml <erldcomml@posoco.in>, Nadim Ahmed (नदिम अहमद) <nadim@posoco.in>, Chief Load Dispatcher <cld_sldc@sldcorissa.org.in>, Dir com mkdas <dir.com.mkdas@gridco.co.in>, Sgm pp <sqm.pp@gridco.co.in>, Chief General Manager (O n M) <cgm.onm@optcl.co.in>, Gridco trading cell <gridco.trading.cell@gmail.com>

Sir,

With reference to the subject cited above, some points to be clarified before the committee as:

Point No.-1:

The committee requested to submit the detailed justification along with documents regarding Metering Issue of 220kV Bolangir (PG)-Katapali (OPTCL) line as submitted by OPTCL is from 04/05/2016 to 02/12/2018, which was delayed for more than 2.5 years.

Previous to 30/04/2018 OPTCL was used to check the direction of energy flow (C.T. polarities) of SEMs data by considered weekly SEM data of ERLDC. The detailed checked was not done at OPTCL end due to none availability of software for SEM data calculation and also some SEM data were not converted to NPC format due to some reason. In view of the above the data sheets (MONTH WISE DATA SHEETS) are attached for kind reference. While preparing the above month wise data sheet, it was observed on April 2018 that something was erroneously recorded by the SEM of Bolangir (PG) end and we immediately compared the both end SEMs data in day wise & block wise from May 2018 backward manually and it was found that the SEM data of Bolangir (PG) end was erroneously recorded from May 2016. The Block wise & day wise data comparison sheets are attached for your kind reference.

Point No.-2 :

We received the system disturbance report from Katapali Grid S/s on 23/07/19 and breakdown restoration letter from line maintenance engineer from Bargarh Grid S/s on 22/07/19, which are attached herewith for your kind reference.

It is observed that before tripping the said line, the power flow from Bolangir(PG) to Katapali and after restoration, the power was from katapali to Bolangir(PG) (Block wise MW Comparison from 30th Dec 18 to 16th Jan 19 data sheets are attached). However, the phase wise current patterns (recorded in **Meter SI. No. ORP02909** at Katapali end for the said line) are almost same for before 07/01/19 and after 08/01/19 of said line from Katapali end. Also it is observed that before tripping (before 15:40 Hrs on 07/01/19) of the said line any loose connection are not observed from the above patterns (Line current pattern for Jan 19 attached), as power flow from Bolangir(PG) to Katapali.

Point No.-3 :

The detailed CVT & IVT test reports at Katapali end of 220Kv Katapali (OPTCL)-Bolangir (PG) line are attached herewith for your kind reference.

Encl: As above

Yours Faithfully

Saundarya Kumar Pattanayak

AGM(Ele), SLDC, OPTCL

- **MONTH WISE INTER-STATE-DATA COMPARISION SHEETS-2016.xlsx** 68 KB
- **MONTH WISE INTER-STATE-DATA COMPARISION-SHEETS-2017.xlsx** 70 KB
- **MONTH WISE INTER-STATE-DATA COMPARISION-SHEETS-2018.xlsx** 32 KB
- BLOCK WISE COMPARISION SHEET.xlsx 221 KB
- **DAY WISE COMPARISION.xlsx** 36 KB
- POINT No-2 Documents.rar 3 MB
- POINT No-3 Documents.rar 1 MB

ERPC: KOLKATA

Minutes of 2nd meeting of the Committee on "Metering & Accounting issue of 220KV Bolangir(PG)- Katapalli (OPTCL) line for the period from 04.05.2016 to 02.12.2018" held on 19.02.2020 at ERPC, Kolkata.

OPTCL, GRIDCO, Powergrid (Odisha Projects), ERLDC and ERPC participated in the meeting. List of the participants is attached in Annexure-A.

SE (Commercial), ERPC welcomed the participants. First meeting of the committee was held at ERPC, Kolkata on 16.07.2019. Based on the discussion taken in the 1st meeting, OPTCL was advised to furnish few clarifications. Accordingly, OPTCL replied to the queries raised in the 1st meeting of the committee vide email dated 24.07.2019. Considering the replies furnished by OPTCL and to take the matter forward, the following points have been discussed and finalized in respect of metering issue of 220 KV Bolangir(PG)- Katapalli(OPTCL) line:

- OPTCL representative informed that they have been doing manual checking of meter data at their end. While checking the same in one of the instances, they found mismatch in energy recorded in Katapali(OPTCL) & Bolangir(PGCIL) meterdata. This mismatch was traced back to 04.05.2016. The Committee had earlier observed that this discrepancy was pointed out by OPTCL after a lapse of more than 2.5 years and OPTCL could have been vigilant to bring the issue to the notice of ERPC/ERLDC earlier.-
- 2. The Committee agreed to treat this as special case and accordingly revised DSM accounting for GRIDCO for the disputed period (04.05.2016 to 02.12.2018) shall be carried out by ERPC Secretariat. However, OPTCL is advised to check the meterdata regularly. Further, any discrepancy found in meterdata has to be brought to the notice of ERPC/ERLDC immediately so that required action can be taken. OPTCL is warned that in case of any negligence on their part in future, post facto accounting shall not be done. OPTCL representative agreed.
- ERLDC representative asked for block-wise data of 220KV Sadepalli(OPTCL)- Katapalli(OPTCL) for verifying flow of power for the entire disputed period. OPTCL agreed to give the data by 20.02.2020.
- Powergrid (Odisha Project) representative informed that they have tested the CVT & CT at Bolangir and test results are satisfactory.
- . 5. The followings are agreed for accounting and settlement purpose subject to concurrence in the upcoming CCM & further ratification in the upcoming TCC/ERPC:
 - OPTCL to furnish all the time block-wise meterdata including that of 220KV Sadepalli(OPTCL)- Katapalli(OPTCL) to ERPC/ERLDC

- ERLDC shall verify the meterdata as submitted by OPTCL and submit the verified data to ERPC after applying applicable transmission loss.
- ERPC shall consider monthly average frequency for each month of the disputed period for computation of Deviation Charges. Accordingly, ERPC Secretariat shall prepare a consolidated DSM statement for GRIDCO on account of this revision by considering monthly average frequency and verified meterdata received from ERLDC.
- The amount receivable by GRIDCO due to this revision shall be paid from the DSM pool of Eastern Region. This payment shall be made to GRIDCO only after all the outstanding payments to beneficiaries of Mangdechhu HEP in Bhutan are liquidated.
- The payment to GRIDCO from DSM pool shall be subject to availability of fund and any liability of DSM payment by GRIDCO to ER DSM pool during any week shall not be adjusted against the amount receivable by GRIDCO on account of this revision.
- No interest shall be paid to GRIDCO on account of this revision.

SI No	Name & Designation	Organisation	Signature
1 '	SHYAM KEJRIWAL , SE	ERPC	gua-
2	NADRY ARMAD CM	ERIDE	-Markin
3	Madhu Sudan Satros, DGM	GRIDCO Ltd.	M.S.Saha
4	Savendarya ku. potkanapak AGM (Ele)	SLDC, odlsha	Supathol
5	S.K. SAHU, DOMCAMY 12	PowerGRID, odisha Projecti , Brosk	- Jegnin-

Meeting ended with vote of thanks to chair.

ERPC: KOLKATA

Minutes of meeting of Special Meeting of the Committee to "Review the Methodology of Reactive Energy Accounting and Billing of ER constituents" held on 04.03.2020 at ERPC, Kolkata.

WBSETCL, BSPHCL, ERLDC and ERPC participated in the meeting. List of the participants is attached in Annexure-A.

SE (Commercial), ERPC welcomed the participants. He informed that as per decision taken in the 42nd Commercial Committee Meeting held on 25.02.2020 at ERPC, Kolkata wherein, a committee was constituted with SE, ERPC (Chairman) and one member each from WBSETCL, BSPHCL, ERLDC to review the methodology of Reactive Energy Accounting and billing of ER constituents. Accordingly, a meeting of the committee has been convened on 04.03.2020 at ERPC, Kolkata.

As per Clause 11 & 12 of Annexure-I of IEGC (w.e.f. 03/05/2010)

Quote.....

11. RPC Secretariats shall also issue the weekly statement for VAR charges, to all regional entities who have a net drawal/injection of reactive energy under low/high voltage conditions. These payments shall also have a high priority and the concerned regional entities and other regional entities shall pay the indicated amounts into regional reactive pool account operated by the RLDC within 10 (ten) days of statement issue, provided that the Commission may direct any entity other than RLDC to operate the regional reactive pool account. The regional entities who have to receive the money on account of VAR charges would then be paid out from the regional reactive pool account, within two(2) working days from the receipt of payment in the Reactive pool account.

12. If payments against the above VAr charges are delayed by more than two days, i.e., beyond twelve (12) days from statement issue, the defaulting regional entity shall have to pay simple interest @ 0.04% for each day of delay. The interest so collected shall be paid to the regional entities who had to receive the amount, payment of which got delayed. Persistent payment defaults, if any, shall be reported by the RLDC to the Member Secretary, RPC, for initiating remedial action.

As per present practice, ERPC issues weekly Reactive Charge Statement, Reactive Charges are billed to only those states that have to pay the reactive charges in the Reactive pool account as per the computation while total pay-out to the States from the Reactive Pool is reduced to zero.

This is being done as per the decision taken in the "Meeting of the Group for Fixing Methodology for computation of Reactive Energy on the Interstate Lines & Auditing of UI & Reactive Energy Accounts, etc" held on 15.09.2006 at ERPC, Kolkata. During that meeting, it was decided that the total pay-in accumulated in the Reactive pool would be used for system improvement purposes.

However, presently there is Power System Development Fund (PSDF) to take care of system improvement requirements of any State. There is well laid out procedure/guidelines of CERC/MoP for disbursement of fund to utilities from PSDF. Such a fund was non-existent during 2006 when the above decision was taken. Secondly, the overall grid has undergone sea change with many Generators (ISGS, IPPs), utilities (traders for international transactions) and new transmission elements (including HVDC, SVC, STATCOM etc.) integrated with Indian Electricity grid.

Further, the Reactive Energy charges account as issued by other RPCs, were also analyzed. It was felt by the Committee that those States who help in maintaining the voltage profile should be incentivized.

Based on the discussion in the meeting and to align with the methodology followed by other RPCs, the followings are agreed subject to concurrence in the upcoming TCC/ERPC:

- If all the States have to receive from Reactive Pool in any week, receivable amount of the respective state shall be reduced to zero.
- If payable by states to Reactive pool is more than or equal to receivable by states from Reactive Pool, then settlement will be done as per actuals and treatment of any surplus amount shall be done as per relevant CERC Regulations.
- If Payable by States to Reactive Pool is less than receivable by states from Reactive Pool, then the total
 amount payable to the pool shall be apportioned among the States who have to receive from the pool in pro
 rata basis.
- If all the States have to pay to Reactive Pool, the total amount received in the pool shall be treated as per guidelines of relevant CERC Regulations.
- ERPC will issue weekly Reactive Energy charge statement and billing & settlement will be done in the same week. There shall be no carry forward.
- 6. ERPC shall also issue a statement detailing VAr exchange between two States through inter-state tie lines (excluding inter-regional tie lines). The statement shall also reflect the reactive charges as computed. However, payment & settlement of such charges shall not be done from the Reactive pool but shall be done mutually by the respective states. This shall be done as per existing CERC(IEGC) regulations.
- This methodology shall be implemented w.e.f 06.04.2020 (Monday). Retrospective revision of accounts due to change in methodology, as suggested, shall not be done.

Meeting ended with vote of thanks to chair.

SINo	Name & Designation	Organisation	Signature
1	S. KEDRIWAL , SE	ERPC	Qug.
2	NADIM AHMAD, CM	ERLOC	-rzh-
3	C. K. HALDAR	WB SLDC	Ralder
4	Nordeen Ahmad, ESE	BSPHC L	A



पूर्वी क्षेत्रीय विद्युत कॉमलि Eastean Regionan Power Contamines हायरी सेंग/Diary No. 973 दिलांक/Date 16/03/2021 भारत सरकार/Govt of India 14, गोल्फ वर्षका रोड टाकोणिज 14, Golf Club Road कोलाकाला-33, Kolkara-33

Ref. No.: NVVN/BD-7/S-1/TPTCL/01/

Annexure- B14

एनटीपीसी विद्युत व्यापार निगम लिमिटेड (ल्टिपेसे स्पिटेंड के पूर्व लागिव क्ले फाणक क्यमें)

NTPC Vidyut Vyapar Nigam Limited (A Whoily Owned Subsidiary of NTPC Limited)

केन्द्रीय कार्यालय/Corporate Centre

10th March '2021

To, Shri. Bikram Singh Head Revenue & Marketing Tata Power Trading Company Ltd

Subject: Agreement between TPTCL and NVVN as Settlement Nodal Agency for Dagachu HEP of Bhutan

Ref: Email dated 15th Dec 2020 & 10th Feb 2021 for signing of SNA agreement between NVVN & TPTCL

Dear Sir,

This is in reference to 42rd & 43rd Commercial Committee Meeting held by ERPC dated 25.02.2020 & 21.09.2020 respectively. In the meeting NVVN was advised to enter into necessary agreement with TPTCL to take over all the responsibilities of nodal agency from TPTCL for Dagachu HEP transactions.

In view of this NVVN vide email dated 15th Dec 2020 has submitted Settlement Nodal Agency (SNA) agreement to TPTCL for further finalisation and execution with NVVN.

Further, to the "Guidelines for Import / Export (Cross Border) of Electricity-2018" issued by MoP, Procedure for approval and facilitating Import/Export (Cross Border) of Electricity by the Designated Authority (DA), has been issued on 26.02.2021. In line with this, the SNA agreement submitted earlier by NVVN has been revised (Clause 2(h) added) to include the responsibilities to be performed by NVVN as a Settlement Nodal Agency under the DA Procedure issued by CEA on 26.02.2021.

We request you to kindly confirm for further execution of SNA Agreement at the earliest.

Thanking You,

Yours faithfully,

lunam la (Shyam Kumar) 003 2020

General Manager, BD

Cc:

Member Secretary, ERPC Chief Engineer, CEA CEO, TPTCL 3.

Produen (HEE)

पंतीकृत कार्यालय : एनदीपीसी मयन, समेप काणलेखा, 7, इंस्टीट्यूहनला एरिया, लोगो चेड, नई डिल्ली-110.003 कार्योर फावन नम्बर : UA0105CL2002GCU117584 केवीमेरेन मेंe:011-24355256, 24369565, केला : 011-24357021, 24362009 होंगे : contact@nvin.co.in, वेब्रायूट : www.nvin.co.in Registered Office : NTPC Blawan, SCOPE Complex, 7, instruional Area, Lodni Road, New Dehi-110.003 Registered Office : NTPC Blawan, SCOPE Complex, 7, instruional Area, Lodni Road, New Dehi-110.003

Registered Office : NTPC Bhewan, SCOPE Complex, 7, trastructure Note, Loon Hose, New Control Control (24362009 Corporate Identification Number : U40108DL2002GD117584 Telephone No. 011-24368205, 24389565, Fax No. : 011-24367021, 24362009 E-mail : contact@nvm.co.in, web atta : www.nvm.co.in

SUMMARY OF DEVIATION CHARGE RECEIPT AND PAYMENT STATUS

BILL UPTO 21-02-2021 (W-47 of 2020-2021) Last Payment Disbursement Date - 05.03.2021

				Fig	gures in Rs. Lakhs
CONSTITUENTS	Receivable	Received	Payable	Paid	Outstanding
BSPTCL	9,954.14331	4,539.35294	1,607.85672	0.00000	3,806.93365
JUVNL	8,870.09687	5,873.30453	1,487.74122	0.00000	1,509.05112
DVC	4,713.08016	4,606.58845	1,557.34656	1,433.10021	-17.75464
GRIDCO	944.68403	876.22956	4,322.07214	4,213.82373	-39.79394
WBSETCL	15,140.94178	14,911.50519	349.07107	0.00000	-119.63448
Sikkim	83.61955	0.00000	780.43472	679.90088	-16.91429
NTPC	12,601.84561	12,317.74348	214.78887	0.12768	69.44094
NHPC	31.00652	29.27738	1,524.87516	1,516.12367	-7.02235
MPL	83.57003	64.46075	787.91276	785.17539	16.37191
APNRL	1,724.13120	1,273.38704	656.04373	158.97970	-46.31987
CHUZACHEN	53.30937	53.30937	83.62371	83.62371	1.42109
NVVN-BD	1,562.84232	1,544.23210	25.57168	25.57168	18.61022
GMR	211.96237	180.30463	489.90452	430.94670	-27.30008
JITPL	690.53098	690.53089	67.59135	61.49123	-6.10003
TPTCL (Dagachu)	1,738.88421	1,720.55097	16.75596	16.75596	18.33324
JLHEP	826.86021	773.01399	4.53475	4.53475	53.84622
NVVN-NEPAL	3,447.07668	3,185.64147	207.65939	204.38254	258.15836
BRBCL	657.21970	657.21970	42.33857	31.88656	-10.45201
PGCIL SASARAM	13.09010	12.18379	21.60998	20.29087	-0.41280
TUL (Teesta-III)	1,296.30161	1,309.09754	358.05210	370.84803	0.00000
NERLDC	72,601.33468	73,409.52192	36,807.14711	32,803.09262	-4,812.24173
WRLDC	23,854.53237	23,819.93400	1,55,060.21917	1,54,402.59732	-623.02348
NRLDC	59,823.04483	57,486.86978	27,794.23820	26,044.21506	586.15191
SRLDC	56,561.94765	55,745.36216	20,175.79893	20,175.79893	816.58549
Dikchu	94.69043	93.02665	384.20561	382.89380	0.35197
PGCIL-Alipurduar	6.49542	0.00000	23.22498	16.21189	-0.51767
Tashiding(THEP)	394.97495	355.58907	161.00044	161.00044	39.38588
KBUNL	452.64017	452.64357	51.01233	25.72498	-25.29075
NPGC	729.23778	726.70880	181.55434	181.55434	2.52898
NPGC-Infirm	1,099.97671	1,021.15236	0.00000	0.00000	78.82435
Total	2,80,264.0716	2,67,728.7421	2,55,244.1861	2,44,230.6527	

% Realization 82.9 As On Receivable by ER Payable: Receivable: Payable by ER POOL Paid by ER POOL Received by ER P Paid: Received: '- ve' Payable by ER pool '+ ve' Receivable by ER pool

05-03-2020

Deviation Interest Bill due to delay payment

SI No.	Name of Constituents	Outstanding Interest for FY 18- 19 as on 05.03.21	Outstanding Interest for FY 19-20 as on 05.03.21	Outstanding Interest for FY 20-21 as on 05.03.21	Outstanding Interest as on 05.03.21
1	BSPHCL	0	0	0	0
2	JUVNL	0	29672072	4513040	34185112
3	DVC	0	0	0	0
4	GRIDCO	-520	0	0	-520
5	WBSETCL	0	0	0	0
6	SIKKIM	0	0	0	0
7	NTPC	0	0	0	0
8	NHPC	0	0	0	0
9	MPL	-791	0	0	-791
10	APNRL	0	16773	1197274	1214047
11	CHUZACHEN	2347	0	0	2347
12	NVVN(IND-BD)	0	0	1564	1564
13	JITPL	0	8849	0	8849
14	GMR	1265691	15763512	402113	17431316
15	IND BARATH	2667585	0	0	2667585
16	TPTCL(DAGACHU)	0	0	0	0
17	JLHEP	0	14628	99214	113842
18	BRBCL	0	0	0	0
19	NVVN(IND-NEP)	0	0	0	0
20	TUL(TEESTA-III)	0	0	0	0
21	DIKCHU	0	101739	0	101739
22	HVDC-PSL	0	0	0	0
23	HVDC-ALPD	-4410	173026	6118	174734
24	TASHIDING	0	0	87736	87735
25	OPGC	0	24209		24209
26	NPGC	0	0	222	222
27	KBUNL	0	340	4	344
	Total	3929901	45775148	6307284	56012333

All figs in Rupees.

'- ve' Payable by ER pool '+ ve' Receivable by ER pool

Note: Ind-bharath interest is calculated till 29.05.2019

RRAS interest details							
	Total Interest	Total Interest	Total Interest	Total Interest			
Constituent Name	Receivable	Received	Payable	Paid	Net Interest		
NTPC	0	0	1,17,27,179	88,80,565	-28,46,614		
BRBCL	0	0	36,82,419	31,59,224	-5,23,195		
KBUNL	0	0	7,36,556	4,32,727	-3,03,829		
MPL	0	0	35,49,139	23,07,158	-12,41,981		
NPGC	543	0	10,59,201	5,71,699	-4,86,959		

Annexure-B16.3

STATUS OF REACTIVE CHARGES

RECEIVABLE IN ER POOL AS PER PUBLISHED A/C FROM 15.02.21 TO 21.02.21

AS ON 05.03.2021

CONSTITUENT	AMOUNT RECEIVABLE	AMOUNT RECEIVED	OUTSTANDING
	IN THE POOL (Rs.)	IN THE POOL (Rs.)	(Rs.)
WBSETCL	136820502	133707012	3113490
			0
DVC	11772918	11772918	0
			0
BSPHCL	34599801	0	34599801
			0
SIKKIM	357469	31147	326322
			0
JUVNL	41312370	18589022	22723348
			0
GRIDCO	46126405	45559765	566640
			0
TOTAL	270989465	209659864	61329601

Annexure -B17

Current Status of Letter of Credit (LC) amount against DSM charges for ER constituents

	Figures in Lacs of Rupees							
SI No	ER Constituents	No. of weeks in which Deviation Charge payable	No of times payment was delayed	Total Deviation charges payable to pool during 2019-20	Average weekly Deviation Charge liability	LC Amount	Due date of expiry	Remarks
					(C)/52 weeks	110% of (B)		
		(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	BSPHCL	46	46	9156.49712	176.08648	193.69513		
2	JUVNL	44	44	6601.37893	126.94959	139.64455	08.04.21	Open LC for 139.64455 Lacs-Axis Ban
3	DVC	31	1	5132.41959	98.70038	108.57041		
4	GRIDCO	28	24	11965.21113	230.10021	253.11024		
5	WBSETCL	41	5	15308.52424	294.39470	323.83417		
6	SIKKIM	30	30	537.38370	10.33430	11.36773		
7	NTPC	43	3	8620.70935	165.78287	182.36116	30.06.2021	Open LC for 182.36116 Lacs
8	NHPC	3	1	123.49227	2.37485	2.61234		
9	MPL	11	0	136.32298	2.62160	2.88376	Not Required	
10	MTPS STG-II	52	5	997.68205	19.18619	21.10481		
11	APNRL	44	44	1187.78806	22.84208	25.12629	25.01.22	Opened for 25.12629 Lacs
12	CHUZACHEN (GATI)	24	24	89.09836	1.71343	1.88477	16.06.21	Opened for 1.88477 Lacs(Bank copy not rec
13	NVVN (IND-BNG)	50	1	2955.61051	56.83866	62.52253		
14	JITPL	42	10	977.52676	18.79859	20.67845		
15	GMR	49	45	2504.51834	48.16381	52.98020	21.08.21	Opened for 52.98049 Lacs
16	TPTCL(DAGACHU)	52	0	2674.07905	51.42460	56.56706	Not Required	
17	JLHEP (DANS ENERGY)	49	12	748.35044	14.39135	15.83049		
18	BRBCL(NABINAGAR)	26	5	566.38026	10.89193	11.98112		
19	NVVN (IND-NEPAL)	41	1	1030.15803	19.81073	21.79180		
20	HVDC SASARAM	18	18	16.43152	0.31599	0.34759	31.03.21	Open LC for 0.34759 Lacs
21	HVDC-ALIPURDUAR	14	14	27.67831	0.53228	0.58550		
22	TEESTA-III(TUL)	19	0	1518.7341	29.20643	32.12707	Not Required	•
23	DIKCHU	14	13	164.53555	3.16415	3.48056	12.05.2021	Opened for 3.48056 Lacs
24	Tashiding (THEP)	30	9	302.85729	5.82418	6.40660		
25	NPGC	52	5	1849.579	35.56883	39.12571	14.01.21	Opened for 39.12571 Lacs(Bank copy not re-

Bank
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OCC MEETING

Restoration of 132kV PTPS JUSNL-DVC Patratu Tie Circuit 84 (6C)



Annexure-B19.1 HISTORY:



- Initially there were two independent 132kV lines between PTPS, Patratu and DVC Ramgarh s/s, which was called 77, 78 in terms of DVC nomenclature and 5C, 6C in terms of JSEB nomenclature. DVC Patratu s/s was not in existence.
- In early 70s, the configuration of existing circuitries modified with inception of newly constructed DVC Patratu s/s at Balkudra, patratu.



Previous Configuration of Tie Ckt



Present Configuration of Tie Ckt



1

£



Diversion Proposal & Coml Clearance

3

01. JUVNL approached DVC and sought clearance regarding diversion of Tie Ckts for construction of Ash Dyke area of new 2X800MW PTPS Project (a joint venture with NTPC).

02. Vide no. COML/Diversion/PTPS-5130 dated 26.02.2020, Commercial clearance was issued from DVC.



• As per remarks (column 17) of the said Coml. Clearance:

132kV Multi-circuit towers will be used where one side (i.e. left side from existing location no. 14 to gantry at PTPS end) will be utilized for DVC's transmission lines and other side will be used for M/s JUSNL's transmission lines due to paucity of corridor.



Shutdown Initiation and Work Progress

- Reference to the issued Construction Clearance, AGM, NTPC approached DVC Patratu substation on 28.02.2020 for shutdown of both circuits for a period of one week (upto 06.03.2020) at a stretch regarding the said diversion work.
- The work could not be materialized on time and subsequently threat of COVID-19 erupted.
- In view of urgency of the matter concerned, early restoration was requested from all corners.



Normalization of Tie Ckt. 85(5C)

- After consistent persuasion during LOCKDOWN situation from all corner, tie line 85 (5C) got normalized through top left side circuit of multi ckt. tower on 09.05.2020.
- Further, it was noticed that both side's lower ckts. of multi ckt. tower is in service for JUSNL's Ranchi based lines.

7



Request for amendment of Construction Clearance

- Vide letter no. 837 G.M, C&M(NWBP)/JUSNL dated 20.08.2020, JUSNL requested to DVC for amendment in construction clearance for early restoration of tie ckt 84.
- They conveyed that restoration of 84 through right side top ckt can easily be done but termination of the same in left side lower ckt as per construction clearance requires shutdown of both Ranchi based ckts for a considerable period which is very difficult in present scenario.



Present Status of Site

- No work is going on, at Site.
- Tie Ckt 84 is out from PTPS end.
- It is kept charged from DVC end upto location no. 12.
- Early restoration is necessary in view of radial mode of power supply to Patratu and NK s/s.



Point of View DVC Vs JUSNL



• The maintenance of diverted section will be carried out by JUSNL as and when required. Further existing scheme will again be shifted in 4-5 years with shifting of switchyard of PTPS, which is underway.



10

Thank You



Eastern Regional Power Committee, Kolkata

Minutes of Special Meeting on "Issues related to 132 kV Patratu (DVC) - PTPS (JUSNL) D/C tie lines" held on 10th November 2020 at 11:00hrs

The meeting was convened through online Microsoft Teams platform. List of participants is enclosed at Annexure-A.

Member Secretary, ERPC chaired the meeting and welcomed all the participants to the meeting. It was informed that the issue was deliberated in 172nd OCC Meeting held on 19th October 2020 wherein DVC informed that there are two tie lines between 132kV Patratu (DVC) S/s and PTPS(JUSNL) S/s. JUVNL hadapproached DVC for clearance of diversion of the above Tie ckts for construction of Ash-dyke area of new 2X800MW PTPS Project (a JV with NTPC). As per DVC Commercial Clearance (Vide no. COML/Diversion/PTPS-5130 dated 26.02.2020), it was decided that 132kV multi-ckt tower will be used for the diversion job, where one side (i.e. left side from existing location no. 14 to gantry at PTPS end) will be utilized for DVC's Transmission lines and the other side for JUSNL's transmission lines. However,the bottom lines were used for diversion of 132 kV Kanke and 132 kV Hatialines and both of them are now in service.DVC added that theyhad commissioned one circuit on upper segment and the commissioning of another circuit is needed to be done. DVC requested JUSNL to divert their connection on one side so that 132 kV DVC second circuit would be commissioned.

Deliberations in the meeting:

- DVC explained that 132 kV Pataratu (DVC) PTPS (JUSNL) D/C tie lines are very important for maintaining power supply at Patratu. It would be difficult to carry out the maintenance of the lines, if both the lines were diverted through the top segment of multi-circuit tower. Shutdown of JUSNL lines of 132 kV Kankeand 132 kV Hatiawould be required for carrying out the maintenance work on their lines.
- DVC requested JUSNL to divert JUSNL lines to one side so that DVC's line could be restore as per the agreement.
- PVUNL, NTPC explained that 132 kV Kankeand 132 kV Hatia lines were commissioned using the bottom segment of multi circuit towers on emergency basis to maintain power supply at Ranchi. For shifting the line as per the agreement, they need at least 6 days shutdown for 132 k V Hatiaand Kankelines. They informed that it is very difficult to arrange man and material due to ongoing Covid -19 Situation.
- PVUNL, NTPCadded that diversion of 132kV lines using multi circuit towers is interim arrangement till completion of the 400/220 kV GIS substation within 3 years, thereafter multi circuit towers would be dismantled and the 132kV lines would be diverted accordingly.
- PVUNL, NTPC requested to maintain the existing configuration and other line of 132kV Patratu (DVC)-Patratu(JUSNL) could be restored using the upper segment of the multi circuit towers. Tower maintenance of multi circuit towers would be done by JUSNL.

- JUSNL informed that as per the current power scenario the 6 days shutdown for 132 kV Hatia and Kanke lines would be difficult.
- Member Secretary, ERPC opined that since it is a temporary arrangement and the 132kV lines of JUSNL were already in service, it would be prudent to continue with the existing arrangement. The concern raised by DVC related to shutdown of JUSNL lines for carrying out maintenance of DVC lines could be discussed in the shutdown meetings of ERPC as the shutdown is required for few days once or twice in a year.
- DVC stressed that the lines of DVC should be restored as per the Commercial clearance given by them and insisted to divert JUSNL lines to one side as per the agreement so that DVC lines could be restored.

After detailed deliberations no consensus could be arrived and the issue was reffered to forthcoming TCC Meeting for their guidance.

Meeting ended with vote of thanks to the chair.

Minutes of meeting held on 21-12-2020 to discuss ampacity of conductors for reconductoring of various lines in NER

A meeting was held on 21-12-2020 to discuss ampacity of conductors for reconductoring of various lines in NER under chairmanship of Chief Engineer (PSPA-II), CEA. List of participants is enclosed at Annexure-I.

Chief Engineer (PSPA-II), CEA welcomed the participants and requested CTU/POWERGRID to explain the agenda.

1.0 CTU stated that the following reconductoring works have been assigned to POWERGRID under Regulated Tariff Mechanism (RTM) with implementation timeframe of 30 months vide MoP vide OM dated 25-09-2020. These works are being taken up as NERSS-XII:

SI. No.	Transmission line	Reconductoring with HTLS	Ampacity of Single HTLS Conductor
1	400 kV D/C Siliguri-Bongaigaon line (Twin Moose)	Twin HTLS	1596A
2	220 kV D/C Alipurduar-Salakati line (Single Zebra)	Single HTLS	1596A
3	220 kV D/C BTPS-Salakati line (Single Zebra)	Single HTLS	1596A
4	132 kV S/C Dimapur-Imphal line (Single Panther)	Single HTLS	798A
5	132 kV S/C Loktak-Jiribam line (Single Panther)	Single HTLS	798A

2.0 POWERGRID informed that above transmission lines are very old and were designed with maximum conductor temperature of 54/57°C, 65°C and 75°C for 132kV, 220kV and 400kV lines respectively, considering an ambient temperature of 40°C. During detailed engineering, it was observed that the sag considered in the tower design, corresponding to the maximum conductor temperature as mentioned above, is very less compared to present day design of transmission lines where maximum operating temperature is higher (75°C/85°C).

POWERGRID also informed that the towers of above transmission lines were designed based on IS: 802 (Part I)-1977, "Code of Practice for use of Structural Steel in Overhead Transmission line Towers, part I: Loads and permissible stresses" and following maximum conductor temperature and maximum ambient temperature were considered in the design of towers. Accordingly, sag and Ampacity of existing lines are given below (with ambient temperature of 40°C):

SI. No.	Transmission line	Existing conductor	Maximum Conductor Temp. (deg. C)	Design Span (m)	Maximum Sag (m)	Ampacity of existing conductors (A)
1	400kV D/C Siliguri- Bongaigaon line	Twin ACSR MOOSE	75	400	12.87	707

SI. No.	Transmission line	Existing conductor	Maximum Conductor Temp. (deg. C)	Design Span (m)	Maximum Sag (m)	Ampacity of existing conductors (A)
2	220kV D/C Alipurduar- Salakati line	Single ACSR ZEBRA	65	350	8.84	451
3	220kV D/C BPTS- Salakati line	Single ACSR ZEBRA	65	350	8.84	451
4	132kV S/C Dimapur- Imphal line	Single ACSR PANTHER	54	304	5.74	93
5	132kV S/C Loktak- Jiribam line	Single ACSR PANTHER	57	335	7.25	185

Accordingly, keeping in view the tower design of the existing lines, the ampacity of HTLS conductor rating as agreed in the 2nd meeting of NERPC-TP needs to be reviewed.

3.0 CEA enquired about the maximum power flow observed in the system studies. CTU presented the flow on lines, which are given below:

SI. No.	Transmission line	Maximum power flow on each circuit envisaged with reliability criteria as per CEA's Manual (MW)	Equivalent Ampacity of single HTLS sub- conductor required (A) (calculated @ 0.95pf)	Ampacity of existing ACSR sub- conductor (A)	Ampacity of Single HTLS Conductor as per MoP order (A)	
1	400kV D/C Siliguri-	1000	760	707	1506	
	Bongaigaon line	1000	700	101	1550	
2	220kV D/C					
	Alipurduar-Salakati	350	967	451	1596	
	line					
3	220kV D/C BPTS-	300	820	451	1506	
	Salakati line	300	029	451	1590	
4	132kV S/C Dimapur-	20	02	03	708	
	Imphal line	20	52	35	1 30	
5	132kV S/C Loktak-	50	230	185	798	
	Jiribam line		200	100	130	

4.0 CTU stated that above power flows were for 2022-23 timeframe and may increase further based on the generation availability and demand growth in NER. Once reconductoring is being carried out, it should be done with the maximum possible conductor rating, keeping in mind about the future perspective of 20-25 years. However, the Ampacity as recorded in meetings of NERPCTP/NCT and in MoP order, are far exceeding the requirement, especially for the 220kV and 132kV lines.

- 5.0 POWERGRID stated that considering the sag tension requirement of existing towers, the maximum ampacity that could be achieved in instant 400kV, 220kV and 132kV lines are 1400A, 1100A and 600A / 450A (600A for Loktak-Jiribam & 450A for Dimapur-Imphal) respectively assuming ambient temperature of 40 deg. C.
- 6.0 Based on the above mentioned technical difficulties in achieving the approved current rating through HTLS and considering power flow requirement as per studies of CTU, it was agreed that the Ampacity of HTLS conductors for these lines in NER, as mentioned below in col (E) meets the technical requirement:

SI. No.	Name of transmission line	Ampacity of existing ACSR sub- conductor (A)	Ampacity of Single HTLS Conductor as per MoP order (A)	Ampacity of single HTLS sub- conductor agreed considering technical constraints and system requirement (A)
(A)	(B)	(C)	(D)	(E)
1	400kV D/C Siliguri-Bongaigaon	707	1596	1400
	line (Twin ACSR Moose)	101	1000	1400
2	220kV D/C Alipurduar-Salakati	451	1596	1100
	line (Single ACSR Zebra)		1000	1100
3	220kV D/C BPTS-Salakati line	151	1506	1100
	(Single ACSR Zebra)	401	1.390	1100
4	132kV S/C Dimapur-Imphal line	03	708	450
	(Single ACSR Panther)	80	190	400
5	132kV S/C Loktak-Jiribam line	185	708	600
	(Single ACSR Panther)	105	190	000

7.0 Accordingly, CTU/POWERGRID may propose the above modifications in the forthcoming meeting of NERPC/NCT, which is proposed to be held in January, 2021. Thereafter, the changes may also be informed to NERPCTP.

Annexure-I

SI. No.	Name	Designation	Organization
1	Pardeep Jindal	Chief Engineer (PSPA-II)	CEA
2	B S Bairwa	Director (PSPA-II)	CEA
3	Ashok Pal	CGM (CTU)	POWERGRID
4	S C Taneja	CMG (Engg-T/L)	POWERGRID
5	Surendra Kumar	Sr. GM (Engg-T/L)	POWERGRID
6	Rajesh Kumar	GM (CTU)	POWERGRID
7	Manish Ranjan Keshari	Manager (CTU)	POWERGRID
8	Anupam Kumar	Dy. Manager (CTU)	POWERGRID
9	Abhilash Thakur	Engineer (CTU)	POWERGRID

List of participants

Shate/ Shape	N Normany	muet requency i	oad shedding o	COFTCL				7
Diffilitry Freque	ency Na	une of Circle	Name of Division	Name of E&MR Division	Name of Grid/Sub- Station	Name of Feeder	Load in MW	DATE OF LAST
OFFCL Stage-	I Bol	langir	Kesinga	Bolangir New	Kaninan			TESTING
49.4 H	z Bo	langir	Kosinen	Relands view	Nestriga	33kV Narla Feeder	11.0	31.01.20
	Bot	rhammer	a Stresse	Donangit INEW	Junagarh	33kV Charbahalpur Feeder	10.0	31.01.20
	Ray	-home-part	redeminent	Berhampur -	Bhanjanagar	33kV KB Pur Feeder	70	00 10 10
	tau tau	mampur	Bhanjanagar	Berhampur	Aska	33kV Buguda Feeder	110	00"10.72
	Det	mampur	Berhampur	Berhampur	Berhampur	33kV Children English	0.17	21.01.20
	Ber	champur	Chhatrapur	Berhampur	Rahmman	CON Y CHARTI LEEDEL	11.0	21.01.20
	8310	ubaneswar	Khurda	Bhuhaneway	When a large state	DOKY Shalikote Feeder	16.0	27.01.20
	Bht	ubaneswar	Khurda	Rhithana	initian and a second	33KV Banki Feeder	13.0	23.01.20
	Cut	ttuck	Cuttack	Cottoob	inayagarn	33kV Khandapada Feeder	8.5	27:01:20
	0	ainpal	Chainnat	Manager	Jagatsingnpur	33kV Balikuda Feeder	11.0	04.02.20
	laip	MIF Rd/Balasneov	Rhidest	The formation of the state of t	Bounda	33kV Jarpada Feeder	12.0	03.07.20
	hin	ur Rd/Balaerrol	Halander	Japur Kd(Balasore)	Bhadrak	33kV Dhamnagar Feeder	16.0	05 (02 0)
	PLAN.	fatoeners and	andersone	Jajpur &d(tsalasore)	Balasore	33kV Srijang Feeder	5.5	00.00 LU
-	Harry	dia	alguenoa	Bolangar	Bolangir (Old)	33kV Dumarbahal Feeder	201	20 In no
	Rue		hard ran	puna	Bargarh	33kV Dunguri Feeder	150	NE CO M
	Pol.	and a	NUUIKeia	Burla	Rourkela	33kV Lathikata Feeder	80	00.00.00
	1000	1000	nuapada	Bolangir	Khariar	33kV Khariar RE	15.0	02.02.20
PTCL Stage-Ib	Iava	maoar	Takona a			Total	181.5	
49.2Hz	lava	the second se	Jayanagar	Kayagada	Jayanagar	33kV Boriguma Feeder	10.0	18 01 20
	Tana	0	Jayanagar	Kayagada	Sunabeda	33kV Laxmipur Feeder	80	Nr 10 81
	D-10	(10) tal	Inerubali	Kayagada	Therubali	33kV Bissm Katak Fooder	0.0	NE MA AN
	trad	andare	Phulbani	Berhampur	Phulbani	33kV Kalinea Funder	0,0	07.70 Ch
	Cutt	ack.	Paradeep	Cuttack	Kendrapara	13bV I man House	0.0	27.11.22
	Cutt	ack	Paradeep	Cuttack	Pattamim/ai	SORA THIM LEAGE	0.51	To be configured by GE
	Berh	andurn	Chhatrapur	Seehumpur	Chaterana	JOKV Kajmagar Feeder	8.0	05.02.20
	Cutt	ack	Paradeen	TuHaok (- indentifier	53kV Kambha Feeder	14.0	24,01.20
	Bhut	barreswar	Puri	Rhubshum	Chandikhole (33kV Kabatabandaha Feeder	15.0	05.02.20
	Bhub	Daneswar	Khurda	2 hashownoon and and	INIMAPATA	33kV Kakatpur Feeder	13.0	30.01.20
	Chai	npal	Dheekanal I	Support State	Nnunda	33kV Delanga Feeder	12.0	23.01.20
	Chai	nnal	C'hainnal a	Accession of the second	Dhenkanal	3kV Hindol RD Feeder	120 0	3.02.20
			The second	CONTRACTOR OF THE OWNER OWNE	I Instantial In			

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Annexure- C2

22.

													OPTCL																OPTCL				
												48,8Hz	Stage-IV				æ											49.0Hz	Stage-III				
			avanagar	Bolangir	Jajpur Rd(Balasore)	Cuttack	Berhampur	Burla	Berhampur	Jajpur Rd(Balasore)	Burla	Jayanagar	Bolangir		Jaipur Rd(Balasore)	Berhampur	Bhubaneswar	Bolangir	Chainpal	Chainpal	Chainpal	Jajpur Rd(Balasore)	Bolangir	Burla	Bhubaneswar	Burla	Burla	Chainpal	Japur Rd(Balasore)		Berhampur	Burla	Berhampur
		infame for	avanator	Bolangir	Faipur Road	Paradeep	Bhanjanagar	Rajgangpur	Bhanjanagar	Joda	Rourkela	Jayanagar	Nuapada	Participant of the second	Isimur Road	Rhaniaman	Puri	Kesinga	Dhenkanal	Chainpal	Chainpal	Joda	Bolangir	Pharsuguda	Nayagarh	Barpali	Burla	Dhenkanal	Bhadrak		Bhanjanagar	Rajgangpur	Bhanjanagar
		wayagagaa	Damage Stranger	Information in the second second	Infinite (D.4/ID-12-12-12-12	Cuttack	Berhampur	Burla	Berhampur	Jajpur Rd(Balasore)	Burta	Rayagada	Bolangir	farocense technical	him Dubt	Derignmeine Son dit	Rhohanoonaa	Bolanoir	Meranwindali	Meramundali	Meramundali	Jaipur Rd/Balasone)	Bolangir	Burla	Bhubaneswar	Burla	Burla	Meramundali	Japur Rd(Balasore)		Berhamour	Burla	Berhampur
INFR Scheme		Jayanagar	(waw) nSuend	papur Koad	Pitederminavi	Kondennegat	Bhamineserse	Sundaroarh	Aska	Polanonea	Barkote	Sunabeda	Khariat	Jajpuz Koad	Aska	INITIADATA	weatinga	12010121	Constraint Constraint	Chained	In an appropriate	Palasmonas	Patroscal	Recordence	Navaoath	Bargarh	Sambalmin	Dhenkanal	Bhadrak	meer	Asta	Samdaroarh	Research
	Total	132kV Tentulikhunti Feeder	132kV Patanagarh Foeder	132kV Anandapur Feeder	132KV Patlamundai Feeder	1028V Phulbaru Feeder	1990 Part of the second second	Tably collars a second	TRUE ACCORDANCE IN T	231/V Wooday Incoder	131/V Mahazahar regular	Addy Mandana David	33kV Khariar Easter II	33kV Kuakhia Feeder	33kV Nuagaon Feeder	33kV Konark Feeder	33kV Titilagarh Feeder	33&V Goda Feeder	33KV Parjang Feeder	33kV Athamalik Feeder	JJKY Kemult Feeder	JOKY Khaparakhol Feeder	JOKY Sargipali Feeder	looky bunodpara feeder	open summer a	20LWT	100 M Statuta reader	ASPA Low IC E. 3	1010 Charles of the state	JJKV Budamba Feeder	200 V Dargoan Feeder	ooster a	SJKV Panikoti Feeder
735	186.0	30.0	22.0	30.0	24.0	22.0	5.0	13.0	17.0	9.0	0.7	1.0	184.0	8.0	10.0	7.0	12.0	10.0	13,0	5.0	18.0	8.0	15.0	12.0	22.0	15.0	13.0	16	183,5	15.0	65	12.0	12.0
		20.01 20	31,01.20	03.02.20	05.02.20	22.01.20	04.02.20	21.01.20	03.02.20	04.02.20	18.01.20	02.02.20		03.02.20	21.01.20	30.01.20	31.01.20	04:02:20	03.02.20	03.02.20	03.02.20	22.01.20	04.02.20	27.01.20	04.02.20	04,02.20	03.02.20	03.02.20		21.01.20	04.02.20	22.01.20	03.02.20

22 row

Annexure-C3

SPS Logic for T-K SPS

Important Points in SPS Logic Implementation

• Generation Reduction Logic : Old Logic (No Change)

- 1. HVDC get six signals out of which presently 4 are used which are block/deblock signals of pole (Pole 1 Block, Pole 1 deblock, pole 2 block and pole 2 deblock, Pole 1 Ground Fault Recovery and Pole 2 Ground Fault Recovery)
- 2. The Current transducer is having 350 ms of refresh rate.
- 3. 150 MW reduction in each unit in 2 seconds through mill tripping.
- 4. Unit tripping providing relief without any delay.
- 5. GRM Detection : One pole blocked and the other pole de-blocked and flow less than 200 MW is sensed as GRM condition (So there will be delay based on pre loading and electrode Current characteristic of HVDC). The HVDC Flow MW considered in logic is (-2.4)sec of Pole block time that is Pre-disturbance level HVDC Flow and accordingly SPS logic operates.
- New SPS Signal Generation Logic: <u>HVDC SPS Operation Logic</u>AND 400 kV Talcher-Meramundali D/C current >Thermal loading.
 - 400 kV T-M Line Current Logic should have three Imax setting out of which one will active as per season
 - 400 kV Talcher Meramundali Line current setting be revised based on PGCIL Provided thermal rating (Imax) on Seasonal basis.
 - HVDC SPS Operation Signal will be Active for 120 Seconds to ensure GRM Operation Logic and 400 kV Talcher-Meramundali Loading Logic is active during HVDC power order reduction in GRM from 1000 to 150 MW in 75 Seconds after pole tripping.
- Possibility of Ground Return Mode (GRM) Signal for both poles should be checked by Talcher HVDC so that it can be directly implemented in the logic to avoid any delays as observed for existing logic.
- As presently direct GRM signal is directly not available and HVDC send Pole 2 Ground Fault Recovery signal to NTPC which set/reset due to recovery attempt after line fault. So, this signal cannot be used presently.
- In case of 400 kV Talcher-Meramundali Planned Outage, bypassing of <u>AND logic for the 400 kV Talcher-Meramundali D/C current</u> logic should also be kept so that old SPS can remain there for any contingency of HVDC.

SPS 1000















IMAX Setting Confirmed by PGCIL in 175th OCC of ER

Sl.No.	Months	Ambient Temperature consideration (₀ Celsius)	IMAX: Ampacity for 75 oCelsius conductor temperature	Line Loading (MVA) = (1.73X400X IMAX)/1000
1	November- February	40	2 X 714=1428 Amp	989
2	March-June	50	2 X 516=1032 Amp	714
3	July-October	45	2 X 631=1262 Amp	874

Gen Reduction Logic (Old Scheme As it is)

	SPS 450
Condition	Action in ER Grid
If HVDC One Pole trips and Net Generation of Talcher Stage 2 >1700 MW	Trip one selected Unit of Talcher Stage 2 (In general Unit 6)
If HVDC both Poles trip and Net Generation of Talcher Stage 2 >1100 MW	 Trip two selected Units of Talcher Stage 2 (In general Unit 5 and Unit 6) Net Generation of Talcher Stage 2 > 550 MW after 250 ms delay, then Trip one more Unit of stage 2 (In general Unit 4)
If HVDC both Poles trip and Net Generation of Talcher Stage 2 is more than 550 and less than 1100 MW	 Trip one selected Units of Talcher Stage 2 (In general Unit 5) Net Generation of Talcher Stage 2 > 550 MW after 250 ms delay, then Trip one more Unit of stage 2 (In general Unit 4)
	3. Net Generation of Talcher Stage 2 > 550 MW after 500 ms delay, then Trip one more Unit of stage 2 (In general Unit 6)

Gen Reduction Logic (Old Scheme As it is)

SPS	1000
Condition	Action at NTPC Talcher
For One Pole tripping and othe	er pole in Metallic Return Mode
One HVDC Pole Block With remaining Pole On Metallic Return Mode	No Action
For One Pole tripping and the other pole in Gro	und Return Mode(GRM) of Operation (150 MW)
HVDC Power Flow is between 1450 MW - 1600 MW & One Pole Blocks With	Fast reduction of 150 MW in Unit 4, 5 and 6 each in Talcher stage 2.
remaining Pole On Ground Return Mode	
HVDC Power Flow is between 1300 MW - 1450 MW & One Pole Blocks With	Fast reduction of 150 MW in each of Unit 4 and 5 of Talcher stage 2.
remaining Pole On Ground Return Mode	
HVDC Power Flow is between 1150 MW - 1300 MW & One Pole Blocks With	Fast reduction of 150 MW in Unit 5 of Talcher stage 2.
remaining Pole On Ground Return Mode	
HVDC Power Flow is between 1000 MW - 1150 MW & One Pole Blocks With	No Action
remaining Pole On Ground Return Mode	
If Both HVI	DC poles trip
HVDC Power Flow was more than 1600 MW & Both Poles Block	1. Trip one selected Unit of Talcher Stage 2 (In general Unit 6)
	2. Fast reduction of 150 MW in Unit 4 and 5 each of Talcher Stage 2.
HVDC Power Flow was between 1450 MW - 1600 MW & Both Poles Block	1. Trip one selected Unit of Talcher Stage 2 (In general Unit 6)
	2. Fast reduction of 150 MW in Unit 5 of Talcher Stage 2.
HVDC Power Flow was between 1300 MW - 1450 MW & Both Poles Block	Fast reduction of 150 MW in Unit 4, 5 and 6 each of Talcher Stage 2.
HVDC Power Flow was between 1150 MW - 1300 MW & Both Poles Block.	Fast reduction of 150 MW in Unit 4 & 5 each of Talcher Stage 2.
HVDC Power Flow was between 1000 MW - 1150 MW & Both Poles Block.	Fast reduction of 150 MW in Unit 5 of Talcher Stage 2.
HVDC Power Flow was between 500 MW - 1000 MW & Both Poles Block.	No Action

Existing Gen Reduction Logic at NTPC Talcher Stage 2



HVDC Talcher Electrode Current Characteristics



Analysis of PSS Tuning Response from the Generating Units of Eastern Region

	Intra		Oscillation	Oscillation	Whether PSS is		Whether
Name of the Unit	Plant	Step Size	period	neriod	effective as ner sten	Year of	Recommended
Nume of the offic	Mode	of U _{ref}	without	with DSS	response test	Tuning	for Tuning
	(Hz)		PSS	with F35			ior runnig
Barh Unit 4		3 %	3 cycle	1 cycle	Yes	2015	Ok
Kahalgaon Unit 1		3 %	3 cycle	1 cycle	Yes	2017	Yes, after Bus
							Split
Kahalgaon Unit 2	1.5 Hz	3 %	3 cycle	1 cycle	Yes	2016	Yes, after Bus
-			-	-			Split
Kahalgaon Unit 3		6 %	-	-	Provided picture not	2016	To be decided
-					clear to analyze		after
					response		explanation by
							NTPC, also
							after bus split,
							returning is
							required
Kahalgaon Unit 4	1.876	3 %	5 cvcle	3 Cvcle	Yes	2015	Yes. after Bus
			,				Split
Kahalgaon Unit 5		4%			No Appreciable	2009	To be decided
		170			Response	2005	after
Kahalgaon Unit 6		4 %			No Appreciable	2019	explanation by
Kanaigaon onit o		470			Response	2015	NTPC. Yes after
Kabalgaon Unit 7		2 %			Brovided nicture not	2010	Bus Split
Kanaigaon Onit 7		2 /0			cloar to analyzo	2010	bus spin
Toosto V Unit 1		2.9/	E cyclo	2 cyclo	Vac	2000	Vec in view of
Teesta V Unit 1		2%	5 cycle		Yes 2008 Yes 2008 Yes 2008		res in view of
Teesta V Unit 2		2 %	5 cycle		Yes 200 Yes 200 Yes 200		changes in
Teesta V Unit 3		2%	5 cycle	1 cycle	Yes 2008 PSS is showing response 2016		HELWOIK
Talcher Unit 3		3%	-	-	PSS is showing response 2016		NIPC may
					but active power plant is		explain the
					not providing		details after
					appreciable change.		which
							requirement of
							retuning to be
							decided.
Talcher Unit 6		3%	3 cycle	2 cycle	Yes	2016	No
Budge Budge 1		2 %	5 cycle	1 cycle	Yes (Tuned for various	2015	No
					contingency)		
Budge Budge 2		2 %	5 cycle	1 cycle	Yes (Tuned for various	2015	No
					contingency)		
Budge Budge		3 %	3 cycle	1 cycle	Yes (Tuned for various	2019	Yes
Unit 3					contingency)		
JITPL Unit 1		5 %	-	-	No Appreciable	2016	JITPL to
					Response		explain the
							response
JITPL Unit 2		5 %	-	-	No Appreciable	2016	based on
					Response		which it will be
							decided.
Tashiding Unit 1	1.5 Hz	4 %	5 Cycle	1 Cycle	Yes	2017	Yes, in view of
							changes in
							network

(Updated till March 2021: Prepared by ERLDC based on Reports submitted by Generating plants)

Tashiding Unit 2	1.5 Hz	4 %	5 Cycle	1 Cycle	Yes	2017	Yes, in view of changes in network
Bandel Unit 5	1.5 Hz	5 %	6 Cycle	3 cycle	Yes	2019	Adequate
Bakreshwar Unit 1		3 %	3 cycle	2 cycle	Yes	2019	Adequate
Bakreshwar Unit 2		3 %	4 cycle	4 cycle	No Appreciable Response	2019	Retuning is required
Bakreshwar Unit 3		3 %	3 Cycle	4 cycle	Negative Response	2019	Retuning is required
Bakreshwar Unit 4		3 %	No Change in Power	No Change in Power	No Response as plot data resolution is not good	2019	Retuning is required
Bakreshwar Unit 5		3 %	No Change in Power	No Change in Power	No Response as plot data resolution is not good	2019	Retuning is required
Santaldih Unit 5		3 %	3 cycle	2 cycle	Yes (more observable in Excel Data)	2019	Adequate
Santaldih Unit 6		3 %	3 cycle	2 cycle	Yes (more observable in Excel Data)	2019	Adequate
GMR Unit 1		3 %	3 cycle	1 cycle	Yes	2013	Yes, as done long time back
GMR Unit 2		3 %	4 cycle	1 cycle	Yes	2013	Yes, as done long time back
GMR Unit 3		3 %	3 cycle	1 cycle	Yes	2013	Yes, as done long time back
Sagardighi Unit 3		4 %	7 Cycle	4 cycle	Yes	2019	Ok
Sagardighi Unit 4		4 %	7 Cycle	4 cycle	Yes	2019	Ok
Koderma Unit 2		4 %	2 cycle	1 cycle	Not that effective observed from Plot	2019	Not much appreciable
MPL Unit 1		3 %	3 cycle	2 cycle	Yes	2019	Ok
BRBCL Unit 2		4 %	3 cycle	3 cycle	Not that effective observed from Plot	2019	Not much appreciable
Teesta 3 Unit 1	1.47	3 %	3 cycle	1.5 cycle	Yes	2019	ok
Teesta 3 Unit 2	1.47	3 %	4 cycle	2 cycle	Yes	2019	ok
Teesta 3 Unit 3	1.47	5 %	3 cycle	2 cycle	Yes	2019	ok
Teesta 3 Unit 4	1.47	5 %	3 cycle	2 cycle	Yes	2019	ok
Teesta 3 Unit 5	1.47	5 %	4 cycle	2 cycle	Yes	2019	ok
Teesta 3 Unit 6	1.47	5 %	3 cycle	2 cycle	Yes	2019	ok
Dikchu Unit 1	1.47	5 %	8 cycle	1 cycle	Yes	2019	Ok
Dikchu Unit 2	1.47	5 %	8 cycle	1 cycle	Yes	2019	ok
Kolaghat Unit 4		3 %	4 Cycle	1 cycle	Yes	2019	Ok
Kolaghat Unit 5		3 %	4 Cycle	1 cycle	Yes	2019	Ok
HEL Unit 1	1.19	Trip	7 cycle	5 cycle	Yes	2020	Ok
HEL Unit 2	1.19	Trip	7 cycle	5 cycle	Yes	2020	Ok
NPGC Unit 1	1.66	2 %	6 cycle	1 cycle	Yes	2020	Ok
Dharliparli Unit 1		3 %	5 cycle	2 cycle	Yes	2019	Ok

DSTPS Unit 1		4 %	4 cycle	2 cycle	Yes	2019	Ok
DSTPS Unit 2		4 %	4 cycle	2 cycle	Yes	2019	Ok
Mejia Unit 5	1.4	5 %	4 cycle	3 cycle	Yes	2020	ok
Mejia Unit 6	1.4	5 %	4 cycle	3 cycle	Yes	2020	ok
Mejia Unit 7	1.4	5 %	4 cycle	3 cycle	Yes	2020	ok
Mejia Unit 8	1.4	5 %	3 cycle	2 cycle	Yes	2020	ok
Chandrapura Unit 7	1.36	5 %	4 cycle	2 cycle	Yes	2020	ok
Chandrapura Unit 8	1.36	5 %	4 cycle	2 cycle	Yes	2020	ok
Sagardighi Unit 1	1.43	3 %	5 cycle	1 cycle	Yes	2020	ok
NTPC Farakka Unit 3	1.66	2 %	4 Cycle	1 cycle	Yes	2020	ok
NTPC Farakka Unit 2	1.66	5 %	6 cycle	1 cycle	Yes	2020	ok
NTPC Farakka Unit 1	1.66	5 %	6 cycle	1 cycle	Yes	2020	ok
NTPC Farakka Unit 6	1.66	5 %	6 cycle	1 cycle	Yes	2019	ok
NTPC Farakka							Submission
Unit 4							Submission
Unit 5							Pending
NTPC Talcher Unit 1	1.66	3 %	4 cycle	2 cycle	Yes	2020	ok
NTPC Talcher Unit 2	1.66	3 %	4 cycle	2 cycle	Yes	2020	ok
Chujachen Unit 1	1.5 Hz	3 %	4 cycle	1 cycle	Yes	2021	Adequate
Chujachen Unit 2	1.5 Hz	3 %	4 cycle	1 cycle	Yes	2021	Adequate
Bokaro Unit 5 (500 MW)						2021	Submission pending

Power Plant	Unit No	PSS tuned (Yes/No)	PSS in Service (Yes/No)	Last PSS Tuning Date	Whether Done in Last 3 Years	Whether Next to be planned	Planned Next PSS Tuning
West Bengal							
Kolaghat-WBPDCL	1	No	Yes	Long Back	No	Yes	Under retirement
Kolaghat-WBPDCL	2	No	Yes	Long Back	No	Yes	Under retirement
Kolaghat-WBPDCL	3	No	Yes	Long Back	No	Yes	When Unit will be on Bar
Sagardighi-WBPDCL	2	No	No	Long Back	No	Yes	When Unit will be on Bar
Bakreshwar-WBPDCL	2	Yes	Yes	2019	Yes	Yes	Retuning to be done as plot response is not good
Bakreshwar-WBPDCL	3	Yes	Yes	2019	Yes	Yes	Retuning to be done as plot response is not good
Bakreshwar-WBPDCL	4	Yes	Yes	2019	Yes	Yes	Retuning to be done as plot response is not good
Bakreshwar-WBPDCL	5	Yes	Yes	2019	Yes	Yes	Retuning to be done as plot response is not good
DPL	7	No	No	N.A	No	Yes	Planned in March 2021
DPL	8	No	Yes	No	No Detail	Yes	To be updated by WBPDCL/DPL
PPSP	1	No	Yes	2009	No	Yes	To be updated by WBSEDCL
PPSP	2	No	Yes	2009	No	Yes	To be updated by WBSEDCL
PPSP	3	No	Yes	2009	No	Yes	To be updated by WBSEDCL
PPSP	4	No	Yes	2009	No	Yes	To be updated by WBSEDCL
TLDP III	4 x 33			No Detail	No Detail	Yes	To be updated by WBSEDCL
TLDP IV	4 X 44			No Detail	No Detail	Yes	To be updated by WBSEDCL
CESC							
Budge Budge-CESC	1	Yes	Yes	2015	No	Yes	2021-22
Budge Budge-CESC	2	Yes	Yes	2015	No	Yes	2021-22
DVC							
Bokaro B 210 MW	3				No Detail	Yes	Unit Is out of Service
Mejia-DVC	4	Yes	Yes	2009	No	Yes	Jun-21
Raghunathpur-DVC	1	No	No		No Detail	Yes	Will be done after AOH
Raghunathpur-DVC	2	No	No		No Detail	Yes	Jun-21
Koderma-DVC	1	Yes	Yes	2013	No	Yes	Sep-21
Waria	4	Yes	Yes	2008	No	Yes	Unit Is out of Service
ISGS							
Kahalgaon NTPC	1	Yes	Yes	2017	Yes	Yes	Apr-21
Kahalgaon NTPC	2	Yes	Yes	2018	Yes	Yes	April 2021 (During AOH)
Kahalgaon NTPC	3	Yes	Yes	2016	Yes	Yes	Jul-21
Kahalgaon NTPC	4	Yes	Yes	2015	No	Yes	Mar-21

Talcher Stage 2 3 Yes Yes 2016 Yes Yes July 2021 (As per SRPC decision) Talcher Stage 2 5 Yes No Details No Details Yes July 2021 (As per SRPC decision) Talcher Stage 2 6 Yes Yes 2016 Yes July 2021 (As per SRPC decision) Barh NFPC 4 2015 Yes July 2021 (As per SRPC decision) Barh NFPC 5 During Unit Yes July 2021 (As per SRPC decision) Barh NFPC 5 During Unit Yes July 2021 (As per SRPC decision) Teesta V 1 Yes Yes 2008 No Yes Jun-21 Teesta V 2 Yes Yes 2008 No Yes Jun-21 BRBCL 1 No Yes Yes Jun-21 Yes Jun-21 BRBCL 3 No Yes Yes Yes Jun-21 Yes Jun-21 BRBCL 3 No	Kahalgaon NTPC	6	Yes	Yes	2009	No	Yes	Mar-21
Talcher Stage 2 4 Yes Yes No Details No Details Yes July 2021 (As per SRPC decision) Talcher Stage 2 6 Yes Yes 2016 Yes Yes July 2021 (As per SRPC decision) Barh NTPC 4 Yes 2015 Yes Yes July 2021 (As per SRPC decision) Barh NTPC 4 Yes 2015 Yes Yes July 2021 (As per SRPC decision) Barh NTPC 4 Yes 2015 Yes Yes July 2021 (As per SRPC decision) Teesta V 1 Yes Yes 2008 No Yes Jun-21 Teesta V 3 Yes Yes 2008 No Yes Jun-21 BRECL 1 No Yes Vendor to Do No Yes Jun-21 BRBCL 3 No Yes Yes Yes Jun-21 BRBCL 1 Yes Yes Yes Jun-21 Jun-21 BRBCL 3	Talcher Stage 2	3	Yes	Yes	2016	Yes	Yes	July 2021 (As per SRPC decision)
Talcher Stage 2 5 Yes Yes No Details Yes July 2021 (As per SRPC decision) Talcher Stage 2 6 Yes 2015 Yes Yes July 2021 (As per SRPC decision) Barh NTPC 4 2015 Yes In Next AOH Barh NTPC 5 During Unit commissioning Yes June 2021 (AOH) Teesta V 1 Yes Yes 2008 No Yes June 2021 (AOH) Teesta V 2 Yes Yes 2008 No Yes June 2021 (AOH) Teesta V 3 Yes Yes 2008 No Yes June 2021 (AOH) BRBCL 1 No Yes Vendor to Do No Yes June 21 BRBCL 3 No Yes Yes 2014 No Yes 2021-22 KBUNL 1 Yes Yes Not Available No Yes 2021-22 KBUNL 3 Yes Yes Not Ava	Talcher Stage 2	4	Yes	Yes	No Details	No Details	Yes	July 2021 (As per SRPC decision)
Telcher Stage 2 6 Yes Yes 2016 Yes Yes July 2021 (As per SRPC decision) Barh NTPC 4 - 2015 Yes In Next AOH Barh NTPC 5 - - 2015 Yes In Next AOH Barh NTPC 5 - - - Yes Yes June 2021 (AOH) Teesta V 1 Yes Yes 2008 No Yes June 211 Teesta V 2 Yes Yes 2008 No Yes June 21 Teesta V 3 Yes Yes 2008 No Yes June 21 BRBCL 1 No Yes Vendor to Do No Yes June 21 BRBCL 3 No Yes 2014 No Yes 2021-22 KBUNL 1 Yes Yes Not Available No Yes 2021-22 KBUNL 3 Yes Yes Not Available	Talcher Stage 2	5	Yes	Yes	No Details	No Details	Yes	July 2021 (As per SRPC decision)
Barh NTPC 4 2015 Yes In Next AOH Barh NTPC 5	Talcher Stage 2	6	Yes	Yes	2016	Yes	Yes	July 2021 (As per SRPC decision)
Barh NTPC 5 Image: During commissioning commissioning commissioning Yes June 2021 (AOH) Teesta V 1 Yes Yes 2008 No Yes Jun-21 Teesta V 2 Yes Yes 2008 No Yes Jun-21 Teesta V 3 Yes Yes 2008 No Yes Jun-21 BRBCL 1 No Yes Ves Vendor to Do No Yes Jun-21 BRBCL 3 No Yes Ves Yes Yes Jun-21 BRBCL 3 No Yes Vendor to Do No Yes Jun-21 BRBCL 3 No Yes Ves 2014 No Yes 2021-22 KBUNL 2 Yes Yes Not Available No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 KBUNL 4	Barh NTPC	4			2015		Yes	In Next AOH
Teesta V 1 Yes Yes 2008 No Yes June 2021 (AOH) Teesta V 2 Yes Yes 2008 No Yes June 21 Teesta V 3 Yes Yes 2008 No Yes June 21 Teesta V 3 Yes Yes 2008 No Yes June 21 BRBCL 1 No Yes Yes Yes June 21 BRBCL 2 Yes Yes Yes Yes June 21 BRBCL 3 No Yes Yes Yes Yes June 21 BRBCL 3 No Yes Yes Yes Yes Yes June 21 BRBCL 1 Yes Yes Yes Yes Yes Z021-22 Xes KBUNL 3 Yes Yes Not Available No Yes Z021-22 Rangit 3 x 20 Not Available No	Barh NTPC	5			During Unit		Ves	
Teesta V 1 Yes Yes 2008 No Yes Jun-21 Teesta V 2 Yes Yes 2008 No Yes Jun-21 BRBCL 1 No Yes Yes 2008 No Yes Jun-21 BRBCL 1 No Yes Ves Yes Yes Jun-21 BRBCL 3 No Yes Ves Yes Jun-21 BRBCL 3 No Yes Ves Yes Jun-21 BRBCL 3 No Yes Ves Ves Jun-21 KBUNL 1 Yes Yes 2014 No Yes Jun-21 KBUNL 4 Yes Yes 2014 No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22	barrinite	5			commissioning		105	June 2021 (AOH)
Teesta V 2 Yes Yes 2008 No Yes Jun-21 Teesta V 3 Yes Yes 2008 No Yes Jun-21 BRBCL 1 No Yes Vendor to Do No Yes Jun-21 BRBCL 2 Yes Yes Yes Yes Jun-21 BRBCL 3 No Yes Yes Yes Jun-21 BRBCL 3 No Yes Yes Yes Jun-21 BRBUNL 1 Yes Yes Yes 2014 No Yes 2021-22 KBUNL 3 Yes Yes Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Rangit 3 x 20 Yes Yes 2015 No	Teesta V	1	Yes	Yes	2008	No	Yes	Jun-21
Teesta V 3 Yes Yes 2008 No Yes Jun-21 BRBCL 1 No Yes Yes Yes Yes Jun-21 BRBCL 2 Yes Yes Yes Yes Yes Jun-21 BRBCL 3 No Yes Yes Over S Jun-21 BRBCL 3 No Yes Vendor to Do No Yes Jun-21 BRBCL 1 Yes Yes Over S 2021-22 Jun-21 KBUNL 1 Yes Yes Not Available No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 Ragit 3 x 20 Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-2	Teesta V	2	Yes	Yes	2008	No	Yes	Jun-21
BRBCL 1 No Yes Vendor to Do No Yes Jun-21 BRBCL 2 Yes Yes Ves Jun-21 BRBCL 3 No Yes Vendor to Do No Yes Jun-21 BRBCL 1 Yes Yes Vendor to Do No Yes Jun-21 KBUNL 1 Yes Yes Vendor to Do No Yes Jun-21 KBUNL 2 Yes Yes Not Available No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Jorethang 1 Yes Yes 2015 No Yes Apr-21 Jorethang 1 Yes Yes 2015 No Yes Apr-21 ADHUNIK 1 Yes Yes 2013 No	Teesta V	3	Yes	Yes	2008	No	Yes	Jun-21
BRBCL 2 Yes Yes Yes Yes Jun-21 BRBCL 3 No Yes Vendor to Do No Yes Jun-21 BRBCL 3 No Yes Yes Zol14 No Yes Jun-21 KBUNL 1 Yes Yes Yes Zol14 No Yes Zol1-22 KBUNL 3 Yes Yes Not Available No Yes Zol21-22 KBUNL 4 Yes Yes Not Available No Yes Zol21-22 Rangit 3 x 20 Not Available No Yes Zol21-22 Bargit 3 x 20 Not Available No Yes Zol21-22 Bargit 3 x 20 Yes Yes Zol5 No Yes Apr-21 Jorethang 1 Yes Yes Zol13 No Yes Apr-21 ADHUNIK 2 Yes	BRBCL	1	No	Yes	Vendor to Do	No	Yes	Jun-21
BRBCL 3 No Yes Vendor to Do No Yes Jun-21 KBUNL 1 Yes Yes 2014 No Yes 2021-22 KBUNL 2 Yes Yes 2014 No Yes 2021-22 KBUNL 3 Yes Yes Not Available No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Bagit 3 x 20 Not Available No Yes 2021-22 Bagit 3 x 20 Yes Not Available No Yes 2021-22 Bagit 3 x 20 Yes 2015 No Yes Apr-21 Jorethang 1 Yes Ye	BRBCL	2	Yes	Yes	2019	Yes	Yes	Jun-21
KBUNL 1 Yes Yes 2014 No Yes 2021-22 KBUNL 2 Yes Yes 2014 No Yes 2021-22 KBUNL 3 Yes Yes Not Available No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 Rangit 3 x 20	BRBCL	3	No	Yes	Vendor to Do	No	Yes	Jun-21
KBUNL 2 Yes Yes 2014 No Yes 2021-22 KBUNL 3 Yes Yes Not Available No Yes 2021-22 KBUNL 4 Yes Yes Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 2021-22 Image: 3 x 20 Not Available No Yes 2021-22 Rangit 3 x 20 Not Available No Yes 705 updated by NHPC Image: 1 Yes Yes 2015 No Yes Apr-21 Jorethang 1 Yes Yes 2013 No Yes Apr-21 ADHUNIK 1 Yes Yes 2013 No Yes Mar-21 JITPL 1 Yes Yes 2016 Yes Yes Jul-21 GMR 1 Yes Yes 2013 No	KBUNL	1	Yes	Yes	2014	No	Yes	2021-22
KBUNL3YesYesNot AvailableNoYes2021-22KBUNL4YesYesNot AvailableNoYes2021-22Rangit3 x 20-Not AvailableNoYes2021-22Rangit3 x 20-Not AvailableNoYes2021-22IPPJorethang1YesYes2015NoYesApr-21Jorethang2YesYes2015NoYesApr-21ADHUNIK1YesYES2013NoYesMar-21ADHUNIK1YesYes2016YesYesMar-21JITPL1YesYes2016YesYesJul-21JITPL2YesYes2013NoYesMar-21GMR1YesYes2013NoYesMay-21GMR3YesYes2013NoYesMay-21GMR3YesYes2013NoYesMar/21IB TPS1YesYes2011NoYesMar/201IB TPS2YesYes2015NoYesMar/2021Upper Indravati1YesNo2015NoYesTo be updated by OHPCUpper Indravati3YesNo2001NoYesTo be updated by OHPCUpper Indravati4 <td>KBUNL</td> <td>2</td> <td>Yes</td> <td>Yes</td> <td>2014</td> <td>No</td> <td>Yes</td> <td>2021-22</td>	KBUNL	2	Yes	Yes	2014	No	Yes	2021-22
KBUNL4YesYesNot AvailableNoYes2021-22Rangit3 x 20Image: Constraint of the second se	KBUNL	3	Yes	Yes	Not Available	No	Yes	2021-22
Rangit3 x 20Not AvailableNoYesTo be updated by NHPCIPPImage: Constraint of the probability of th	KBUNL	4	Yes	Yes	Not Available	No	Yes	2021-22
IPP Image: Constraint of the second sec	Rangit	3 x 20			Not Available	No	Yes	To be updated by NHPC
Jorethang 1 Yes Yes 2015 No Yes Apr-21 Jorethang 2 Yes Yes Yes 2015 No Yes Apr-21 ADHUNIK 1 Yes YES 2013 No Yes Apr-21 ADHUNIK 1 Yes YES 2013 No Yes Mar-21 ADHUNIK 2 Yes YES 2013 No Yes Mar-21 JITPL 1 Yes Yes 2016 Yes Yes Jul-21 JITPL 2 Yes Yes 2016 Yes Yes Jul-21 GMR 1 Yes Yes 2013 No Yes May-21 GMR 2 Yes Yes 2013 No Yes May-21 IB TPS 1 Yes Yes 2011 No Yes Mar'2021 Upper Indravati 1 Yes No	IPP							
Jorethang 2 Yes Yes 2015 No Yes Apr-21 ADHUNIK 1 Yes YES 2013 No Yes Mar-21 ADHUNIK 2 Yes YES 2013 No Yes Mar-21 ADHUNIK 2 Yes YES 2013 No Yes Mar-21 JITPL 1 Yes Yes 2016 Yes Yes Jul-21 JITPL 2 Yes Yes 2016 Yes Yes Jul-21 GMR 1 Yes Yes 2013 No Yes May-21 GMR 2 Yes Yes 2013 No Yes May-21 GMR 3 Yes Yes 2013 No Yes May-21 GMR 3 Yes Yes 2013 No Yes May-21 IB TPS 1 Yes Yes 2011 No	Jorethang	1	Yes	Yes	2015	No	Yes	Apr-21
ADHUNIK 1 Yes YES 2013 No Yes Mar-21 ADHUNIK 2 Yes YES 2013 No Yes Mar-21 JITPL 1 Yes Yes 2016 Yes Yes Jul-21 JITPL 2 Yes Yes 2016 Yes Yes Jul-21 GMR 1 Yes Yes 2016 Yes Yes Jul-21 GMR 1 Yes Yes 2013 No Yes May-21 GMR 2 Yes Yes 2013 No Yes May-21 GMR 3 Yes Yes 2013 No Yes May-21 GMR 3 Yes Yes 2013 No Yes May-21 Orissa - - - - - - - IB TPS 1 Yes Yes Yes 2015 No	Jorethang	2	Yes	Yes	2015	No	Yes	Apr-21
ADHUNIK 2 Yes YES 2013 No Yes Mar-21 JITPL 1 Yes Yes 2016 Yes Yes Jul-21 JITPL 2 Yes Yes 2016 Yes Yes Jul-21 JITPL 2 Yes Yes 2016 Yes Yes Jul-21 GMR 1 Yes Yes 2013 No Yes May-21 GMR 2 Yes Yes 2013 No Yes May-21 GMR 3 Yes Yes 2013 No Yes May-21 GMR 3 Yes Yes 2013 No Yes May-21 BTPS 1 Yes Yes 2013 No Yes May-21 IB TPS 1 Yes Yes 2011 No Yes Mar'2021 Upper Indravati 1 Yes No 2015 No	ADHUNIK	1	Yes	YES	2013	No	Yes	Mar-21
JITPL1YesYes2016YesYesJul-21JITPL2YesYes2016YesYesJul-21GMR1YesYes2013NoYesMay-21GMR2YesYes2013NoYesMay-21GMR3YesYes2013NoYesMay-21Orissa	ADHUNIK	2	Yes	YES	2013	No	Yes	Mar-21
JITPL2YesYes2016YesYesJul-21GMR1YesYes2013NoYesMay-21GMR2YesYes2013NoYesMay-21GMR3YesYes2013NoYesMay-21Orissa	JITPL	1	Yes	Yes	2016	Yes	Yes	Jul-21
GMR1YesYes2013NoYesMay-21GMR2YesYes2013NoYesMay-21GMR3YesYes2013NoYesMay-21Orissa	JITPL	2	Yes	Yes	2016	Yes	Yes	Jul-21
GMR2YesYes2013NoYesMay-21GMR3YesYes2013NoYesMay-21Orissa	GMR	1	Yes	Yes	2013	No	Yes	May-21
GMR3YesYes2013NoYesMay-21Orissa	GMR	2	Yes	Yes	2013	No	Yes	May-21
OrissaImage: Second	GMR	3	Yes	Yes	2013	No	Yes	May-21
IB TPS1YesYes2011NoYesMar'2021IB TPS2YesYes2012NoYesMar'2021Upper Indravati1YesNo2015NoYesTo be updated by OHPCUpper Indravati2YesNo2015NoYesTo be updated by OHPCUpper Indravati3YesNo2000NoYesTo be updated by OHPCUpper Indravati4YesNo2001NoYesTo be updated by OHPCBalimela1 (60 MW)No detailYesYesTo be updated by OHPC	Orissa							
IB TPS2YesYes2012NoYesMar'2021Upper Indravati1YesNo2015NoYesTo be updated by OHPCUpper Indravati2YesNo2015NoYesTo be updated by OHPCUpper Indravati3YesNo2000NoYesTo be updated by OHPCUpper Indravati4YesNo2001NoYesTo be updated by OHPCBalimela1 (60 MW)NoNo detailYesTo be updated by OHPC	IB TPS	1	Yes	Yes	2011	No	Yes	Mar'2021
Upper Indravati1YesNo2015NoYesTo be updated by OHPCUpper Indravati2YesNo2015NoYesTo be updated by OHPCUpper Indravati3YesNo2000NoYesTo be updated by OHPCUpper Indravati4YesNo2001NoYesTo be updated by OHPCBalimela1 (60 MW)NoNo detailYesTo be updated by OHPC	IB TPS	2	Yes	Yes	2012	No	Yes	Mar'2021
Upper Indravati2YesNo2015NoYesTo be updated by OHPCUpper Indravati3YesNo2000NoYesTo be updated by OHPCUpper Indravati4YesNo2001NoYesTo be updated by OHPCBalimela1 (60 MW)No detailYesYesTo be updated by OHPC	Upper Indravati	1	Yes	No	2015	No	Yes	To be updated by OHPC
Upper Indravati3YesNo2000NoYesTo be updated by OHPCUpper Indravati4YesNo2001NoYesTo be updated by OHPCBalimela1 (60 MW)No detailYesYesTo be updated by OHPC	Upper Indravati	2	Yes	No	2015	No	Yes	To be updated by OHPC
Upper Indravati 4 Yes No 2001 No Yes To be updated by OHPC Balimela 1 (60 MW) No detail Yes To be updated by OHPC	Upper Indravati	3	Yes	No	2000	No	Yes	To be updated by OHPC
Balimela 1 (60 MW) No detail Yes To be updated by OHPC	Upper Indravati	4	Yes	No	2001	No	Yes	To be updated by OHPC
	Balimela	1 (60 MW)			No detail		Yes	To be updated by OHPC
Balimela 2 (60 MW) No detail Yes To be updated by OHPC	Balimela	2 (60 MW)			No detail		Yes	To be updated by OHPC
Balimela 3 (60 MW) No No Not tuned No Yes To be updated by OHPC	Balimela	3 (60 MW)	No	No	Not tuned	No	Yes	To be updated by OHPC
Balimela 4 (60 MW) No No Not tuned No Yes To be updated by OHPC	Balimela	4 (60 MW)	No	No	Not tuned	No	Yes	To be updated by OHPC
Balimela 5 (60 MW) No No Not tuned No Yes To be updated by OHPC	Balimela	5 (60 MW)	No	No	Not tuned	No	Yes	To be updated by OHPC

Balimela	6 (60 MW)	No	No	Not tuned	No	Yes	To be updated by OHPC
Balimela	7 (75 MW)	No	No	Not tuned	No	Yes	To be updated by OHPC
Balimela	8 (75 MW)	No	No	Not tuned	No	Yes	To be updated by OHPC
Upper Kolab	1	Yes	Yes	2007	No	Yes	To be updated by OHPC
Upper Kolab	2	Yes	Yes	2007	No	Yes	To be updated by OHPC
Upper Kolab	3	Yes	Yes	2007	No	Yes	To be updated by OHPC
Upper Kolab	4	Yes	Yes	2007	No	Yes	To be updated by OHPC
Rengali	1	Yes	Yes	Not tuned	No	Yes	To be updated by OHPC
Rengali	2	Yes	Yes	Not tuned	No	Yes	To be updated by OHPC
Rengali	3	Yes	Yes	Not tuned	No	Yes	To be updated by OHPC
Rengali	4	Yes	Yes	Not tuned	No	Yes	To be updated by OHPC
Rengali	5	No	Yes	Not tuned	No	Yes	To be updated by OHPC
Sterlite	4 X 600			No detail		Yes	To be updated by SLDC Orissa
Jharkhand							
Topughat	1	Vac	Vac	2017	Vac	Vac	No report has been submitted. So tuning
renugnat	Ţ	res	res	2017	res	Yes	to be planned
Topughat	2	Voc	Voc	2017	Voc	Voc	No report has been submitted. So tuning
renugnat	2	res	res	2017	res	res	to be planned
Subarnrekha	2 X 65					Yes	To be updated
Bihar							
BTPS	6 (110)					Yes	To be updated by BSPGCL
BTPS	7 (110)					Yes	To be updated by BSPGCL
BTPS	8					Yes	To be updated by BSPGCL
BTPS	9					Yes	To be updated by BSPGCL
Bhutan							
Tala	1	No	Yes			Yes	To be updated by BPC
Tala	2	No	Yes			Yes	To be updated by BPC
Tala	3	No	Yes			Yes	To be updated by BPC
Tala	4	No	Yes			Yes	To be updated by BPC
Tala	5	No	Yes			Yes	To be updated by BPC
Tala	6	No	Yes			Yes	To be updated by BPC
Chukha	1	No	Yes	2005	No	Yes	To be updated by BPC
Chukha	2	No	Yes	2005	No	Yes	To be updated by BPC
Chukha	3	No	Yes	2005	No	Yes	To be updated by BPC
Chukha	4	No	Yes	2005	No	Yes	To be updated by BPC
Mangdechu	1	No	Yes			Yes	To be updated by BPC
Mangdechu	2	No	Yes			Yes	To be updated by BPC
Mangdechu	3	No	Yes			Yes	To be updated by BPC

Annexure-C8.1

SUMMARY OF RRAS CHARGE RECEIPT AND PAYMENT STATUS

BILL UPTO 21-02-2021 (W-47 of 2020-2021)

Last Payment Disbursement Date -05.03.2021

			Figures in Rs. Lakhs		
CONSTITUENTS	Receivable	Received	Payable	Paid	Outstanding
NTPC	3915.79595	713.32024	14516.11898	11424.34519	110.70192
MPL	695.82706	119.01884	5023.63699	4436.12325	-10.70552
BRBCL	1105.08664	781.32082	2951.92959	2651.88816	23.72439
KBUNL	427.13280	68.53527	1866.20700	1473.33695	-34.27252
NPGC	609.06780	257.66860	1470.94747	1117.34862	-2.19965
TOTAL	6752.91025	1939.86377	25828.84003	21103.04217	87.24862

Receivable: Receivable by ER POOL Payable Payable by ER POOL Received Received by ER POOL Paid Paid by ER POOL "- ve" Payable by ER pool "+ ve" Receivable by ER pool

SUMMARY OF AGC CHARGE RECEIPT AND PAYMENT STATUS

BILL UPTO 21-02-2021 (W-47 of 2020-2021)

Last Payment Disbursement Date -08.03.2021

			Figures in Rs. Lakhs		
CONSTITUENTS	Receivable	Received	Payable	Paid	Outstanding
BARH	0	0	218.81653	218.63081	-0.18572
TOTAL	0.00000	0.00000	218.81653	218.63081	-0.18572

Receivable by ER POOL Receivable: Received Received by ER POOL "- ve" Payable by ER pool

Pavable Paid "+ ve" Receivable by ER pool

Payable by ER POOL Paid by ER POOL

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Annexure-C8.2

DETAILS OF DISBURSEMENT TO POWER SYSTEM DEVELOPMENT FUND

SI No	Nature of Amount	Amount transferred	Date of Disbursement	Remarks
orno	Opening Balance (upto		Disbuisement	Tremunos
1	31.12.16)	90040.05774		
2	Reactive Energy Charge	248.26904	31.07.17	Reactive Charges_17-18
3	Reactive Energy Charge	128.44284	29.08.17	Reactive Charges_17-18
4	Reactive Energy Charge	103.22685	26.09.17	Reactive Charges_17-18
5	Reactive Energy Charge	249.14078	31.10.17	Reactive Charges_17-18
6	Reactive Energy Charge	172.20693	30.11.17	Reactive Charges_17-18
7	Reactive Energy Charge	200.00000	15.12.17	Reactive Charges_17-18
8	Reactive Energy Charge	100.00000	05.01.18	Reactive Charges_17-18
9	Reactive Energy Charge	558.45339	06.02.18	Reactive Charges_17-18
10	Reactive Energy Charge	171.95546	06.03.18	Reactive Charges_17-18
11	Reactive Energy Charge	129.35497	04.04.18	Reactive Charges_17-18
12	Reactive Energy Charge	126.21494	07.05.18	Reactive Charges_18-19
13	Reactive Energy Charge	183.31081	06.06.18	Reactive Charges_18-19
14	Reactive Energy Charge	215.58816	05.07.18	Reactive Charges_18-19
15	Reactive Energy Charge	176.54245	03.08.18	Reactive Charges_18-19
10	Reactive Energy Charge	39.54556	06.09.18	Reactive Charges_18-19
17	Reactive Energy Charge	34.03973	01.10.10	Reactive Charges 18-19
10	Reactive Energy Charge	14.37230	01 12 19	Reactive Charges 18 10
20	Reactive Energy Charge	236 80035	02.01.10	Reactive Charges 18-19 & 15-16
20	Reactive Energy Charge	300.04546	05.02.19	Reactive Charges 18-19 & 15-16
21	Reactive Energy Charge	233 27008	05.02.19	Reactive Charges 18-19
22	Reactive Energy Charge	105 79202	03.03.19	Reactive Charges 18-19
23	Reactive Energy Charge	287 48448	03.05.19	Reactive Charges 18-19 & 19-20
25	Reactive Energy Charge	129 69559	03.06.19	Reactive Charges 19-20
26	Reactive Energy Charge	207.83840	04.07.19	Reactive Charges 19-20
27	Reactive Energy Charge	94.91703	02.08.19	Reactive Charges 19-20
28	Reactive Energy Charge	188.53681	02.09.19	Reactive Charges 19-20
29	Surplus DSM amount transferred	32210.51998	24.09.19	DSM Charges 19-20
30	Reactive Energy Charge	173.06004	01.10.19	Reactive Charges_19-20
31	Reactive Energy Charge	273.15002	01.11.19	Reactive Charges_19-20
32	Reactive Energy Charge	401.09564	04.12.19	Reactive Charges_19-20
33	Reactive Energy Charge	252.53573	02.01.20	Reactive Charges_19-20
34	Reactive Energy Charge	148.65520	07.02.20	Reactive Charges_19-20
35	Reactive Energy Charge	205.22437	04.03.20	Reactive Charges_19-20
36	Bank interest from Reactive acct	0.21706	03.04.20	Bank interest from Reactive acct
37	Reactive Energy Charge	843.03166	03.06.20	Reactive Charges_19-20 & 20-21
38	Reactive Energy Charge	507.80481	07.07.20	Reactive Charges_17-18,18-19 & 20-21
39	Reactive Energy Charge	309.41068	06.08.20	Reactive Charges_17-18,18-19 & 20-21
40	Reactive Energy Charge	83.23955	02.09.20	Reactive Charges_19-20 & 20-21
41	Bank interest of DSM A/C-TDS port	251.65235	18.09.20	Bank interest TDS portion transferred from POSOCO,CC
42	Bank interest of DSM A/C-TDS port	15.64788	22.09.20	Bank interest TDS portion transferred from POSOCO,CC
43	Reactive Energy Charge	118.85979	06.10.20	Reactive Charges_ 20-21
44	Reactive Energy Charge	101.42971	04.11.20	Reactive Charges_ 20-21
45	Reactive Energy Charge	82.34791	04.12.20	Reactive Charges_ 20-21
46	Reactive Energy Charge	500.95333	06.01.21	Reactive Charges of 19-20 & 20-21
47	Reactive Energy Charge	92.51486	03.02.21	Reactive Charges of 19-20 & 20-21
48	Reactive Energy Charge	50.22963	04.03.21	Reactive Charges of 19-20 & 20-22
	Total	133532.01133		