Minutes
of
86th PCC Meeting

Date: 26.12.2019
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 86TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 18.12.2019 (WEDNESDAY) AT 11:00 HOURS

List of participants is at **Annexure-A.**

PART – A

ITEM NO. A.1: Confirmation of minutes of 85th Protection sub-Committee Meeting held on 19th November, 2019 at ERPC, Kolkata.

The minutes of 85th Protection Sub-Committee meeting held on 19.11.19 circulated vide letter dated 10.12.2019.

Members may confirm the minutes of 85th PCC meeting.

Deliberation in the meeting

Members confirmed the minutes of 85th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN NOVEMBER, 2019

ITEM NO. B.1: Disturbance at Liluah substation on 27.11.2019 at 02:36 Hrs.

At 02:36 Hrs, 132 KV BUS PT at Liluah S/s burst resulting tripping of 132 KV Liluah-Howrah Q/C.

At the time of incident, CESC system was synchronized to rest of the grid at Howrah point (132 KV Southern-Howrah, 132 KV Southern-Botanical-Howrah D/c) which got islanded as synchronization relay at Southern operated to disconnect CESC system from rest of the grid. CESC started running in island mode for 9 minutes.

At 02:45 Hrs, when re-synchronization attempt was taken at Howrah, 2 running Units (U#1, U#3-264 MW generation) at BudgeBudge tripped, thereby around 260 MW load loss occurred in CESC area.

Generation Loss: 264 MW & Load Loss: 260 MW

CESC may explain.

Deliberation in the meeting

CESC representative was not present in the meeting.

WBSETCL informed that bus fault at 132kV Liluah bus was occurred due to failure of 132 KV BUS PT at Liluah S/s. WBSETCL added that 132 kV lines from Howrah and Rishra got tripped on zone 2 after 350 ms.

From the report submitted by CESC, PCC observed that SPS at Howrah was operated within 300 ms and isolated the CESC system from rest of the grid.

ERLDC informed that sequence of events for this disturbance was not captured in ERLDC SCADA system.

After detailed deliberation, PCC decided to discuss the disturbance in next PCC meeting on following observations:

1. *Isolation of CESC system might not be required in this case and proper time coordination between WBSETCL protection system and CESC islanding scheme is required to be deliberated in detail to avoid such unwanted system separation.*
2. *Rough synchronisation was observed at Howrah during resynchronisation attempt at 02:45 hrs*

ITEM NO. B.2: Disturbance at Teesta – III Generating Station on 25.11.2019 at 15:18 Hrs.

During synchronization of unit #5 of Teesta III, breaker got stuck and bus I at Teesta III tripped resulting tripping of 400kV Teesta-III-Dikchu S/C.

At same time, 400kV Teesta-III-Kishangunj S/C also tripped resulting tripping of both the evacuating lines from Teesta III and leading to generation loss of 303 MW at Teesta III.

Generation Loss: 303 MW

NHPC may explain**.**

Deliberation in the meeting

Teesta-III gave a detailed presentation which was given at ***Annexure-B2.***

Teesta-III informed that while synchronizing Unit #5, Circuit breaker of U Phase pole was remained in open condition due to sudden hydraulic oil pressure drop whereas V- Phase and W - Phase successfully got closed. Above condition prevailed due to internal slippage of U-phase breaker pole hydraulic pump, which failed to build-up required pressure and resulted in Hydraulic Lockout alarm & trip.

After that, Unit#5 main CB Pole discrepancy trip was activated and initiated the trip command, but as there was hard wired interlock in tripping circuit with hydraulic low oil pressure lockout stage-2, due to which trip command was blocked and unable to trip V-phase and W-phase Circuit breaker poles of Unit #5.

After that, Unit #5 reverse power trip activated. LBB protection of Bus I was operated and tripped all the elements connected to Bus I. But at the same time DT was initiated for elements connected to Bus II and resulting tripping of 400kV Teesta III-Kishanganj Line from Kishanganj end.

Further, Teesta-III intimated that they have replaced the Oil Pump Unit and they have contacted their OEM team for suggestions regarding unsuccessful pole discrepancy operation.

ERLDC informed that overvoltage and distortion in signals was observed at Teesta-III end after tripping of 400kV Teesta III-Kishanganj Line from Kishanganj end.

After detailed deliberation, PCC advised Teesta-III to take the following corrective actions:

- *DT should not be initiated for Bus II elements in this case, the LBB scheme at Teesta III should be reviewed*
- *One second delay was observed between initiation of reverse power flow relay of Unit 5*

and LBB initiation, the same need to be checked.

- *Operation of pole discrepancy to be checked*
- *Occurrence of resonance phenomenon to be simulated/verified at Teesta-III after tripping of 400kV Teesta III-Kishanganj Line from Kishanganj end in view of distortion in signals at Teesta III end*
- *The settings of Unit #5 reverse power relay to be reviewed*
- *Protection system at Teesta III including CB operation to be tested to avoid inadvertent operation of protection system in future.*

ITEM NO. B.3: Disturbance at Arambagh substation on 05.11.2019 at 06:52 Hrs.

At Arambagh substation, isolator got stuck while changing the isolator position and this leads to bus fault at 400 kV Bus. As CT supervision function (cable cut) blocked the bus bar protection, bus bar protection did not clear the fault.

All the lines tripped either from remote end on Zone-2/3 or in Zone 4 from Arambagh end. Also, ICT 4 tripped from 220 kV side on directional over current.

Load Loss: 104 MW

WBSETCL may explain.

Deliberation in the meeting

WBSETCL gave a detailed presentation which was given at ***Annexure-B3.***

WBSETCL informed that 400kV Bus-1 was scheduled to go under shut down from 07:00 hrs for connection of bus pipe of new 125MVAR bus reactor bay. While shifting Arambag- New PPSP line-2 from 400kV Bus-1 to Bus-2, it was found that Bus-2 isolator could not be operated from remote and not even electrically from local. For this reason, the isolators were operated manually one by one.

R-phase isolator was closed successfully. While closing Y-phase isolator, the operating personnel inadvertently operated the earth switch. As the earth switch blade came close to the pantograph, flashing occurred causing earth fault in 400kV bus.

WBSETCL further informed that bus-bar protection was blocked prior to the incident which went unnoticed as annunciation dc in 400kV bus coupler panel was not healthy and two lamps in panel were defective which indicated its earlier operation.

Due to fault in 400kV bus, and due to non- operation of bus-bar protection relay, the fault was cleared from remote ends and consequently 400kV, 220kV and 132kV elements of the substation got tripped from remote end.

WBSETCL intimated that all 400 kV lines tripped in Zone-II and all 220 kV lines tripped in Zone-III from remote end. They have reviewed the operation of relays from other ends and found them correct except for New Chanditala 400kV where DEF operating time was wrongly set. They have rectified the settings.

PCC observed that protection of 400/220kV ICTs should operate and cleared the fault before tripping of 220kV lines on zone 3.

WBSETCL informed that protection system of ICT 1, 2 and 3 could not pickup the fault. They added that the ICT settings would be reviewed.

PCC advised WBSETCL to train the operators to acquainted with the operating procedure.

ITEM NO. B.4: Tripping of 220 KV Gaya Sonenagar D/C on 27.11.2019 at 15:30 Hrs.

At 15:30 Hrs, 220 KV Gaya Sonenagar D/C tripped at Sonenagar end only due to DT receipt. No tripping was reported at Gaya end. Load loss was at Aurangabad, Sonenagar and Japla.

Load Loss: 53 MW

BSPTCL may explain.

Deliberation in the meeting

BSPTCL informed that during the relay replacement work of transformer at Sonenagar, the trip command was inadvertently extended to 220 KV Gaya Sonenagar D/C lines.

PCC advised BSPTCL to send the details to ERPC/ERLDC at the earliest.

ITEM NO. B.5: Disturbance at Jorethang on 04.11.2019 at 14:18 Hrs.

220 kV Jorethang - New Melli - I was under shutdown. At 14:18 hrs successful A/R occurred for 400 kV Kishangunj - Rangpo S/C on B-N fault (fault distance was 175.5 km from Kishangunj).

At the same time, 220 kV Rangpo - New Melli S/C and 220 kV Jorethang - New Melli - II tripped resulting generation loss of 38 MW at Jorethang due to loss of evacuation path.

Name	Relay Indication at End 1	Relay Indication at End 2
220 kV Rangpo - New Melli S/C	DT received	E/F, IN = 300 A
220 kV Jorethang - New Melli – II	E/F, IN = 232 Amp	Yet to be received

Generation Loss: 38 MW

Powergrid may explain.

Deliberation in the meeting

Powergrid informed that a high resistive B-N fault occurred in 400 kV Kishangunj - Rangpo S/C and successfully got cleared after A/R operation.

But at the same time, 220 kV Rangpo - New Melli S/C line tripped from New Melli end and 220 kV Jorethang - New Melli - II tripped from Jorethang end on DEF.

Powergrid added that DEF settings at New Melli was found low. The settings have been revised as per the present fault level.

PCC observed that settings of DEF at Jorethang of 220 kV Jorethang - New Melli - II needs to be reviewed.

PRDC explained that earlier DEF settings and proposed DEF settings considering the fault level.

PCC decided to communicate the revised settings to Jorethang with a suggestion to implement the settings after thorough scrutiny at their end.

ITEM NO. B.6: Tripping of 400 kV Kishangunj - Rangpo S/C and 220 kV Jorethang - New Melli D/C on 11.11.2019 at 10:58 Hrs.

At 10:58 hrs, successful A/R occurred for 400 kV Kishangunj - Rangpo S/C on Y-N fault.

At the same time, 220 kV Jorethang - New Melli D/C tripped only form Jorethang end resulting tripping of JLHEP unit #1 due to loss of evacuation path

Generation Loss: 43 MW

Powergrid may explain.

Deliberation in the meeting

Powergrid informed that a high resistive B-N fault occurred in 400 kV Kishangunj - Rangpo S/C and successfully got cleared after A/R operation.

PCC noted that above issue is similar to Item No. B5.

ITEM NO. B.7: Disturbance at HVDC Talcher station on 05.11.2019 at 10:55 Hrs.

HVDC Talcher Kolar pole I have been blocked at 10:55 Hrs on dtd 05.11.2019 due to "ESOF" from Kolar side resulting Pole 2 in metallic return mode.

SPS operated at JITPL & GMR, subsequently generation reduce by 70MW & 150MW respectively. Power flow through HVDC Talcher Kolar reduced from 2000 MW to 1000 MW.

After that, JITPL & GMR increased their generation after bypassing SPS. SPS was taken into service at 13:35 and 13:53 hrs respectively.

Generation Loss: 220 MW

Deliberation in the meeting

Powergrid informed that Talcher received "ESOF" from Kolar side due to faulty card. They informed that the faulty card has been replaced.

Powergrid further informed that many similar issues have been faced earlier also and the same have been referred to M/s Siemens for analysis. Powergrid informed that LoA has been placed and OEM would visit the site in January, 2020.

ITEM NO. B.8: Disturbance at Koderma Generating station on 26.11.2019 at 05:56 Hrs.

At 05:56 Hrs, R phase shunt capacitor of GCB burst while synchronizing U#2 at Koderma, which is connected through Bus#1.

Subsequently, all elements connected to bus I tripped and bus I became dead.

No Generation/Load Loss.

DVC may explain.

Deliberation in the meeting

DVC representative was not present during the meeting.

PCC decided to discuss the above disturbance in next PCC meeting.

ITEM NO. B.9: Tripping Incidences in the month of November, 2019.

Other tripping incidences occurred in the month of November, 2019 which needs explanation from constituents of either of the end is given in **Annexure-B9**.

In 36th TCC, all the constituents were advised to use the PDMS on-line portal for uploading the single line tripping details along with DR (comtrade files), EL and other relevant files for all trippings of August 2017 onwards. Otherwise, it will be considered as violation of compliance of clause 5.2(r) & 5.9 of IEGC.

In 74th PCC, all the constituents were requested to submit the disturbance report along with DR through the new version of on-line portal which was implemented from 01st Jan. 2019.

Members may discuss.

Deliberation in the meeting

*Members explained the tripping incidences. Updated status is enclosed at **Annexure-B9.***

PART- C:: OTHER ITEMS

ITEM NO. C.1: FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)

The decisions of previous PCC Meetings are given at Annexure.

In 73rd PCC, it was observed that latest status on the implementation of the previous PCC recommendations were not updated by the constituents regularly. All the constituents were advised to update the latest status of the recommendations as per the list given in Annexure.

Members may update the latest status.

Deliberation in the meeting

*Members updated the latest status. Updated status is enclosed at **Annexure-C1.***

ITEM NO. C.2: Schedule of training program to be conducted by PRDC

PRDC, as per the AMC, is going to conduct 2nd training programme on PDMS and PSCT in state utility premises of Eastern Region. The tentative schedule is given below:

SL NO.	State	Date	Trainning

1	West Bengal(Siliguri)	04.02.2019-05.02.2019	On PDMS
	West Bengal(Durgapur)	08.02.2019-09.02.2019	On PDMS
2	Bihar	08.04.2019-09.04.2019	On PDMS
		10.04.2019-11.04.2019	On PSCT
3	Sikkim	11.06.2019-12.06.2019	Relay Setting analysis and Protection Co-ordination
4	Odisha	22.07.2019-23.07.2019	On PDMS
5	Jharkhand	25.08.2019-26.08.2019	On PDMS
6	For all state	In December 2019	On PSCT

PRDC informed that the training programme on PDMS has already been completed in West Bengal, Bihar, Sikkim & Odisha as per the schedule.

Members may update.

Deliberation in the meeting

Members noted.

ITEM NO. C.3: Status of Third Party Protection Audit

The compliance status of 1st Third Party Protection Audit observations is as follows:

Name of Constituents	Total Observations	Complied	% of Compliance
Powergrid	54	46	85.19
NTPC	16	14	87.50
NHPC	1	1	100.00
DVC	40	26	65.00
WB	68	49	72.06
Odisha	59	42	71.19
JUSNL	34	25	73.53
BSPTCL	16	5	31.25
IPP (GMR, Sterlite and MPL)	5	5	100.00

** Pending observations of Powergrid are related to PLCC problems at other end.*

The substation wise status of compliance is available at ERPC website (Observations include PLCC rectification/activation which needs a comprehensive plan).

In 77th PCC, BSPTCL has submitted the updated status.

In 79th & 80th PCC, BSPTCL was advised to submit the details of the compliance report.

BSPTCL may update.

Deliberation in the meeting

Members noted.

ITEM NO. C.4: Non-commissioning of PLCC / OPGW and non-implementation of carrier aided tripping in 220kV and above lines.

According to CEA technical standard for construction of electric plants and electric lines -Clause 43(4) (c), transmission line of 220 KV and above should have single-phase auto-reclosing facility for improving the availability of the lines. However, from the tripping details attached June-August, 2016 it is evident that the some of 220kV above Inter & Intra-Regional lines do not having auto-reclose facility either at one end or at both ends. Out of these for some of the lines even PLCC/OPGW is not yet installed and carrier aided protection including Autorecloser facility is not yet implemented. Based on the trippings of June- August, 2016 and PMU analysis a list of such lines has been prepared and as given below:

List of line where auto reclose facility is not available(Information based on PMU data analysis)

S. No	Transmission Lines name	Date of Tripping	Reason of Tripping	Owner Detail		Present Status	
				End-1	End-2	OPGW/PLCC Link available	AR facility functional
13	220KV BUDIPADAR-KORBA-II	23.06.16	Y-N FAULT	OPTCL	CSEB	PLCC available	will be activated in consultation with Korba
17	220 KV TSTPP-RENGALI	17.07.16	EARTH FAULT	NTPC	OPTCL		by March 2018
18	220KV BUDIPADAR-RAIGARH	21.07.16	EARTH FAULT	OPTCL	PGCIL	PLCC defective	
20	220 KV FARAKKA-LALMATIA	03.08.16	B-N FAULT .	NTPC	JUNSL	Yes	Old Relay and not functional. 7-8 months required for auto re-close relay procurement.
23	220 KV MUZAFFARPUR - HAZIPUR - II	10.08.16	B-N FAULT	PGCIL	BSPTCL		Voice established. For carrier required shutdown
24	220 KV ROURKELA - TARKERA-II	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	Expected to install protection coupler by Jan 17
27	220 KV BIHARSARIF-TENUGHAT	07.09.16	B-N FAULT	BSPTCL	TVNL		
33	220KV Jamshedpur-Jindal-SC						

34th TCC advised all the respective members to update the above list along with the last tripping

status in next PCC meeting.

TCC further advised all the constituents to give the latest status of PLCC of other 220kV and above lines under respective control area.

OPTCL:

1. 220kV Rengali(PG)-Rengali S/Y (Proposal for Commn. in OPGW is pending): *PSDF appraisal committee accepted the proposal*
2. 220kV Indravati(PG)-Indravati(PH) (Proposal for Commn. in OPGW pending): *PSDF appraisal committee accepted the proposal*
3. 132kV Baripada(PG)-Baripada (Tendering in Progress for OPGW): *Contract awarded*
4. 132kV Baripada(PG)-Rairangpur (Tendering in Progress for OPGW): *Contract awarded*

BSPTCL:

Sl No.	***Lines***	***Status***
1	*220 kV Purnea(PG)-Madhepura*	*Protection through PLCC is working properly*
2	*220 kV Biharsharif-BTPS new*	*Commissioning of PLCC is under progress.*
3	*220 kV BTPS new- Begusarai*	*Commissioning of PLCC is under progress.*
4	*220 kV Biharshariff-Bodhgaya line LILO at Khizersarai*	*OPGW is present. Protection is done through DPC.*
5	*220kV MTPS-Motiari line*	*OPGW is installed.*
6	*220KV Madhepura-New Purnea D/C*	*Protection through PLCC is working properly*
7	*220KV Muzaffarpur-Hajipur D/C line*	*Protection through PLCC is working properly*
8	*220KV Patna-Khagaul-SC*	*PLCC Panel working properly.*
9	*220 kV DMTCL(Darbhanga)-Laukhi Circuit-I*	*PLCC Panel working properly*
10	*220 kV Tenughat-Biharsharif S/C*	*PLCC to be commissioned*
11	*220 kV Gaya-Sonenagar New circuit-I*	*Communication through OPGW*
12	*220 kV Pusauli-Dehri S/C*	*PLCC not working*
13	*220 kV Begusarai-Purnea(PG) D/C*	*PLCC working properly*
14	*220 kV DMTCL-Motipur ckt-II*	*PLCC to be commissioned.*
15	*220 kV Dehri- Gaya D/C*	*PLCC working properly*
16	*220 kV Kishanganj(PG)-Kishanganj(B)-II*	*PLCC working properly*

In 79th PCC, BSPTCL submitted PLCC status of some of the lines. The details have been updated in above table.

In 80th PCC meeting, BSPTCL was advised to rectify the PLCC & Autoreclose issues in coordination with their communication wing.

Members may update.

Deliberation in the meeting

Members noted.

ITEM NO. C.5: Additional agenda – Follow-up of the Tripping Incidences in the month of October, 2019.

Tripping Incidences in the month of October, 2019 is given at Annexure.

Members may update the latest status.

Deliberation in the meeting

*Members updated the latest status and same was given at **Annexure-C5**.*

ITEM NO. C.6: Additional agenda – Follow-up of the A/R issues in the month of October, 2019.

A/R issues in the month of October, 2019 is given at Annexure.

Members may update the latest status.

Deliberation in the meeting

*Members updated the latest status and same was given at **Annexure-C6**.*

Annexure-A

Participants in 86th PROTECTION COORDINATION SUB-COMMITTEE (PCC) Meeting of ERPC

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.12.2019 (Wednesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
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7	S.K. SAHU	DCom, POWERGRID Odisha Projects	9078883643	SKSahu@Powergridindia.Com	
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17	Dharm Das Murmu	J.M./CRITL	8877128318	cecritl.jusn1@rediffmail.com	
18	GAUTAM NAYAK	ACE/WBSETCL	9434910544	gtmnyk92@gmail.com	18/12/19
19	JAYANTA KANJILAL	ACE/WBSETCL	9434910189	K_JAYANTA12@REDIFFMAIL.COM	
20	C. K. Haldar	ACE/WB-SLDC	9434910379	chinmay.haldar62@gmail.com	

Participants in 86th PROTECTION COORDINATION SUB-COMMITTEE (PCC) Meeting of ERPC

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 18.12.2019 (Wednesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
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"Coming together is a beginning, staying together is progress, and working together is success." –Henry Ford

Annexure-B2

TEESTA-III TRIPPING INCIDENT ON DATED 25.11.2019

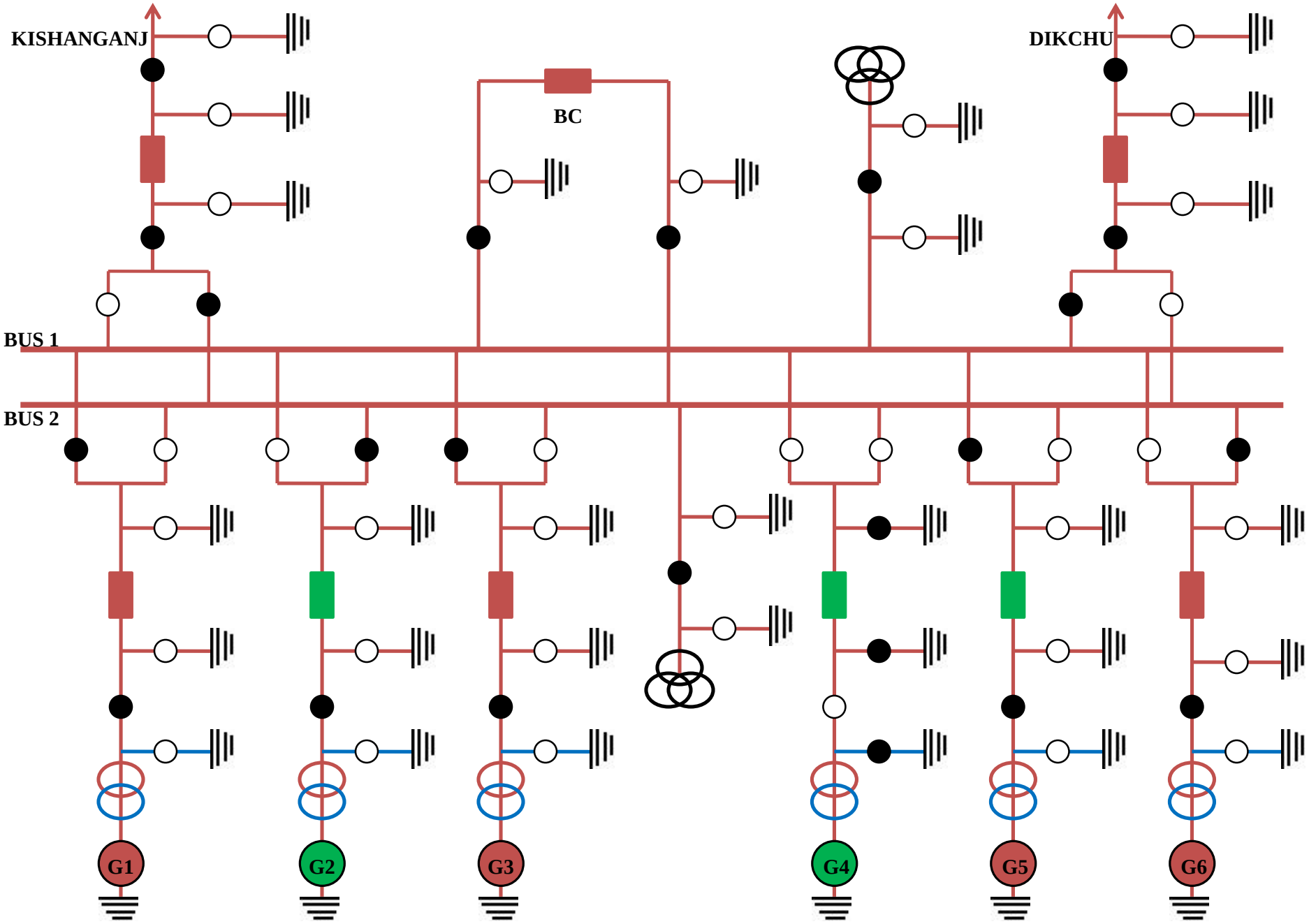
TEESTA-III TRIPPING INCIDENT ON DATED 25.11.2019

- **Date: 25-11.2019, Time 15:30:27 Hrs**
- **Station: Teesta-III HEP**
- **Unit#4 was under Annual Maintenance**

Pre-Fault Condition:

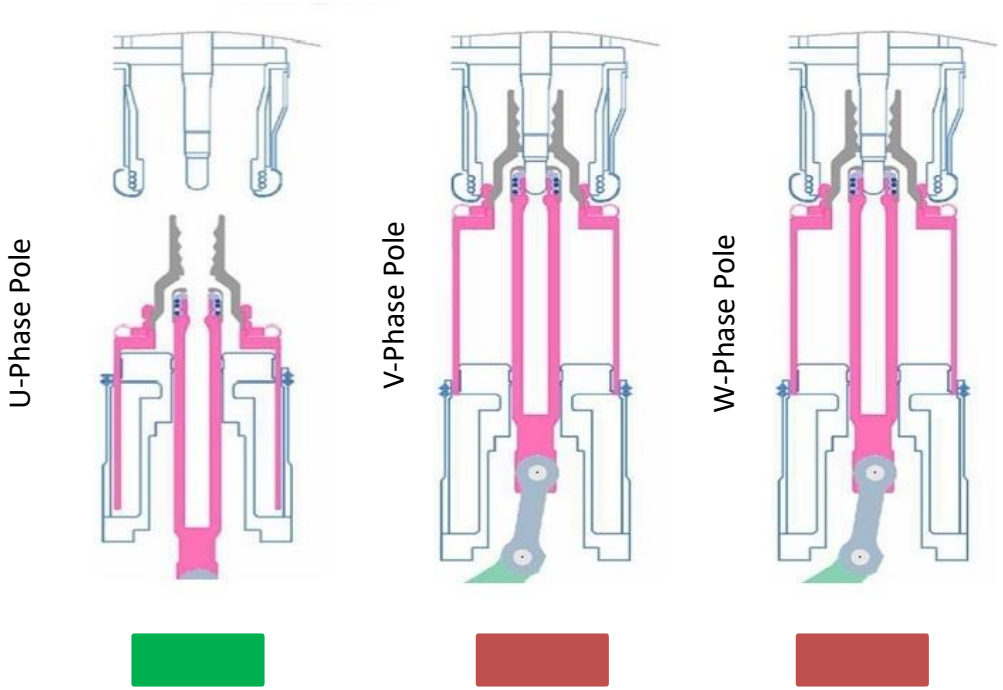
- **400 KV Teesta-III Dikchu Line on Bus-I**
- **Unit#1 , Unit#3 and Unit#5 on Bus-I**
- **400 KV Teesta-III Kishanganj Line on Bus-II**
- **Unit#2 and Unit#6 on Bus-II**
- **400 KV Bus Coupler is in closed position**

- **Unit#3 load was 45 MW**
- **Unit#6 load was 44 MW**
- **Unit#1 load was 8.17 MW**


KISHANGANJ
BC
DIKCHU
BUS 1
BUS 2
G1
G2
G3
G4
G5
G6

FIELD OBSEVATION/PHYSICAL FINDINGS

Unit#5 while synchronizing, Circuit breaker U Phase pole remained in open condition due to sudden hydraulic oil pressure drop (Hydraulic Lockout Stage-I and Stage-II alarm/trip) and where as V- Phase and W -Phase successfully got closed.



CB Pole Feedback to SCADA

SEQUENCE OF EVENTS

- At **15:30:30.470 hrs** Unit#5 main CB Phase discrepancy trip activated and trip command initiated, but as there was hard wired interlock in tripping circuit with hydraulic oil pressure low lockout stage-2, due to which trip command was blocked the tripping of UNIT-5 V-phase and W-phase Circuit breaker poles.

- At **15:30:38.561 hrs** Unit#5 reverse power trip (32G) activated in both main 1 and main 2 relays.
- At **15:30:39:485 Hrs** Bus bar main-2 protection CBF trip activated.
- At **15:30:39:491 Hrs** Bus bar main-1 protection CBF trip activated.
- At **15:30:39.497 Hrs** Bus bar main- 2 Zone 1 Protection trip activated.
- At **15:30:39.503 Hrs** Bus bar main -1 Zone 1 Protection trip activated due to this LBB protection operated and 400KV Bus coupler, Unit-1, Unit#3 and Teesta III-Dikchu line CB tripped.

SEQUENCE OF EVENTS

- At **15:30:39:619 Hrs,** Teesta III-Kishanganj Line tripped due to Over voltage stage2 (setting 480 kv /0.1 sec).

- At **15:30:39:650 Hrs,** Unit#6 also tripped due to over voltage stage 2 and went to Turbine operation.

- In GIS Unit-5 both CB poles V-ph & W- ph opened by pressing manual push button and then bus isolator opened.

RESTORATION

- After receving code from ERLDC,
- Teesta III-Dikchu line charged at 15:55 Hrs
- Teesta III-Kishanganj line charged at 15:58 Hrs
- Unit#1 synchronized at 15:56 Hrs
- Unit#2 synchronized at 16:18 Hrs
- Unit#3 synchronized at 15:55 Hrs
- Unit#6 synchronized at 15:56 Hrs

ANALYSIS

- Due to internal slippage of U-phase breaker pole hydraulic pump, required pressure failed to build-up and resulted in Hydraulic Lockout alarm & trip (Stage-1 & Stage-2).

REMEDIAL MEASURES

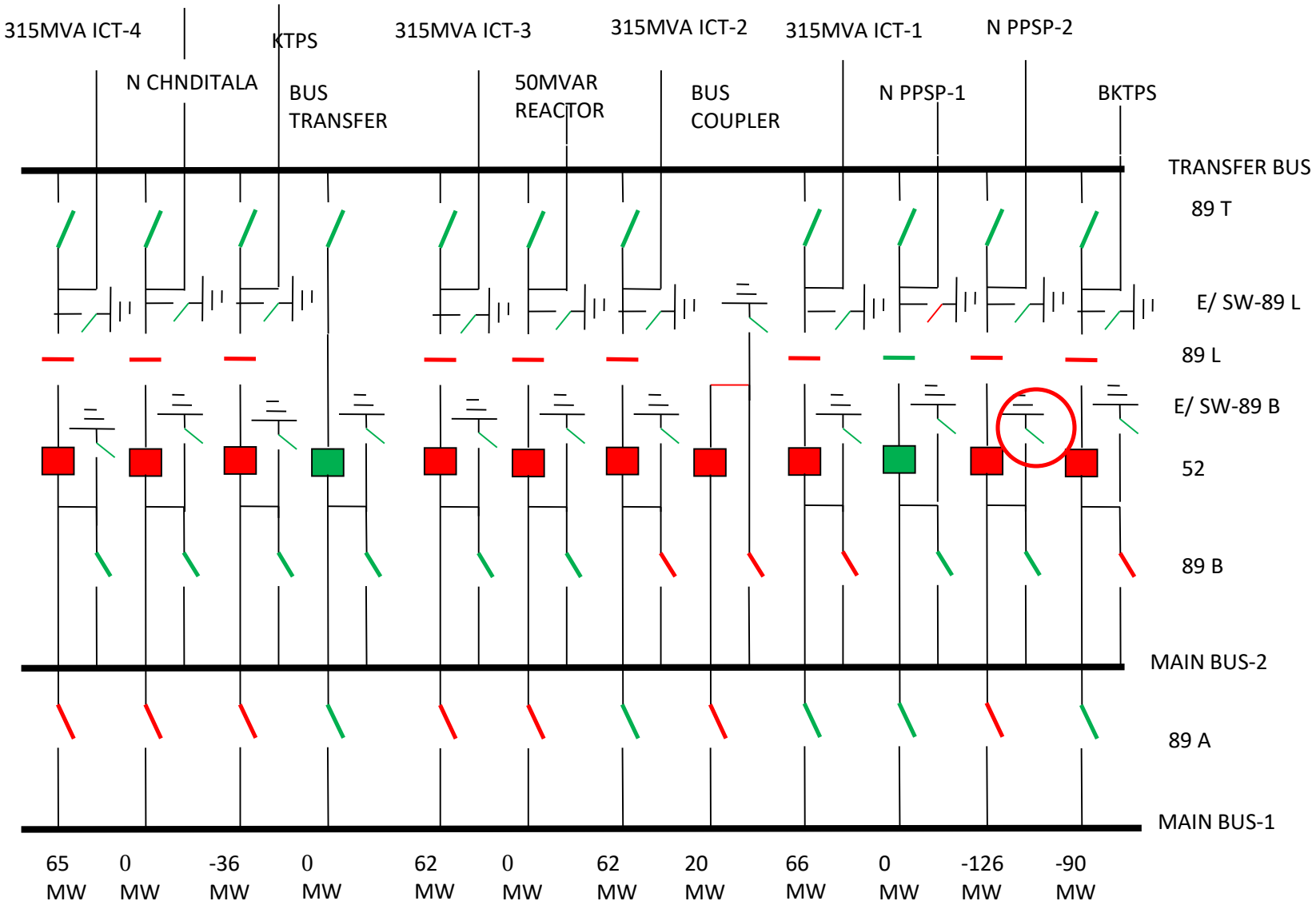
- Faulty OPU assembly was replaced with spare one, after replacement hydraulic line charged and pressure start building and comes to normal operating pressure.

- Breaker operation checked locally and found everything normal.

- On 27.11.2019 at 06:14 hrs, Unit synchronized.

Annexure-B3

400KV SYSTEM AT ARAMBAG S/S BEFORE FAULT ON 05-11-2019 AT 06:52:07




MAIN BUS ISOLATOR
MAIN BUS-2
MAIN BUS-1
MAIN BUS ISOLATOR
EARTH ISOLATOR
BUS ISOLATOR MECHANISM BOX
EARTH ISOLATOR MECHANISM BOX

400kV bus-1 was scheduled to go under shut down from 07:00 hrs for connection of bus pipe of new 125MVAR bus reactor bay.

While shifting Arambag- New PPSP line-2 from 400kV Bus-1 to bus-2, it was found that Bus-2 isolator (staggered Pantograph with earth switch) could not be operated from remote and not even electrically from local. For this reason, the isolators were operated manually one by one.

Red phase isolator was closed successfully. While closing yellow phase isolator, the operating personnel inadvertently operated the earth switch. As the earth switch blade came close to the pantograph, flashing occurred causing earth fault in 400kV bus.

System affected by the incident:

Due to fault in 400kV bus, and due to non- operation of bus-bar protection relay (reason of which is explained later), the fault was cleared from remote ends and consequently 400kV, 220kV and 132kV system of the substation got dead.

kV	Element name	Relay indication	Approx time	Load loss
400	Arambag-BKTPS line	Y ph Z2	<400ms	nil
	Arambag- New PPSP line-2	Y ph, Z2/ local- Z4	540ms	nil
	Arambag- KTPS	y- ph, Z2	<400ms	nil
	Arambag- New Chanditala	DEF	250ms	nil

kV	Element name	Relay indication	Approx time	Load loss
220kV	315MVA ICT-1	Not tripped		nil
	315MVA ICT-2	Not tripped		
	315MVA ICT-3	Not tripped		nil
	315MVA ICT-4	67Y	1.2s	nil
	Arambag- Rishra line	Y ph, Z3	1.05s	Nil
	Arambag- New Bishnupur line-1	Y ph, Z3	1.2s	nil
	Arambag- New Bishnupur line-2	Y ph, Z3	1.2s	nil
	Arambag- Midnapore line-1	Y ph, Z3	1.1s	nil
	Arambag- Midnapore line-1	Y ph, Z3	1.1s	nil
	Arambag- Domjur line -2	Y ph, Z3	640ms	nil

kV	Element name	Relay indication	Approx time	Load loss
132kV	Arambag- Tarakeshwar line-1	67/ 67N	1.5s	nil
	Arambag- Tarakeshwar line-2	67/ 67N	1.5s	nil
	Arambag- Birsingha line-1	Not tripped		10MW*
	Arambag- Birsingha line-2	Not tripped		10MW*
	Arambag-Raina line-1	Not tripped		21MW
	Arambag-Raina line-2	Not tripped		21MW
	50MVA, 132/33kV Trf-1	Not tripped		11MW
	50MVA, 132/33kV Trf-2	Not tripped		11MW
	50MVA, 132/33kV Trf-3	Not tripped		11MW

Damage of equipment:

4 inch bus pipe at pad connector of Y phase Main bus-2 pantograph isolator i.r.o 400kV Arambag- New PPSP line-2 bay.

Operation of protection

400kV Bus bar protection:

This is a high impedance differential protection scheme (ABB make, type RADHA) comprising Zone-A (Main bus-1), Zone-B (main bus-2) and Check zone. CT supervision (95) of individual zones blocks operation of respective differential relays and need external reset for unblocking of protection. Protection block condition is indicated by electrically resettable flag of block relay and one illuminated push-button switch, which may be used for manual blocking also. A zone trip signal is initiated only when operation of 87A or/ and 87B is accompanied by operation of 87CH. Operation of 87 and 95 relays are extended to annunciators at 400kV bus- coupler panel.

On the day of the incident, neither any annunciation nor any indication appeared. But the photographs of B/B panel taken just after the incident clearly show that:

95A DID NOT OPERATE


THIS LAMP WAS DEFECTIVE
AND DID NOT GLOW
95B
CS87B
CS87B-ZONE B SEL. SW.
IN
BLOCK
RESET
REDMI NOTE 8 PRO
64MP QUAD CAMERA
95B OPERATED

THIS LAMP WAS DEFECTIVE AND DID NOT GLOW

95CH OPERATED

Afterwards on 06-11-2019, bus bar protection was checked thoroughly and found that operation of bus bar differential relay was satisfactory except defective lamp in Block PB i.r.o. 95B and 95CH.

Protection was blocked prior to the incident which went unnoticed as annunciation dc in 400kV bus coupler panel was not healthy and Lamps in illuminated PB i.r.o. 95B and 95CH were defective.

Distance relay at other ends:

Operation of distance relay from other ends was correct except New Chanditala 400kV where DEF operating time was wrongly set. The setting has been rectified. Z3 time setting at Domjur 220kV end will be rectified.

Corrective action to be taken:

- Bus bar protection scheme has been thoroughly checked
- Annunciation circuit has been rectified
- ABB make Illuminated has been replaced
- Apart from existing annunciation and indication of the B/B protection, one numerical IED shall be installed shortly for recording of time stamped operation and blocking of B/B protection as well as differential currents of individual zones.

Annexure-B9

List of tripping/auto-reclose incidents in the month of November 2019, where discrepancies has been observed in protection system/DR configuration (discussed in 86th ER PCC meeting)

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Reason	Primary observation/ Remarks	comments in PCC	Action taken (to be updated by utilities)
1	220KV-PUSAULI-DEHRI-1	03-11-2019	11:34	PLCC problem	BSPTCL to update about status of PLCC	BSPTCL to update	
2	220KV-CHANDIL-STPS(WBSEB)-1	04-11-2019	16:30	Master trip relay operated at Chandil end	Why Master trip operated at Chandil ?	Maloperation of master trip relay; relay has been replaced	Solved
3	400KV-NEW PPSP-NEW RANCHI-2	06-11-2019	09:02	DT received at New Ranchi	Why DT was send from NEW PPSP ?	WBSETCL informed DT not sent by New PPSP end. PG ER1 to check PLCC issue	
4		07-11-2019	09:10	DT received at New Ranchi	Why DT was send from NEW PPSP ?		
5	220KV-NEW PURNEA-MADHEPURA-2	07-11-2019	12:16	R-N Fault	No Auto-reclose operation at Madhepura may be explained	A/R enabled at Madhepura end (without carrier protection)	Solved
	220KV-MADHEPURA-NEW PURNEA-1	16-11-2019	11:23	R-N Fault			

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Reason	Primary observation/ Remarks	comments in PCC	Action taken (to be updated by utilities)
6	220KV-FSTPP-LALMATIA-1	11-11-2019	11:30	TRIPPED FROM FSTPP	High fault clearance time and No Auto-reclose operation may be explained	NTPC to share DR	
8	400KV-BARIPADA-KHARAGPUR-1	15-11-2019	11:20	Y-N Fault	Kharagpur end DR to be standardized. Baripada end DR to be shared. Status of A/R operation at both ends to be shared.	PG to share DR at Baripada end. Line tripped from Kharagpur end due to fault in reclaim time.	
9	220KV-MUZAFFARPUR(PG)-DHALKEBAR-2	16-11-2019	16:42	Tripped from Muzaffarpur end only	No fault observed in PMU, tripping may be explained	Faulty trip circuit replaced at Muzaffarpur	Solved
10	400KV-KODERMA-BOKARO-1	19-11-2019	01:27	B-N Fault	DR may be sent, A/R operation may be explained.	No representative from DVC was present. DVC to update	
11	400KV-KODERMA-BIHARSARIFF(PG)-2	20-11-2019	11:56	R-N Fault	No Auto-reclose operation from Biharshariff may be explained	A/R was under shutdown due to OPGW work	Solved
12	220KV-CHANDIL-STPS(WBSEB)-1	21-11-2019	12:35	Y-N Fault	STPS end DR to be shared, Chandil end DR to be standardized, Status	WBPDCL & JUSNL are to solve the issue of PLCC panel	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Reason	Primary observation/ Remarks	comments in PCC	Action taken (to be updated by utilities)
					of A/R operation at both end to be shared		
14	220KV-GAYA-SONENAGAR-1	26-11-2019	21:28	R-N Fault	Only R phase breaker opened at Sonenagar end. But auto-reclose attempt was not taken after dead time. Reason may be explained by BSPTCL.	BSPTCL to update (Same problem was flagged in 85th ER PCC meeting also)	
15	220KV-RANCHI-HATIA-1	29-11-2019	15:40	DT received at Ranchi	Reason for DT sent from Hatia may be explained	At Ranchi end, the CB tripped in PD as initially only Y pole opened due to wiring issue. The same is rectified. No DT sent from Hatia end as per JUSNL. PG ER1 to check PLCC issue	
16	400KV-ARAMBAGH-NEW CHANDITALA-1	10-11-2019	01:26	O/V voltage at Arambagh (423 KV)	O/V mal-operation at Arambagh and step taken to solve the issue may be may be explained. (Arambagh end DR may be sent)	CVT at Arambagh has been replaced	Solved
		27-11-2019	02:50	O/V relay operated at Arambagh			

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Reason	Primary observation/ Remarks	comments in PCC	Action taken (to be updated by utilities)
		28-11-2019	22:01	O/V operated due to problem in line CVT at Arambagh			

ANNEXURE-C1

Sl No.	Name of the incidence	PCC Recommendation	Latest status
85th PCC Meeting			
1.	Tripping of 400 kV Angul – JITPL D/C on 17.10.2019 at 08:11 Hrs	PCC decided to discuss the issue in next PCC meeting wherein JITPL should explain the following: 1. Reason for initiation of master trip (86) contact of unit 1 2. DC earth fault persisting in the switchyard DC system	***Reason for initiation of master trip (86) contact of unit 1*** *– Master trip relay not initiated as the unit is already in shutdown. Master trip relay installed in the main power plant control DCS room GRP panel (Not referring to switchyard). The LBB relay energies due to signal initiation, as DC earth fault in the marshaling box at switchyard observed, resulting LBB operation.* ***DC earth fault appeared in the switchyard DC system****- To avoid such condition marshaling box covered with poly to avoid moisture ingress in the marshaling box.*
2.	Multiple tripping at Budipadar S/s on 08.10.2019 at 19:26 Hrs.	PCC advised OPTCL to check the earthing within the substation and tower footage resistance close to Budipadar S/s. PCC also observed that DR configuration is not proper at Budipadar S/s, PCC advised to rectify the same.	*OPTCL informed that they have substation personnel to check the earthing and tower footage resistance.* *They further informed that they have configured the DR.*
3.	Disturbance at Teesta – III Generating Station on 26.10.2019 at 15:43 Hrs	PCC advised Dikchu to review the GT neutral Over-current setting.	
4.	Tripping of 220 kV FSTPP - Lalmatia S/C & 132 KV KhSTPP-Lalmatia S/C on 22.10.2019 at 11:55 Hrs	PCC advised NTPC to submit the tripping details to ERPC and ERLDC	*NTPC informed that they have submitted the details via email.*
5.	Multiple tripping incident at Indravati on 17-09-2019 at 16:03 hrs	PCC advised Powergrid to analyze the reason for sudden voltage rise.	
6.	Implementation of Zone 4 reduced time setting at	PCC advised BSPTCL to share the details to ERLDC	*BSPTCL informed that they are*

	Sipara Substation and enabling of back up protection in 220 kV Patna-Sipara T/C Differential protection	and ERPC.	*yet to resolve the issue.*
84th PCC Meeting			
7.	Disturbance at Talcher HVDC station on 04.09.19 at 16:59 Hrs.	Powergrid informed that the issue has been referred to M/s Siemens for analysis. PCC noted this and asked powergrid to share the findings.	*LOA placed. OEM would visit the site in January 2020.*
83rd PCC Meeting			
8.	Total power failure at 220 kV Darbhanga (BSPTCL) S/s on 16.08.2019 at 22:23 Hrs.	PCC observed that DR configuration at DMTCL end is not in order. PCC advised DMTCL to configure the DR settings as per the standard.	
9.	Disturbance at 400 kV New Purnea S/s 29.08.2019 at 08:08 Hrs	From the DRs submitted by BSPTCL, it was observed that the sampling frequency was set at 200 Hz which hampers in capturing the correct information. PCC advised BSPTCL to properly configure the DR settings as per the standard approved by PCC.	*BSPTCL informed that they have sent the team to set sampling frequency at 1000 Hz.*
82nd PCC Meeting			
10.	Total Power failure at 220 kV Jorethang, 220 kV Tashiding & 220 kV New Melli S/s on 14.07.2019 at 10:35 Hrs.	PCC advised DANS Energy to take the following actions to avoid the unwanted tripping of the lines: • Since the line length of the transmission lines are less than 20 km, differential protection may be implemented for 220kV Tashiding-New Melli line and Jorethang-New Melli line to improve the reliability.	*DANS Energy informed via mail that they have revised settings of Distance Protection Relay of 220 kV Jorethang New Melli Circuit 1 & 2 at Jorethang.*

		• Distance relay reach settings and selection of primary/secondary in the relay configuration settings to be reviewed at both Tashiding and Jorethang end. • Exact impedance of the line to be measured using off line fault location and the realy settings are to be reviewed accordingly. Distance relays at Tashiding and Jorethang end should be tested to verify the correct operation.	
11.	Disturbance at 220 kV Siliguri S/s on 22.07.19 at 03:57 Hrs.	PCC advised Powergrid to take the following corrective actions: • Time synchronization of DRs need to be checked and rectified at Dalkhola end. • As carrier was sent from dalkhola end in zone-2 initiation, Powergrid was advised to check overreach scheme in the relay settings at Dalkhola end and to review the settings.	*Powergrid informed that the module for time synchronisation have been replaced.*
81st PCC Meeting			
12.	Disturbance at 400 kV Dikchu S/s on 30.06.2019 at 09:55 Hrs.	The time setting for the DEF relay at Jorethang end was 500 msec. PCC advised Jorethang to review the timer setting of DEF protection at Jorethang end. PCC advised Chuzachen to review the zone settings for 132 kV Chuzachen-Rangpo line.	

		PCC advised TPTL to do line patrolling for 400 kV Rangpo-Dikchu line to find out the cause of such high resistive fault in the line.	
13.	Disturbance at 220 kV Budhipadar(OPTCL) S/s on 12.06.2019 at 00:37 Hrs.	PCC advised OPTCL to properly configure the DRs for 220 kV Budhipadar – Korba D/C & 220 kV Budhipadar-Raigarh circuit at Budhipadar end and for 220 kV Budhipadar – Lapanga - II at Lapanga end as per the DR standard finalised in 79th PCC Meeting. PCC also advised OPTCL to check the time synchronisation	*OPTCL informed that they had replaced the old relay at Korba.*
14.	Disturbance at 400 kV Meramundali (OPTCL) S/s on 03.06.2019 at 01:15 Hrs.	For voltage rise issue, PCC advised to check for any CVT related issues in the substation. PCC also advised to carry out earthing audit of the complete substation.	*OPTCL informed that they have issued tender for the earthing audit of the substation.*
15.	Disturbance at 220/132 kV Dumka(JUSNL) S/s on 19.06.2019 at 13:02 Hrs.	PCC advised for time synchronization of the DR outputs at both Maithon & Dumka end.	*JUSNL informed that there was antenna and cable fault in the time synchronisation module.* *JUSNL informed that the material is to be received via courier and same is to resolved by December, 2019.*
76th PCC Meeting			
16.	Disturbance at 400kV Gaya(PG), 220kV Gaya and Bodhgaya on 05-01-19 at 11:20 hrs	PCC advised BSPTCL to review the Khijasarai end relay settings to avoid unwanted tripping at Khijasarai end and submit the relay settings to ERPC for inclusion in PDMS.	*BSPTCL informed that they have sent the details via mail.*
71st PCC Meeting			

17.	Disturbance at 220/132 kV Motipur(BSPTCL) S/s on 15.08.18 at 13:00 hrs.	PCC advised BSPTCL to check the disturbance recorders of all the lines in 220 kV Motipur S/s and communicate the findings to ERPC/ERLDC at the earliest.	
18.	Disturbance at 400 kV Farakka S/s on 19.08.18 at 15:26 hrs.	PCC advised to check the reason for not sending carrier from Farakka to Kahalgaon and non-operation of Autorecloser.	*NTPC informed that the carrier healthiness is being checked and work is in under progress.*

Annexure-C5

List of tripping/auto-reclose incidents in the month of October 2019, where discrepancies has been observed in protection system/DR configuration (discussed in 85th ER PCC meeting)

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Reason	Primary observation/ Remarks	Deliberation in PCC meeting	Status of action taken
1	400KV JEYPORE-GAZUWAKA-I	01-10-2019	13:17	O/V Stage I operated at Jeypore	STATCOM TFR not received for analysis of High voltage	Static O/V relay has been replaced by numeric relay. PG to send .dat file of STATCOM DR	
2	220 kV Rajarhat - Jeerat	02-10-2019	10:44	B-N fault	Why DT sent to Jeer at for SLG fault which led to tripping of line even after successful AR from one end	PG to update	
8	220KV MAITHON-DHANBAD-II	05-10-2019	11:02	B-N fault	Dead time at both ends may be co-ordinated; No breaker operation is being captured in Maithon end DR	PG to update (as per DR at Maithon end dead time is 1200 ms; Dhanbad end Dead time is 1000 ms)	
10	220KV RENGALI(PH)-TSTPP-SC	06-10-2019	15:46	B-N fault	Reason for delayed trip (400 ms) may be explained.	PLCC issue; OHPC/GRIDCO SLDC to update	
11	400KV LAPANGA-OPGC (IB THERMAL)-1	07-10-2019	0:50	B-Phase conductor snapped	As per PMU data repeated attempt of auto-reclose has been observed; As per DR recorded at Lapanga, no successive A/R attempt has been observed. OPGC end DR may be sent	OPTCL/GRIDCO SLDC/OPGC to update	

Annexure-C5

S.NO	LINE NAME	TRIP DATE	TRIP TIME	Reason	Primary observation/ Remarks	Deliberation in PCC meeting	Status of action taken
17	400KV RAJARHAT-JEERAT-SC	08-10-2019	19:25	R-N fault	Fault clearance time more than 100 ms due to delay of Carrier receive. Reason for TCB lock out may be explained. R pole of MCB remained open for more than 1400 ms (till the end of DR). Reason for R pole stuck at Rajarhat end may be explained.	PG to update	
18	400KV NEW PPSP-NEW RANCHI-II	10-10-2019	13:06	B-N fault	Reason for non-attempt of A/R at New Ranchi may be explained. D/P pick up signal in New PPSP end DR may be configured properly. DR may be configured as per decisions taken in 79th ER PCC meeting	PG to update	
24	220KV RENGALI(PH)-TSTPP-SC	17-10-2019	12:35	Y-N Fault	Reason for delayed trip (500 ms approx.) may be explained.	PLCC issue; OPTCL/GRIDCO to update	
25	220KV GAYA-KHIZERSARAI-I	19-10-2019	15:31	B-N fault	Reason for delayed trip (500 ms approx.) may be explained.	PLCC issue; BSPTCL to update	PLCCC is yet to be commissioned
26	220KV BOLANGIR(PG)-BOLANGIR(GRIDCO)-II	22-10-2019	14:32	Backup O/C	Reason for delayed trip (350 ms approx.) may be explained.	PLCC issue; OPTCL/GRIDCO to update	will be rectified in few months

Annexure-C6

Sr No	Date	Time	Line name	Problem at	issues	Utility to update	Action taken by utilities
1	04-10-2019	14:23	400 kV Tala Binaguri - IV	PLCC	Carrier not received at Binaguri end. Delayed tripping of 500 ms from Binaguri end in Z-II.	Bhutan/PG ER2	
2	05-10-2019	11:03	220 kV Maithon – Dhanbad - II	Maithon	No breaker operation is captured in DR	PG ER2	
6	12-10-2019	05:58	400 kV Binaguri - Purnea - II	Binaguri	Reason for line tripping may be explained. Not captured in DR	PG ER2	
7	12-10-2019	08:51	220 kV Gaya Sonenagar - I	Sonenagar	A/R operation started at Sonenagar end; But three poles tripped after 1 second without reclose attempt.	BSPTCL	
8	15-10-2019	04:37	220 kV Gaya Sonenagar - II	Sonenagar	A/R operation started at Sonenagar end; But three poles tripped after 1 second without reclose attempt	BSPTCL	
9	04-10-2019	12:49	400 kV Alipurduar – Bongaigaon – I	Alipurduar	Z-I, Z-II picked up but Z-III did not pick up in DR. DR may be configured as per decision taken in 79th ER PCC meeting.	PG ER2	
10	04-10-2019	05:34	400 kV Subhasgram – HEL - II	Subhasgram	A/R not successful for tie breaker at Subhasgram end but no fault was captured in DR during reclose of tie breaker	PG ER2	
11	07-10-2019	15:35	400 kV Rangpo – Kishanganj S/C	Rangpo	Digital channels called main CB trip and zonal protection trip are not properly configured	PG ER2	
12	08-10-2019	09:38	400 kV Durgapur – Sagardighi – I	Durgapur	CB open R, B & Y may be properly configured. As per these digital channels, three poles opened at Durgapur end. But as per analog channel, A/R operation is successful at Durgapur end.	PG ER2	

Annexure-C6

Sr No	Date	Time	Line name	Problem at	issues	Utility to update	Action taken by utilities
13	14-10-2019	09:54	400 kV Alipurduar – Binaguri – II	Binaguri	Reason for failure of auto-reclose at Tie breaker may be explained	PG ER2	
14	14-10-2019	04:13	220 kV Chukha – Birpara - I	Birpara	No D/P picked up (PGCIL may confirm line tripped in D/P or not). CB OPEN R, Y, B was in reset condition even after three phase line tripping at Birpara end	PG ER2	