



Minutes
of
44th PCC meeting

Date: 17.06.2016
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 44TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 08.06.2016 (WEDNESDAY) AT 11:00 HOURS

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

Member Secretary, ERPC welcomed all the participants to the meeting and informed that constituents are not providing requisite data and detailed timely report with DR., EL etc. to ERPC/ERLDC for disturbances in respective control area. Thereby PCC is facing immense difficulties in meaningful analysis and concluding the incidences with remedial actions/suggestions for system improvement. As a result time and again same type of disturbances are plaguing the grid. This is a serious concern for the eastern grid.

Therefore PCC decided that from now onwards for all the disturbances constituents should submit a detailed disturbance report, at least 10 days before PCC meeting, containing the following information:

- *Single line diagram of the affected area/region*
- *Pre fault conditions*
- *Tripping incident details with proper relay indication*
- *Disturbance record*
- *Analysis of the tripping incident*
- *Conclusion*
- *Remedial measures taken*

These reports will be placed as agenda item of PCC meeting along with further queries by ERPC/ERLDC, if any.

Subsequently in PCC meeting concerned constituents have to place their incidences with all details.

Non compliance of the above mentioned PCC decision will be taken a violation of clause 5.9 of IEGC and will be accordingly reported to CERC

All constituents noted and agreed to comply.

PART – A

ITEM NO. A.1: Confirmation of minutes of 43rd Protection sub-Committee Meeting held on 23rd May, 2016 at ERPC, Kolkata.

The minutes of 43rd Protection Sub-Committee meeting held on 23.05.16 circulated vide letter dated 03.06.16.

Members may confirm the minutes of 43rd PCC meeting.

Deliberation in the meeting

Members confirmed the minutes of 43rd PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES WHICH OCCURRED IN CTU/STU SYSTEMS DURING MAY, 2016.

Item No B.1. Disturbance in Odisha System

B.1.1: Total power failure at 400/220kV Mendhasal S/s of OPTCL System on 06-05-16 at 14:13 hrs.

At 14:13 hrs, 400 kV Mendhasal – New Duburi tripped from both end on zone 1 distance protection due to B-G fault.

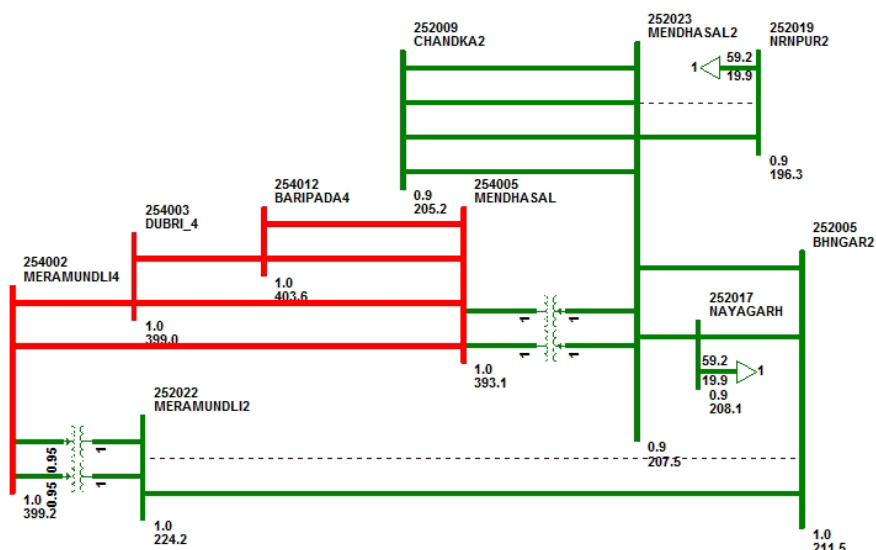
Distance protection of 400 kV Mendhasal - Baripada at Mendhasal end also sensed the fault & line tripped from Mendhasal end only.

At same time, contact of the backup relay (SIEMENS, 7SJ62) of ICT provided for overload alarm got activated which led to operation of LBB.

220 kV Bhanjanagar – Mendhasal S/c line also tripped from Bhanjanagar end on distance protection.

Relay indications are as follows:

Time	Name	Local end	Remote end
14:13 hrs	400/220kV , 315 MVA ICT-I & II at Mendhasal	On 400 kV side – Y Ph, B Ph, E/F, LBB On 220 kV side – E/F	
	400 kV Mendhasal - New Duburi	<u>At Mendhasal</u> D/P, Z-I, Dist – 94.5 km. 4.2 kA	<u>At New Duburi</u> B-N Z-I, F/C 3.467 kA
	400 kV Mendhasal - Baripada	<u>At Mendhasal</u> D/P, B-N, Dist – (-149.8 km) and distance protection	<u>At Baripada</u> Did not trip
	220 kV Bhanjanagar – Mendhasal	<u>At Mendhasal</u> Did not trip	<u>At Bhanjanagar</u> D/P dist = 246.53 km, IA=892A, IB=946A, IC=943A



Analysis of PMU plots:

- From the Talcher PMU plot, approx. 12kV voltage dip has been observed in B phase at 14:13:00 hrs.
- Fault clearance time was approx. 680 ms.

OPTCL may explain the following:

- Fault in 400 kV Mendasal – New Duburi was sensed by both end distance protection in zone 1. But as per Talcher PMU data, fault clearance time was approx. 680 ms. OPTCL may investigate delayed clearance of fault.
- 400 kV Mendasal – Baripada line should not trip from Mendhasal end on distance protection, OPTCL may verify the direction feature of the distance protection.
- OPTCL may explain the tripping of 220 kV Mendasal – Bhanjanagar at Bhanjanagar end.
- OPTCL may furnish the duration of disturbance and amount of energy un-served during the disturbance.

Deliberation in the meeting

OPTCL explained that

- *There was a B-N fault in 400 kV Mendasal - New Duburi line and New Duburi end tripped on Zone 1 B-Phase Earth fault. Fault current was 3.46 kA.*
- *However, Mendasal end distance protection identified as power swing and issued trip command to CB after 600 ms. OPTCL has placed the DR record of the relay.*
- *Because of delayed fault clearance from Mendasal end, over load alarm at 90% of full load for both 315 MVA, 400/220kV ICTs activated and initiated LBB protection.*
- *LBB protection tripped both ICTs and 400 kV Mendasal – Baripada line which were connected to bus-II.*
- *Regarding LBB operation, OPTCL explained that after the incidence of 12.04.16, they have implemented a over load alarm for both 315 MVA, 400/220kV ICTs at 90% of the full load. But the logic was inadvertently initiating LBB protection for both the ICTs.*
- *OPTCL confirmed that the logic has been removed on 6th May 2016 and they will install separate relay for over load alarm within a month.*
- *220 kV Bhanjanagar – Mendasal line tripped from Bhanjanagar end on distance protection due to over load.*

Powergrid informed that 400 kV Mendasal - Baripada line tripped from Baripada end on zone 2 distance protection.

PCC advised OPTCL to check the distance relay of 400 kV Mendasal - New Duburi line at Mendasal end and 220 kV Bhanjanagar – Mendasal line at Bhanjanagar end.

B.1.2: Disturbance at 400/220kV Mendhasal S/s of OPTCL System on 23-05-16 at 17:20 hrs.

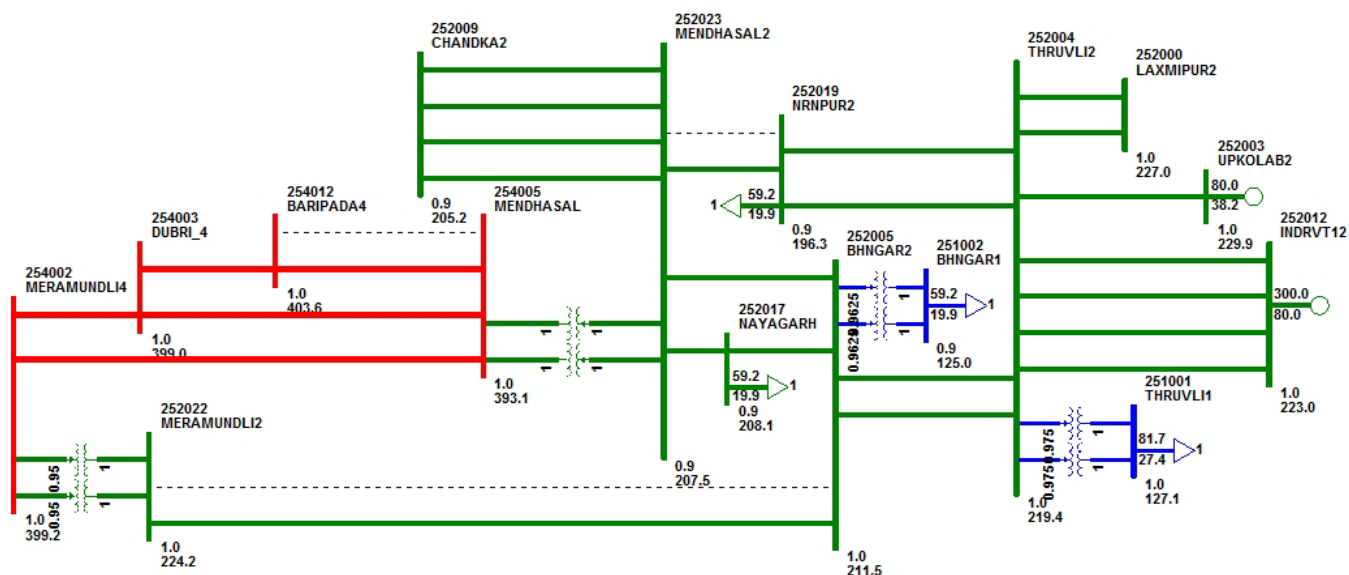
At 17:20 hrs, 400kV Meeramandali- Mendhasal S/c tripped from both end on indication of DP, R-Ph, E/F, Zn-I at Mendhasal end due to tower damage at Loc. No 180, 181 & 182 (near to Mendhasal end i.e 45 KM) because of strong wind.

400kV Meeramandali-New Duburi D/c were out of service due to tower collapse.

At 17:28 hrs, 400kV Mendhasal- Baripada S/c line tripped from Mendhasal end on zone 1 distance protection, B-Ph, Zone I and carrier send to Baripada end.

At 17:28 hrs, 400kV Mendhasal- New Duburi S/c line tripped on overvoltage from Mendhasal end.

After tripping of above mentioned lines MW flow on both 315 MVA ICTs at Mendhasal & New Duburi became zero.



Relay indications are as follows:

Time	Name	Local end	Remote end
17:20 hrs	400kV Mendhasal-Meeramandali S/c	<u>At Mendhasal</u> DP, R-Ph, E/F, Z-I, F.D-45 KM (tower Collapsed)	<u>At Meeramandali</u> Tripped
17:28 hrs	400kV Mendhasal-Baripada S/c	<u>At Mendhasal</u> DP, B-Ph, Z-I, F.D- 23.8 KM, Carrier send	<u>At Baripada</u> Tripped
17:51 hrs	400kV Mendhasal-N.Duburi S/c	<u>At Mendhasal</u> O/V	<u>At N.Duburi</u> Did Not Trip

Analysis of PMU plots:

- From the Rengali PMU plot, approx. 15 kV voltage dip has been observed in R-Ph phase at 17:20:18 hrs.
- At 17:29:05 hrs, 4 kV voltage dip has been observed in B-Ph.
- Fault clearance time in both the incident was approx. 80 ms.

OPTCL may explain the following:

- OPTCL may explain the tripping of 400kV Mendhasal- New Duburi S/c line on overvoltage from Mendhasal end.
- OPTCL may furnish the duration of disturbance and amount of energy un-served during the disturbance.

Deliberation in the meeting

OPTCL explained that

- At 17:20 hrs, there was a R-N fault in 400 kV Mendhasal - Meramundali line and Mendhasal end tripped on Zone 1 R-Phase Earth fault.
- Meramundali end tripped on zone 1, R-N fault and fault distance was 76 km from

Meramundali end.

- *At 17:28 hrs, there was another R-N fault in 400kV Mendhasal- Baripada S/c and Mendasal end tripped on Zone 1 and carrier inter trip has been sent to Baripada end.*
- *However, carrier inter trip was not received at Baripada and Baripada end tripped on zone 2, R-N fault, the fault distance was 35.5 km.*
- *Thereafter over voltage observed at 400 kV Mendasal S/s because of load thrown off and 400kV Mendhasal- N.Duburi S/c line tripped from Mendhasal end on Stage-1 over voltage.*

PCC advised OPTCL and Powergrid (Odisha) to check the PLCC of 400kV Mendhasal- Baripada S/c line.

OPTCL and Powergrid (Odisha) pointed out that because of some mutual co-ordination problem many issues related to O&M of line, bays and equipments available in OPTCL, OHPC and Powergrid sub-stations are not getting properly addressed.

In order to resolve these pending issues PCC advised Member Secretary to have joint interaction with OPTCL/GRIDCO and Powergrid (Odisha) at Bhubaneswar on 17.6.16 during the course of workshop on “Emerging Issues in Power Sector” jointly organized by ERPC, ERLDC and Gridco at Bhubaneswar on 17-18/6/2016.

B.1.3: Multiple elements tripping in OPTCL system on 25-05-16 at 15:20 hrs.

At 15:20 hrs, the following lines were tripped due to inclement weather condition:

- 400kV Mendhasal- Baripada S/c tripped from Baripada end on indication B-Ph, E/F, Z-I & R-Y-B –Ph
- 400kV New Duburi- Mendhasal S/c tripped from New Duburi end on Z-III distance protection.
- 220kV Mendhasal-Nayagarh S/c tripped from Nayagarh end on operation of Y-Ph O/C relay.

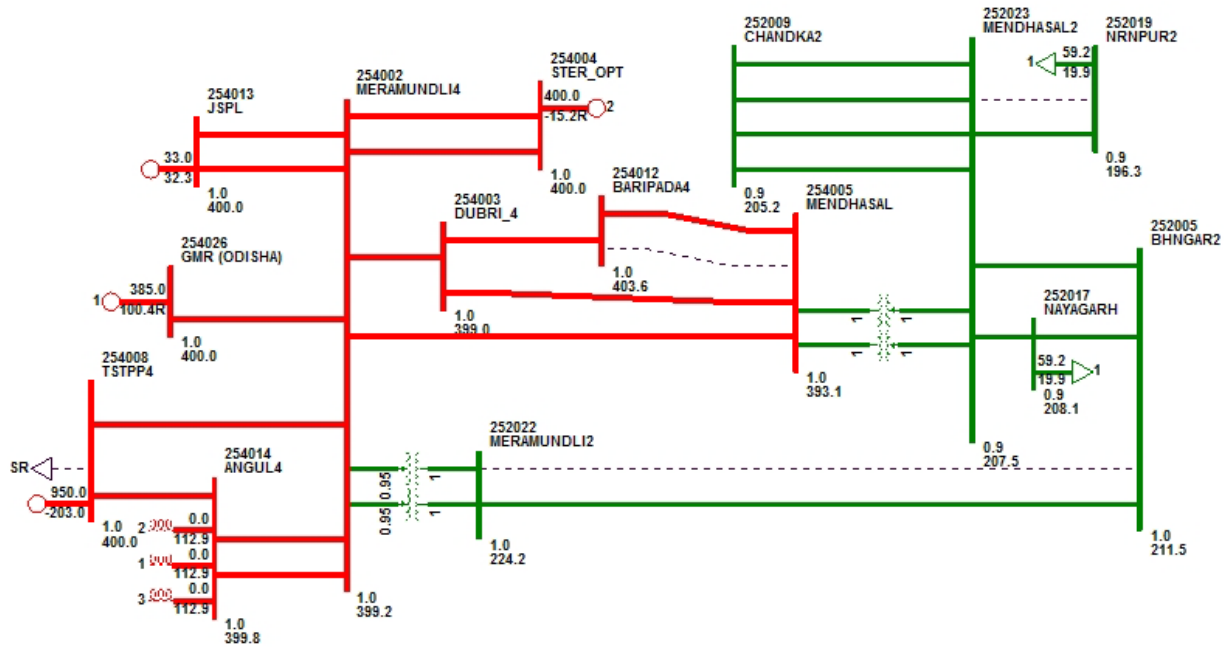
At 15:43 hrs, 400kV New Duburi- Baripada S/c line was tripped from Baripada end only on distance protection.

Relay indications are as follows:

Time	Name	Local end	Remote end
15:20	400kV Mendhasal- Baripada S/c	<u>At Mendhasal</u> Did Not Trip	<u>At Baripada</u> B-Ph , E/F, Z-I
	400kV Mendhasal- N.Duburi S/c	<u>At Mendhasal</u>	<u>At N.Duburi</u> DP, R-Ph, Y-Ph, B-Ph, F.D-152.5kM , Zn-III
	220kV Nayagarh- Mendhasal	<u>At Nayagarh</u> Y-Ph , O/C	<u>At Mendhasal</u> Did Not Trip
15:43	400kV N.Duburi- Baripada S/c	Tripped from Baripada end only on DP	

Analysis of PMU plots:

- From the Rourkela PMU plot, approx. 6 kV voltage dip has been observed in B-Ph phase at 15:20:20 hrs. And after 1 sec i.e 15:20:21 hrs further 6kV voltage dip has been observed in B-Ph.
- Fault clearance time in both the incident was approx. 80 ms.



OPTCL may explain.

Deliberation in the meeting

OPTCL explained that there was a transient B-N fault in 400kV Mendhasal-Baripada S/c line and Mendasal end tripped on zone 1 protection and successfully auto reclosed.

However, Baripada end tripped on zone 1, B-N fault and auto recloser attempted but failed due to permanent fault as intimated by Powergrid (Odisha).

OPTCL informed that 220kV Nayagarh-Mendhasal line tripped from Nayagarh end on over current protection due to over load.

400kV New Duburi- Baripada S/c line tripped from Baripada end as direct trip received from New Duburi end due to spurious signal initiated from New Duburi end.

OPTCL failed to explain the tripping of 400kV Mendhasal-New Duburi S/c line from New Duburi end on zone 3 distance protection and informed that disturbance record is yet to be collected.

PCC felt that without complete information i.e. DR of N. Duburi and detail analysis from OPTCL the tripping incidence could not be analyzed. Therefore, PCC advised OPTCL to place the detail analysis of the event in 33rd TCC Meeting.

B.1.4: Disturbance in OPTCL System on 10-05-16 at 15:39-16:44 hrs.

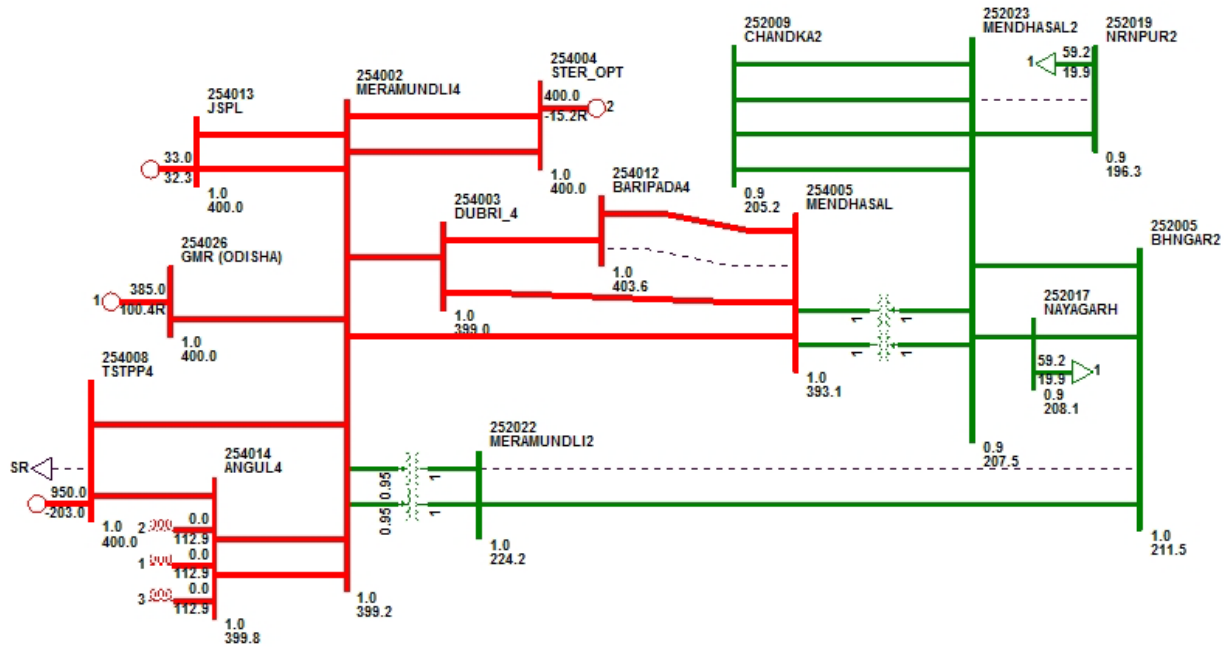
On 10.05.16, at 15:39 hrs to 16:44 hrs, multiple elements tripped in PGCIL, Orissa, GMR & JITPL substation due to inclement weather condition in Orissa. The following sequence of incidents were observed:

At 15:39 hrs:

400kV Talcher- Angul S/c tripped from both ends on SLG (i.e B-N) fault.

Simultaneously, 220kV Meeramandali- Bhanjanagar-II & 220kV Meeramandali- TTPS-II tripped from Meeramandali end on indication of B-N fault.

400/220kV 315 MVA ICT-I at Meeramandali was also tripped from LV (i.e.220kV side) due to actuation of overcurrent protection.



At 15:43 hrs:

400kV lines emanating from Meeramandali S/s such as Meeramandali- Angul D/C & Meeramandali-Sterlite -I tripped from both end due to occurrence of SLG (i.e B-N) fault. However, Meeramandali-Sterlite Ckt-II tripped from Sterlite end only.

400kV Meeramandali- Angul Ckt-I & II were successfully normalized at 16:03 hrs & 16:18 hrs respectively.

At 15:54 hrs:

400kV Meeramandali- N.Duburi- Ckt-I & II tripped from Meeramandali end on indication of Y-N & B-N fault respectively.

At 16:05 hrs:

400kV GMR- Angul-II tripped due to transient SLG (i.e R-N) fault and autorecloser operation was successful at both ends.

However, R-Ph current of 400kV GMR- Angul-II was very high (10kAmp), while R-Ph voltage reduced to 101kV (Phase to neutral) and zero sequence current raised to 12 KA. Hence GT#2 tripped (as zero sequence current reaches more that the setting value).

Subsequently arc was observed in line isolator contact of the 400kV GMR- Angul-II line. GMR manually opened the 400kV GMR- Angul-Ckt-II as a preventive measure while breaker at Angul end tripped after receiving the DT from GMR end.

At 16:44 hrs:

400kV Meeramandali- N.Duburi D/C tower collapsed at loc. No- 8/0 ,8/1 & 8/2 due to tornado.

Charging attempt of 400kV Meeramandali- N.Duburi Ckt-I was taken at Meeramandali end but line tripped on indication of DP and simultaneously LBB protection had initiated at Meeramandali S/s.

All the elements connected to 400kV main bus- I at Meeramandali tripped from local end. GMR running U#3 connected to Odisha system had also tripped.

Heavy voltage dip was observed at 400kV GMR & JITPL bus and caused tripping of GT of JITPL U#1 & GMR U #1 due to unit auxiliaries tripping.

Relay indications are as follows:

S.No	Elements Tripping	Local End	Remote End
15:39 hrs	400kV Talcher- Angul S/c	<u>At Talcher</u> B Phase E/F ,DP	<u>At Angul</u> Z-1, F.D-15.41 KM,F.C-16.6 KA
	220kV Meeramandali- Bhanjanagar-I	<u>At Meeramandali</u> B-Ph to E/F, F.D- 4.774 KM	<u>At Bhanjanagar</u> Did Not Tripped
	220kV TTPS- Meeramandali- II	<u>At Meeramandali</u> B-Ph to E/F, F.D- 8.50 KM	<u>At TTPS</u> NA
	315 MVA ICT-I at Meeramandali	Tripped from 220kV side on O/C	
15:43 hrs	400kV Meeramandali- Angul-I	<u>At Meeramandali</u> B-N fault, F.D- 59.4 KM	<u>At Angul</u> NA
	400kV Meeramandali- Angul-II	<u>At Meeramandali</u> B-N fault, F.D- 6.0 KM	<u>At Angul</u> NA
	400kV Meeramandali- SEL-I	<u>At Meeramandali</u> B-N fault, F.D- 2.0 KM	<u>At SEL</u> NA
	400kV Meeramandali- SEL-II	<u>At Meeramandali</u> Did Not Tripped	<u>At SEL</u> Tripped
15:54 hrs	400kV Meeramandali- N.Duburi-I	<u>At Meeramandali</u> Y-Ph to E/F, F.D- 12.5 KM	<u>At N.Duburi</u> NA
	400kV Meeramandali- N.Duburi-II	<u>At Meeramandali</u> B-N fault, F.D- 59.2 KM	<u>At N.Duburi</u> NA
16:05 hrs	400kV GMR –Angul-II	<u>At GMR</u> R-N fault, AR successful (manually opened)	<u>At Angul</u> R-N fault, AR successful (tripped due to DT received)
	GMR U #2	Tripped due to auxiliary tripped	
16:44 hrs	400kV Meeramandali- N.Duburi-I	<u>At Meeramandali</u> DP. F.D- 3.9 KM	<u>At N.Duburi</u> NA
	400kV SEL-II	Tripped on LBB	
	400kV Mendhasal- Meeramandali S/c		
	400kV Angul Ckt- Meeramandali -II		
	400kV JSPL- Meeramandali Ckt-I		
	315 MVA ICT-I		
	400kV GMR- Meeramandali Ckt-I		
	GMR U#3	Tripped due to Failure of auxiliary	
	GMR U#1		
	JITPL U #1		

Analysis of PMU plots:

At 15:39 hrs

- From the Rengali PMU plot, approx. 55kV voltage dip has been observed in B-Ph at 15:39:44 hrs.
- Fault clearance time was approx. 80 ms.

At 15:43 hrs

- From the Rengali PMU plot, approx. 55kV voltage dip has been observed in B-Ph at 15:43 hrs. And after 1000 ms successful Autorecloser operation was observed but within 25 ms (i.e Reclaim time) further dip was observed in B-Ph.
- Fault clearance time was approx. 80 ms.

At 16:05 hrs

- From the Rengali PMU plot, approx. 20kV voltage dip has been observed in R-Ph at 16:05:23 hrs.
- Fault clearance time was approx. 80 ms.

At 16:44 hrs

- From the Rengali PMU plot, approx. 140 kV voltage dip has been observed in R,Y & B-Ph at 16:44:13 hrs.
- Fault clearance time was approx.280 ms.

Powergrid, OPTCL, GMR and JITPL may explain.

Deliberation in the meeting

Powergrid and OPTCL explained that

At 15:39 hrs

Powergrid (Odisha) explained that there was a B-N fault in 400kV Talcher- Angul S/c line and the fault got cleared from Talcher and Angul end on zone 1 distance protection after unsuccessful auto reclose operation.

OPTCL explained that there was another B-N fault in 220kV TTPS- Meeramandali line - II due to jumper snapping and Meramundali end tripped on Earth fault protection. However, both 220kV TTPS- Meeramandali line - I & II tripped from TTPS end on E/F protection.

OPTCL explained that the tripping of 220kV Meeramandali- Bhanjanagar-I from Meramundali end and tripping of 315 MVA ICT-I at Meeramandali was due to overload on overcurrent protection.

At 15:43 hrs

Powergrid (Odisha) explained that there was B-N fault in 400kV Meeramandali- Angul-II and Angul end tripped on zone 1, B-N fault.

OPTCL informed that 400kV Meeramandali- Angul-I & II tripped from Meramundali end on Zone 1, B-N fault.

OPTCL explained that there was another fault in 400kV Meeramundali-Sterlite line I and Meramundali end tripped on zone 1, B-N fault. However, 400kV Meeramundali-Sterlite line I & II tripped from Sterlite end as both lines were charged through one main & tie CB due to incomplete

dia.

PCC could not conclude the tripping incidences due to non-availability of detail report and therefore, advised OPTCL to place the detail analysis in 33rd TCC Meeting.

Item No B.2. Disturbance in BSPTCL System

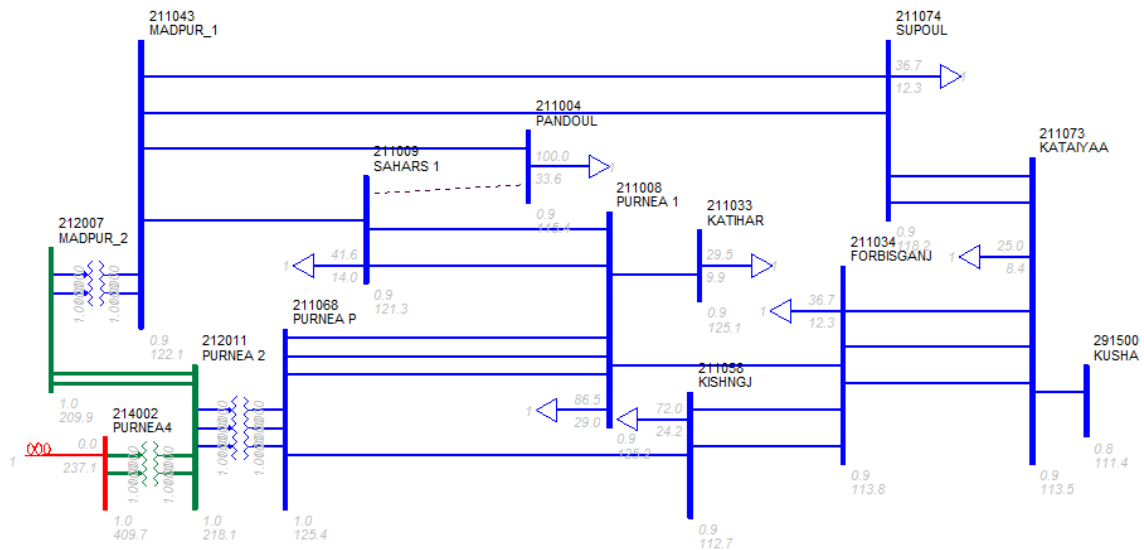
B.2.1: Disturbance at 220/132kV Purnea (PG/BSPTCL) & Madhepura S/s on 04-05-16 at 06:08 hrs.

At 06:08 hrs, 220kV Purnea- Madhepura line-I tripped from both end on B-Ph distance protection. After investigation, it was found that B-Ph Jumper of the said Ckt was snapped at Loc. No 28.

Prior to tripping of 220kV Purnea- Madhepura line-I from both ends, 220kV Purnea- Madhepura line-II was already tripped at 05:04 hrs due to snapping of R-Ph Jumper at Loc. No-104.

After tripping of 220kV Purnea- Madhepura line-I & II, load at Madhepura, Supaul & Nepal area was being fed through 132kV Purnea (B)- Forbisgunj S/c line & 132kV Purnea (PG)- Kishanganj S/c line and caused the tripping of the lines on actuation of overcurrent protection from Purnea (B) & Purnea (PG) end respectively.

Due to tripping of above mentioned 220kV & 132kV lines from Purnea (PG & BSPTCL) approx. 110 MW Nepal power interrupted.



Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
05:04 hrs	220 KV Purnea (PG)-Madhepura CKT-II	<u>At Purnea (PG)</u> Y-N fault(29.4 KM from Purnea(PG) end,4.4 KA)	<u>At Madhepura</u> R-Npickup ,67.04 KM from Madhepura end)
06:08 hrs	220 KV Purnea (PG)-Madhepura CKT-I	<u>At Purnea (PG)</u> B-N fault(27.2 KM from Purnea(PG) end,4.8 KA)	<u>At Madhepura</u> B-N Pick up (Z-1,72 KM from Madhepura end)
	132kV Purnea (PG)- Kishanganj S/c	O/C from Purnea (PG)	
	132kV Purnea (B)- Forbisgunj S/c	O/C from Purnea (B)	

Analysis of PMU plots:

- From the Binaguri PMU plot 18kV voltage dip has been observed in B-Ph at 06:08 hrs
- Fault Clearance time was less than 100 ms.

BSPTCL and Powergrid may explain.

Deliberation in the meeting

BSPTCL and Powergrid explained that

- *At 05:04 hrs, there was a Y-N fault in 220 KV Purnea (PG)-Madhepura CKT-II, both Purnea (PG) and Madhepura end cleared the fault in zone-1.*
- *At 06:08 hrs, there was another fault B-N fault in 220 KV Purnea (PG)-Madhepura CKT-I, both Purnea (PG) and Madhepura end cleared the fault in zone-1.*
- *Thereafter, 132kV Purnea (PG)- Kishanganj S/c line tripped from Purnea (PG) end and 132kV Purnea (B)- Forbisgunj S/c tripped from Purnea (B) end on over current protection due to over load.*

PCC enquired about status of 220 KV Purnea (PG)-Madhepura CKT-II at 06:08 hrs.

BSPTCL failed explain the sequence of tripping.

PCC advised BSPTCL to submit detailed report to ERPC and ERLDC.

B.2.2: Total Power failure at 220/132kV Purnea & Madhepura S/s on 17-05-16 at 20:50 hrs.

At 20:48 hrs, 132kV Madhepura- Supaul D/c tripped during inclement weather condition. Thus after tripping of both 132kV Ckt-II, load at Supaul, Katiya & Nepal area was being fed through 132kV Purnea (B)- Forbisgunj S/c line & 132kV Purnea (PG)- Kishanganj S/c line and it had caused the tripping of the said line on actuation of overcurrent protection from Purnea (B) & Purnea (PG) end respectively.

Due to tripping of above mentioned 132kV lines from Purnea (PG & BSPTCL) approx. 120 MW power got interrupted at Nepal area.

Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
20:48 hrs	220kV Purnea -Madhepura CKT-I	Tripped	
	132kV Purnea (PG)- Kishanganj S/c	O/C from Purnea (PG)	
	132kV Purnea (B)- Forbisgunj S/c	O/C from Purnea (B)	

Analysis of PMU plots:

- From the Binaguri PMU plot 5kV voltage dip has been observed in B-Ph at 20:48 hrs
- Fault Clearance time was less than 100 ms.

BSPTCL may explain the tripping 132kV Madhepura- Supaul D/c lines.

Deliberation in the meeting

BSPTCL explained that

- There was B-N fault in 132kV Supaul-Pulbaras line due to LA burst and both 132kV Madhepura-Supaul D/C lines tripped from Supaul on distance protection.
- 220 KV Purnea (PG)-Madhepura CKT-I, tripped from Madhepura end on zone 1 B-N fault.
- 220 KV Purnea (PG)-Madhepura CKT-II is in service.
- 132kV Purnea (PG)- Kishanganj S/c line tripped from Purnea (PG) end and 132kV Purnea (B)- Forbisgunj S/c tripped from Purnea (B) end on over current protection due to over load.

BSPTCL failed to explain the sequence of tripping and reason for tripping of 220 KV Purnea (PG)-Madhepura CKT-I, tripped from Madhepura end and tripping both 132kV Madhepura-Supaul D/C lines tripped from Supaul.

PCC advised BSPTCL to submit the detailed report to ERPC and ERLDC.

Item No B.3. Disturbance in JUSNL System

B3.1. Total Power failure at 220/132kV Chandil S/s of JUSNL system on 14-05-16 at 16:48 hrs.

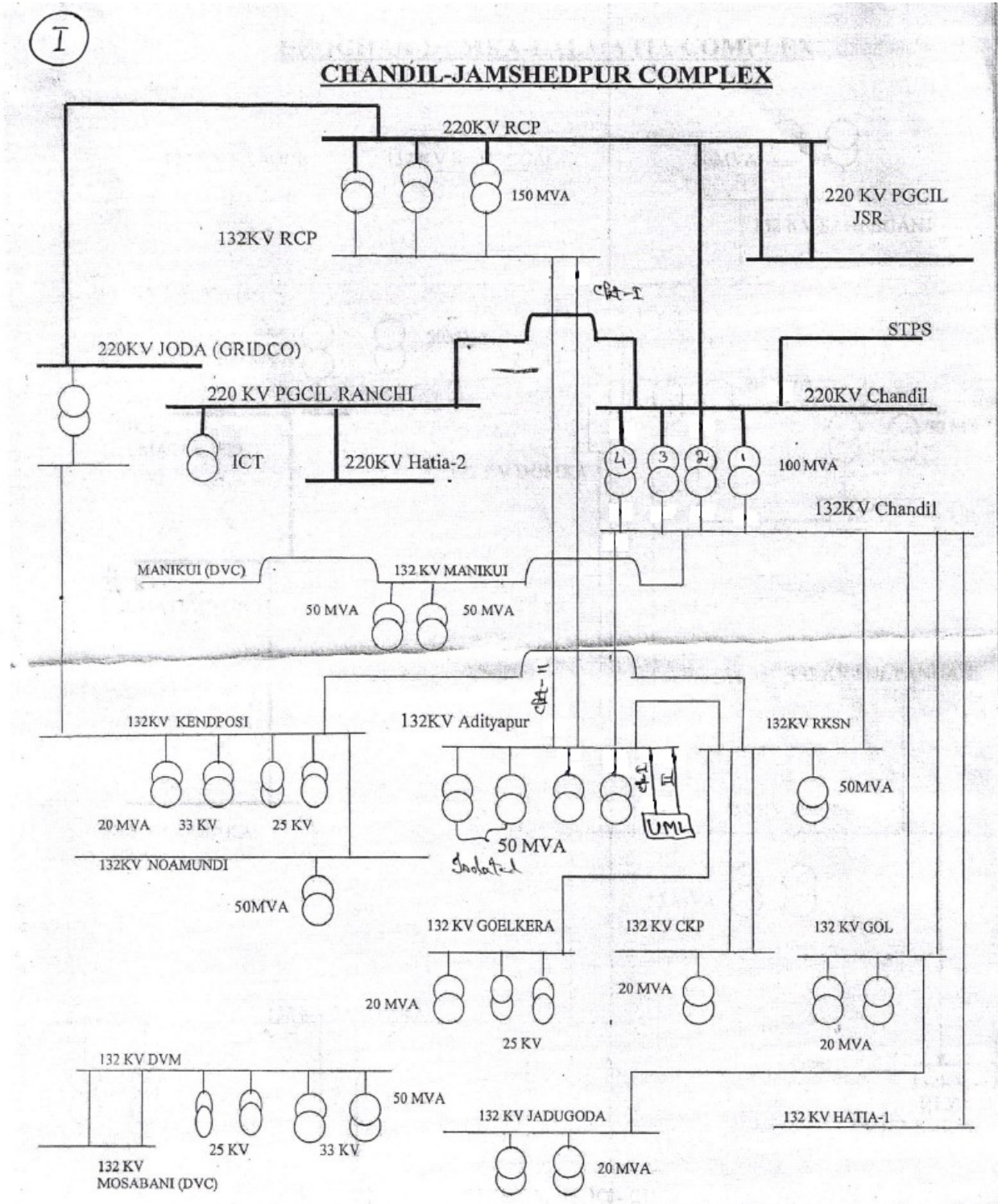
At 16:18 hrs, 220kV Chandil- Santaldih S/c tripped from both end due to Ph-Ph fault (i.e Y-B fault). Charging attempt of the line was taken at 16:48 hrs, but line did not hold and subsequently all the 220kV lines emanating from Chandil S/s i.e. 220kV Chandil- Ramchandrapur S/c & 220kV Chandil-Ranchi S/c tripped from remote end.

After tripping of 220kV lines at Chandil S/s, all the 132kV feeders of 132kV Chandil S/s were manually switched off and approx. 190 MW load loss occurred at Chandil & its surrounded area including traction loss of 25 MW at RKS WN, Goelkera & Kendposi.

Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
16:18 hrs	220kV Santaldih-Chandil S/c	<u>At Chandil</u> Trip	<u>AT Santaldih</u> B-Y PH , O/C, ZONE 1&2 , DISTANCE 71.89 KM ,FAULT CURRENT B PH 2.78KA & Y PH 2.89 KA
16:48 hrs	220kV Santaldih-Chandil S/c	<u>At Chandil</u> SOTF, Carrier send, AR lockout, O/C, E/F, Z-I, F.C- Iy- 88.42 A, Ib- 37.95 A, Ir- 0 A	<u>AT Santaldih</u> NA
	220kV Ranchi-Chandil S/c	<u>At Chandil</u> Master Trip relay	<u>At Ranchi</u> Z-II, R-Ph F.D- 78 KM, F.C- 1.75 KA
	220kV Ramchandrapur-Chandil S/c	<u>At Chandil</u> Did Not Trip	<u>At RCP</u> Started Phase- Y-B-N, O/C , I >1 , E/F started, Fault Duration- 71.81 ms, fault Location- 25.71 KM, F.C- IY- 3.43 KA, Ib- 3.17 KA , Z-III
	132kV Chandil-RKS WN	Manually Switched off	

132kV	Chandil-Adityapur- RКСWN
132kV	Chandil-Tamar
132kV	Chandil-Golmuri



Analysis of PMU plots:

- From the Ranchi PMU plot 10 kV Voltage dip has been observed in both Y & B-Ph at 16:46:39 hrs.

- Fault clearance time was approx.180 ms.

JUSNL and Powergrid may explain the following:

- Tripping of 220kV Chandil- Ramchandrapur S/c from Ramchandrapur on Zone 3
- Tripping of 220kV Chandil- Ranchi S/c from Ranchi end on zone 2

Deliberation in the meeting

JUSNL explained that

- *At 16:18 hrs, 220kV Chandil- Santaldih S/c line tripped from both ends due to Ph-Ph fault (i.e Y-B fault). Tower at loc 257 was fallen on the ground.*
- *At 16:48 hrs, charging attempt of the line was taken, but line did not hold.*
- *At 17:00 hrs, there was another R-N fault in 220kV Chandil- Ranchi S/c line near to 220kV Chandil S/s, Ranchi end tripped on zone 2 and Chandil end tripped on over current (non-directional) DT protection. DT was 100 ms.*
- *220kV Chandil- Ramchandrapur S/c also tripped from over current earth fault protection.*

R-N Fault in 220kV Chandil- Ranchi S/c was also observed in Ranchi PMU plot. Fault clearing time was 340 ms.

It was informed that ERPC protection team already recommended for reviewing of over current settings at 220kV Chandil and Ramchandrapur for proper coordination.

PCC advised JUSNL to comply the ERPC protection team observations at the earliest.

B3.2. Total Power failure at 220/132kV Chandil S/s of JUSNL system on 15-05-16 at 16:45 hrs.

At 16:45hrs, 220kV Chandil- Ramchandrapur S/c tripped from both end on indication of DP, B-Ph, Z-I at Chandil and Z-II from RCP end during the inclement weather condition.

220kV Chandil- Santaldih S/c was already under breakdown due to tower collapse.

At the same time, 220kV Ranchi- Chandil S/c also tripped from both end on R-Y fault. All the 132kV feeders emanating from Chandil S/s were made manually off.

Due to tripping of above mentioned lines from 220/132kV Chandil S/s approx. 190 MW load loss occurred at Chandil & its surrounded area including traction loss of 20 MW at RKSWN, Goelkera & Kendposi.

Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
16:45 hrs	220kV Ramchandrapur- Chandil S/c	<u>At Chandil</u> B-Ph, Start Y-B Ph, Z-I, E/F, F.D- 1.35 KM, F.C- IR- 0.95 KA , IY- 1.450 KA, IB- 4.159 KA	<u>At RCP</u> Start Phase- R-Y-B Ph, Tripped Phase- R-Y-B Ph, E/F start, DP, Z-II, F.D- 12.61 KM, F.C- IR- 0.89 KA, IY- 0.65 KA, IB- 4.75 KA
	220kV Ranchi- Chandil S/c	<u>At Chandil</u> O/C, E/F, DP operated, IR-	<u>AT Ranchi</u> Tripped

		1.71 KA, IY- 1.417 KA , IB- 0.754 KA	
	All 132kV Feeders at 220/132kV Chandil S/s	Manually Switched Off	

Analysis of PMU plots:

- From the Ranchi PMU plot 5 kV Voltage dip has been observed in both R & Y-Ph & 2kV dip in B-Ph at 16:46hrs.
- Fault clearance time was approx.160 ms.

JUSNL and Powergrid may explain the following:

- Tripping of 220kV Ranchi- Chandil S/c line from both ends.

Deliberation in the meeting

JUSNL explained that

- *There was a B-N fault in 220kV Chandil- Ramchandrapur S/c and Chandil end tripped on zone 1 and Ramchandrapur end tripped on zone 2.*
- *Simultaneously, 220kV Ranchi- Chandil S/c line also tripped from Chandil end on on over current (non-directional) DT protection. DT was 100 ms.*

It was informed that ERPC protection team already recommended for reviewing of over current settings at 220kV Chandil and Ramchandrapur for proper coordination.

PCC advised JUSNL to comply the ERPC protection team observations at the earliest.

Item No B.4. Disturbance at 400/220 kV Koderma S/s of DVC System on 25-05-16 at 08:53 hrs

At 08:53 hrs, multiple elements tripping occurred at 400/220kV Koderma S/s due to inclement weather condition. All the 400kV lines emanating from Koderma S/s along with 400/220kV, 315 MVA ICT-I & II at Koderma tripped.

GT#2 of Koderma had tripped by overvoltage protection & low forward power and approx. 400MW generation loss & 250 load loss occurred in Koderma S/s & its surrounded area.

Relay indications are as follows:

Sl. No.	Name of Bay / Line	Local End Relay type	Remote End Relay type
1.	KODERMA-BOKARO LINE#1	Distance Relay-Siemens 59V _{ph-ph} trip & DT send	Distance Relay-Areva Zone-2 & DT receive
2.	KODERMA-BOKARO LINE#2	Distance Relay-Siemens 59V _{ph-ph} trip & DT send	No any indication
3.	KODERMA-GAYA LINE#1	Distance Relay-Siemens 59V _{ph-ph} trip & DT send	Zone-3,dist-230KM,Fault current- 1.65KA
4.	KODERMA-GAYA LINE#2	Distance Relay-Siemens 59V _{ph-ph} trip & DT send & receive	Zone-3,dist-215KM,Fault current I _C - 2.26 KA Over voltage

5	KODERMA-BIHARSHARIF #1	Distance Relay-Siemens 59V _{ph-ph} trip & DT receive	Over voltage & DT send
6	KODERMA-BIHARSHARIF #2	No any indication	Over voltage
7	ICT#1	Differential Relay-Siemens 3I0 Picked up	Over Current& EF Relay-Siemens 51N trip, Fault current I _C – 0.54 KA
8	ICT#2	Differential Relay-Siemens 3I0 Picked up	Over Current& EF Relay-Siemens 51N trip, Fault current I _C – 0.54 KA
9	GT#2	GRP Relay-Siemens 59V _{ph-ph} trip, low forward power, Class-A & B	

Analysis of PMU plots:

- From the Durgapur PMU plot 8kV voltage dip has been observed in B-Ph at 08:53 hrs.
- Fault clearance time was approx. 800 ms.

DVC may explain.

Deliberation in the meeting

DVC submitted a detailed report. Report is enclosed at **Annexure-B4**.

DVC explained that

- There was a transient earth fault in 440kV Koderma-Bokaro line-I near to Koderma and Koderma end tripped on zone 2 protection.
- But Koderma end distance protection was failed to detect the fault due to absence of zero sequence current. Later it was found that neutral was not connected to the relay.
- As a result KODERMA-BOKARO LINE#2, KODERMA-GAYA LINE#1 and KODERMA-GAYA LINE#2 lines tripped from remote end.
- Due to tripping of above lines there was load throw-off leading to overvoltage stage 1 followed by O/V Stage 2 (approx. 602ms later than O/V Stage 1) leading to tripping of all lines from Koderma end
- KODERMA-BIHARSHARIF #1 & II tripped on over voltage from Biharshariff end.

Item No B.5. Disturbance at 400/220kV Sasaram S/s of PGCIL System on 30-05-16 at 15:56 hrs

At 15:56 hrs, 400/220kV, 500 MVA ICT-I at Sasaram tripped due to operation of PRD (pressure relief Device) and consequently other 400/220kV, 315 MVA ICT-II tripped on operation of overcurrent protection.

At the same time Sasaram HVDC pole also got blocked due to failure of auxiliary supply.

Tripping of both ICTs at Sasaram caused the load loss of approx. 450 MW at Sasaram, Dehri, Arrah & its surrounded area including traction load of 80 MW at Kudra, Sonenagar, Karman's, Dumraon & Arrah.

Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
15:56 hrs	440/220kV , 500 MVA ICT-I at Sasaram	PRD operated	
	440/220kV , 315 MVA ICT-II at Sasaram	Overcurrent from HV side	
	HVDC Pole at Sasaram	Blocked due to auxiliary Supply failure	
16:01 hrs	220kV Sasaram- Sahupuri S/c	Hand Tripped	

Analysis of PMU plots:

- From the Sasaram PMU plot 35kV voltage dip has been observed in Y-Ph at 15:56 hrs
- Fault Clearance time was less than 100 ms.

Status of Reporting: Reports are awaited from PGCIL.

Powergrid may explain.

Deliberation in the meeting

Powergrid informed that 400/220kV, 500 MVA ICT-I at Sasaram tripped due to operation of PRD (pressure relief Device) and consequently other 400/220kV, 315 MVA ICT-II tripped on operation of overcurrent protection.

Manufacturer has been contacted for repair/replacement of PRD.

Item No B.6. Tripping incidences in the month of May, 2016

Other tripping incidences occurred in the month of May, 2016 which needs explanation from constituents of either of the end is given at **Annexure- B.6**.

Members may discuss.

Deliberation in the meeting

*Members explained the tripping incidences. Updated list is enclosed at **Annexure- B.6**.*

Item No B.7. Protection Committee visit to BSPTCL and JUSNL Sub-stations

In view of repeated uncoordinated trippings in BSPTCL and JUSNL systems, a committee of following protection engineers was formed to review the situation:

- Shri Sabyasachi Roy, ACE, WBSETCL,
- Shri L Nayak, GM, OPTCL
- Shri Jayanta Datta, SE, DVC
- Shri Surajit Bannerjee Asst GM, ERLDC,
- Shri S. K. Singh, DGM, PGCIL (in place of Shri J. Das, PGCIL)
- Shri S. B. Prasad, ESE, BSPTCL
- Shri Vidyasagar Singh, ESE, JUSNL

PCC needs the following information in respect of Chandil, Ramchandrapur, Adityapur and adjoining substations in Jharkhand and New Purnea, Madhepura, Biharshariff and adjoining substations in Bihar.

1. SLD of all the affected and surround Sub-station (with CT location)
2. Year of manufacture of all equipments
3. Comprehensive CT details along with name plate (with connected/adopted ratio)
4. VT details
5. Fault level- 3-phase as well as 1-phase (line length, conductor details and Transformer details for computing fault level)
6. Transformer detail (Rating, impedance)
7. Availability of Auto-Reclosure feature
8. Availability of carrier protection
9. Availability of Bus- differential and LBB Protection
10. Junction Box (JB) details
11. Cable details used for CT connections (Cross section/core of cable, Junction Box (JB) details & length of cable between JB & control panel)
12. Grid earthing resistance (With latest test report)
13. Breaker details (operating time)
14. CT/PT earthing details
15. Relay details (Relay type, model, settings, manufacturing, basis of settings)
16. Scheme adopted for protection settings for lines and transformers
17. DC system details with charger and battery

In a special meeting held on 8th December, 2015 and PCC meetings, BSPTCL and JUSNL advised to submit the pending details.

BSPTCL and JUSNL have submitted the details.

In 41st PCC, the Protection team has presented a preliminary study report regarding the data as submitted by JUSNL and BSPTCL.

As decided in PCC, a special Meeting was convened on 29th Mar, 2016 to review the data submitted by BSPTCL & JUSNL and also to discuss the road map for the site visit.

JUSNL and BSPTCL had submitted all the requisite data as desired by the Protection Team. The observations as submitted by Protection team in its preliminary study were discussed in detail. The remedial action taken by JUSNL and BSPTCL was reviewed by the protection team and recommendations were advised. The minutes of the meeting is already available at ERPC website.

The protection team advised JUSNL and BSPTCL to initiate the implementation of the recommendations however, the final report with recommendations will be given after the complete study and site visit of the listed sub-stations. It was also decided that the team will start the site visit from the month of April, 2016. The site visit plan will be formulated in consultation with the team members and will be intimated to JUSNL and BSPTCL in due course.

PCC decided that the protection committee members will carry out the site visit of JUSNL substations during 11th to 14th May, 2016 to review the protection system in respect of Chandil, Ramchandrapur, Adityapur and adjoining substations.

In 43rd PCC, it was informed that the Protection team has visited 132/33 kV Ramchandrapur, Adityapur & 220/132 kV Chandil S/s of JUSNL from 11th to 12th May, 2016.

PCC advised to convene a special meeting with JUSNL to discuss the observations of above site visit and place the report.

BSPTCL and JUSNL may update.

Deliberation in the meeting

Members noted.

Item No B.8. PROTECTION PHILOSOPHY OF EASTERN REGION

The Protection Philosophy finalized in special PCC meeting held on 20th July, 2015 is as given below:

Sl. No.	Zone	Direction	Protected Line Reach Settings	Time Settings (in Seconds)	Remarks
1	Zone-1	Forward	80%	Instantaneous (0)	As per CEA
2a	Zone-2	Forward	For single ckt- 120 % of the protected line	0.5 to 0.6 - if Z2 reach overreaches the 50% of the shortest line ; 0.35- otherwise	As per CEA
			For double ckt- 150 % of the protected line		As per CEA
2b	Zone-2 (for 220 kV and below voltage Transmission lines of utilities)	Forward	120 % of the protected line, or 100% of the protected line + 50% of the adjacent shortest line	0.35	As per CEA with minor changes
3	Zone-3	Forward	120 % of the (Protected line + Next longest line)	0.8 - 1.0	As per CEA
4	Zone-4	Reverse	10%- for long lines (for line length of 100 km and above) 20%- for shot lines (for line length of less than 100 km)	0.5	As per CEA

Note:

- 1) **Zone-2:- Z2 Reach should not encroach the next lower voltage level.**
- 2) **Zone-3:- If Z3 reach encroaches in next voltage level (after considering “in-feed”), then Z3 time must be coordinated with the fault clearing time of remote end transformer.**
- 3) **Zone-4:- If utility uses carrier blocking scheme, then the Z4 reach may be increased as per the requirement. It should cover the LBB of local bus bar and should be coordinated with Z2 time of the all other lines.**
- 4) **The above settings are recommended primarily (exclusively) for uncompensated lines.**

All the constituents agreed on the principles read with notes as above.

Till date DVC, WBSETCL, JUSNL, OPTCL, Powergrid (ER-I, ER-II & Odisha-Projects), NTPC, BSPTCL, NHPC, Vedanta and GMR had submitted the zone settings.

PCC advised all the other constituents to implement the revised zone philosophy and submit the settings to ERPC at the earliest.

IPPs may submit the revised zone settings data at the earliest.

Deliberation in the meeting

PCC advised IPPs to implement the revised zone philosophy and submit the settings to ERPC at the earliest.

Item No B.9. Third Party Protection Audit

1. Status of 1st 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	37	68.52
NTPC	16	14	87.50
NHPC	1	1	100.00
DVC	40	26	65.00
WB	68	27	39.71
Odisha	59	38	64.41
JUSNL	34	16	47.06
BSPTCL	16	5	31.25
IPP (GMR, Sterlite and MPL)	5	5	100.00

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

Members may update.

Deliberation in the meeting

PCC advised all the constituents to comply pending observations at the earliest.

2. Schedule for 2nd Third Party Protection Audit:

The latest status of 2nd Third Party Protection audit is as follows:

- | | |
|--------------------------------------|---|
| 1) Jeerat (PG) | Completed on 15 th July 2015 |
| 2) Subashgram (PG) | Completed on 16 th July 2015 |
| 3) Kolaghat TPS (WBPDCCL)- | Completed on 7 th August 2015 |
| 4) Kharagpur (WBSETCL) 400/220kV - | Completed on 7 th August 2015 |
| 5) Bidhannagar (WBSETCL) 400 & 220kV | Completed on 8 th September, 2015 |
| 6) Durgapur (PG) 400kV S/s | Completed on 10 th September, 2015 |
| 7) DSTPS(DVC) 400/220kV | Completed on 9 th September, 2015 |
| 8) Mejia (DVC) TPS 400/220kV | Completed on 11 th September, 2015 |
| 9) 400/220/132kV Mendhasal (OPTCL) | Completed on 2 nd November, 2015 |
| 10) 400/220kV Talcher STPS (NTPC) | Completed on 3 rd November, 2015 |
| 11) 765/400kV Angul (PG) | Completed on 4 th November, 2015 |
| 12) 400kV JITPL | Completed on 5 th November, 2015 |
| 13) 400kV GMR | Completed on 5 th November, 2015 |
| 14) 400kV Malda (PG) | Completed on 23 rd February, 2016 |
| 15) 400kV Farakka (NTPC) | Completed on 24 th February, 2016 |
| 16) 400kV Behrampur(PG) | Completed on 25 th February, 2016 |
| 17) 400kV Sagardighi (WBPDCCL) | Completed on 25 th February, 2016 |
| 18) 400kV Bakreswar (WBPDCCL) | Completed on 26 th February, 2016 |

Members may note.

Deliberation in the meeting

Members noted

Item No B.10. Implementation of Protection Database Management System Project.

ERPC proposal for “Creation & Maintenance of web based protection database management system and desktop based protection calculation tool for Eastern Regional Grid” has been approved by the Ministry of Power for funding from Power System Development Fund (PSDF) vide No-10/1/2014-OM dated 07.03.2016. Subsequently, the LOA was given to PRDC and the first implementation meeting was held on 12.04.2016.

Operational load flow requisite data format is available in ERPC website.

All the constituents are requested to submit the filled formats at the earliest and co-operate for smooth implementation of the project in time bound manner.

In last PCC, all the constituents were advised to submit the filled formats at the earliest.

Members may note and co-operate.

Deliberation in the meeting

Members noted.

PART- C

FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)

(The status on the follow up actions is to be furnished by respective constituents)

ITEM NO. C.1: Multiple elements tripping at 400kV Meeramandali of OPTCL system on 30-04-16 at 22:02hrs.

At 22:02 hrs, a Y-N fault was occurred in 400kV Sterlite- Meeramandali ckt-I due to bursting of Y-Ph LA of the line at Meeramandali end. But due to delayed opening of Y-Ph pole of the said line, LBB protection had operated at Meeramandali S/s. All the elements connected to Bus-I & II were tripped.

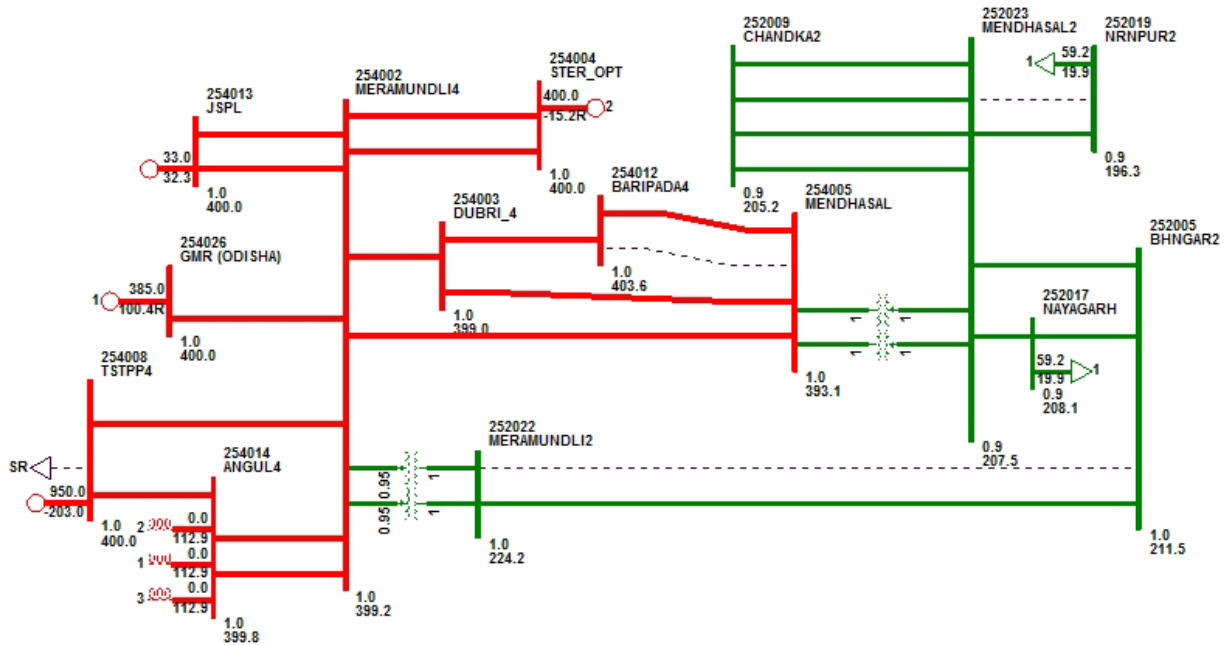
220kV Meeramandali- Bidanasi S/c and Meeramandali- Duburi-I also tripped on indication of Y-N & B-N relay respectively.

Due to tripping of above mentioned elements from Meeramandali s/s, running units of GMR, Sterlite & JSPL tripped due to loss of evacuation paths. Generation loss of approximately 853 MW occurred at GMR U#3, SEL U # 1 & 4 & JSPL. 120 MW load loss occurred in at Bidanasi due to tripping of 220kV Meeramandali- Bidanasi S/c.

Relay indications at 400kV Meramundali end are as follows:

S.No	Line / ATR / Unit	Outage (hrs:mm)	Relay Indications at 400kV Meramundali end	Remarks
1	400 KV Vedanta-i	22:02	Y-N, Z-1, Dist-.1 KM, K96(LBB), L2-34 KA	
2	400 KV Vedanta-ii	22:02	K86(M/T), Y-N, O/V UpHe pick up	
3	400 KV ANGUL-I	22:02	K96(lbb), y-n, z-l, dist-02 km, l2-5.9 ka	
4	400 KV ANGUL-II	22:02	K96(lbb), y-n, z-l, k96(lbb), Uphe pick up	

5	400 KV RSTPS	22:02	K96, K86, O/V	
6	400 KV ICT-2	22:02	K96, K86, O/V , DEVICE TRIP	220 side; m/t, gr AB I phase trip
7	400 KV ICT-I	22:02	K96, K86, O/V , DEVICE TRIP,O/C PICK-UP, PH-2, L2-2.89 KA	220 side; m/t, gr AB I phase trip
8	400 KV DUBURI-I	22:02	Y-N, L2-2.89 KA, L2-E, DIST: -3.5 KM	
9	400 KV DUBURI-II	22:02	K96, K86, Y-N	
10	400 KV JSPL-I	22:02	BKR NOT TRIPPED, BUT NOT GET POWER SUPPLY	
11	400 KV JSPL-II	22:02	K86, Y-N, K96, DIST: -3.1 KM	
12	400 KV MENDHASAL	22:02	L2-E, L1:-1.65KA, DIST-27.1 KM, K86	
13	400 KV GMR	22:02	DTT TRIP 3 PHASE, L2-2.3 KA, DIST :-3.1 KM	
14	220 KV BIDANASI	22:02	L3-N, DIST: -1.0 KM, Gr ab 1 phasetrip relay , mt	
15	220 KV DUBURI-I	22:02	b-n, 60km, z-l, m/t	
16	132 KV DHENKANAL	22:02	R ph o/c , mt	



Bus arrangement at 400kV Meramundali S/s:

Bus I	Bus II	Tie-Breaker status
Vedanta-II	Angul-I	401-off
Mendhsal-I	Duburi-II	402-on (Dubur-II main CB off)
Angul-II	Vedanta-I	403-on
Duburi-I	Mendhsal-II	404-not in service

JSPL-I	RSTPS (KANIHA-i)	405-ON
ICT-I	FUTURE-6	406- not in service
Future-7	ICT-II	407-ON
GMR	JSPL-II	408-ON

Analysis of PMU plots:

- From the Talcher PMU plot, approx. 80kV voltage dip has been observed in Y-Ph at 22:02 hrs.
- Fault clearance time was approx. 200 ms.

OPTCL may explain the following:

- Tripping of all 400kV elements from Bus-I & II of Meramundali S/s
- Tripping of 220kV Meeramandali- Bidanasi S/c and Meeramandali- Duburi line-I from Meramundali S/s.

In 43rd PCC, OPTCL explained that

- Y-N fault was occurred in 400kV Sterlite- Meeramandali line-I due to bursting of Y-Ph LA of the line at Meeramandali end.
- The fault in 400kV Sterlite- Meeramandali line-I was detected by both ends of the line in zone 1. Sterlite end successfully cleared the fault in zone 1 but at 400kV Meramundali end there was delay in CB operation and hence the LBB got initiated.
- Prior to the operation of LBB the bus bar protection at 400kV Meramundali S/s operated on actuation of high set as huge fault current (34kA approx) was observed and tripped all the lines connected to bus-II.
- After that huge over voltage was observed at Meramundali Bus-I which tripped the other elements on high voltage.

PCC felt that in-depth analysis is required for such disturbances and advised the following to OPTCL:

- To analyze the disturbance in detail and submit a comprehensive report along with DR and EL flags within a week so that it would be further discussed in next PCC meeting.
- To submit the CB test report of Meramundali end of 400 kV Sterlite- Meramundali line.
- To place an action plan to reduce such disturbances at 400kV Meramundali S/s with a period of implementation.
- To submit an action plan for replacement of CB at Meramundali S/s.

OPTCL may explain and place the action plan.

Deliberation in the meeting

OPTCL submitted the following information in respect of Meramundali Grid S/s (Details are enclosed at **Annexure-C1**):

- The major system improvement work i.e, CB ,relay replacement.
- Lightning arrester test reports.
- 400kV CT test report for 400kV Mendhasal & Duburi line.
- The relay settings have been adopted as per CPRI recommendation & ERPC protection philosophy.
- The exhaustive relay testing of 400kV Meramundali , Duburi and Vedanta lines has been under taken.
- All secondary wiring checking for tightness has been taken up.

- *New relays has been received at site for Over voltage protection, Ph-Ph measurement & drop/pick ratio 0.99)*

PCC advised OPTCL to analyze the disturbance in detail and submit a comprehensive report.

ITEM NO. C.2: Total power interruption in S. Orissa system on 15-04-16 at 12:17 hrs – 12:23 hrs.

At 12:17 hrs, 400KV Indravati - Rengali S/c line tripped on transient SLG (i.e. C-N) fault. Auto reclose operation was successful at Indravati end but unsuccessful at Rengali end. After few millisecond, direct trip has been received from Rengali end due to over voltage at Rengali and the line tripped from Indravati end also.

Thereafter, the following elements were tripped:

- 400KV Jeypore-Bolangir line (tripped on high voltage from Jeypore)
- 400KV Indravati-Jeypore line (tripped on high voltage from Jeypore)
- 220/132kV ATR-I, & II at Jayanagar (tripped on over flux)
- 220/132kV ATR-I, & II at Bhanjanagar (tripped on over flux)
- Running units #2 & 3 of U.Kolab (tripped on over flux)
- Running unit #5 of Balimela

The bus voltage at Jeypore became zero and 400KV Jeypore-Gajuwaka D/C line was hand tripped from Gajuwaka end.

Thus after tripping of above 400kV lines along with 220/132kV ATRs at Jayanagar & Bhanjanagar, there were no other path left to feed the load at South Orissa system mainly at Theruvali, Bhanjanagar, Narendrapur area. Therefore, flow became zero on all the 220kV lines and bus became dead at Jeypore, Indravati, Jayanagar, Theruvali, and Bhanjanagar & Narendrapur S/s.

Due to tripping of above mentioned lines and units approx. 550 MW load loss and 60 MW generation loss (running units of Balimela & U.Kolab) occurred in south Orissa system mainly at Bhanjanagar, Theruvali, Narendrapur and its surrounded area.

In 43rd PCC, Powergrid explained that--

- At 12:17 hrs, 400KV Indravati - Rengali S/c line tripped on transient SLG (i.e. C-N) fault.
- Auto reclose operation was successful at Indravati end but unsuccessful at Rengali end due to over voltage at Rengali.
- Hence, after few millisecond, the line tripped from Indravati end also on receipt of direct trip from Rengali end.
- After the incident there was oscillations in the system and huge over voltage was observed and the following elements were tripped:
 - 1) 400KV Jeypore-Bolangir line (tripped on high voltage from Jeypore)
 - 2) 400KV Indravati-Jeypore line (tripped on high voltage from Jeypore)
 - 3) 220/132kV ATR-I, & II at Jayanagar (tripped on over flux)
 - 4) 220/132kV ATR-I, & II at Bhanjanagar (tripped on over flux)
 - 5) Running units #2 & 3 of U.Kolab (tripped on over flux)
 - 6) Running unit #5 of Balimela

PCC felt that similar incident was happened on 10-03-16 at 12:24 hrs to 12:31 hrs and severe oscillations, high voltage were observed in south odisha system during the disturbance.

The details from HVDC Gajuwaka end are also not available for detailed analysis of the disturbance.

PCC advised Powergrid to carry out the following and submit a detailed report:

- Check the reason for high voltage at 400kV Rengali end during auto reclose operation in 400kV Indravati-Rengali line
- Collect the details of all the events from HVDC Gajuwaka end during the disturbance
- Detailed analysis for the reason of high voltage at Jeypore and adjoining areas.& also for the oscillations observed in the system.

Powergrid agreed.

PCC also felt that the PDO conditions of HVDC Gajuwaka needs to be reviewed after detail study of the S. Odisha system.

Powergrid may update.

Deliberation in the meeting

PCC advised Powergrid to submit the report.

ITEM NO. C.3: Total Power failure at 220/132kV Hatia S/s of JUSNL system on 20-04-16 at 15:05 hrs.

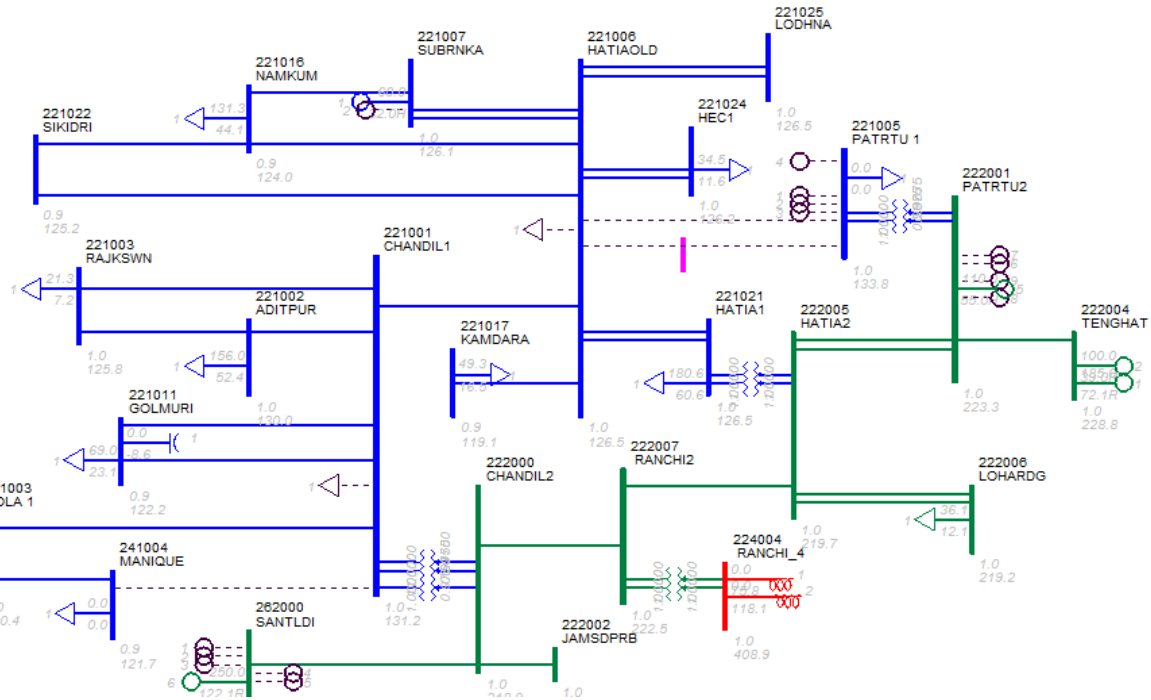
At 14:57 hrs, SLG (i.e. B-N) fault had occurred in 220kV Ranchi- Chandil S/c line near to Chandil S/s. And due to delayed clearance of the fault from Ranchi S/s, the other 220kV lines emanating from Hatia S/s such as 220kV Ranchi- Hatia D/c lines tripped from Hatia end. Thereafter running unit of Patraru (U#10) tripped due to heavy electrical jerk.

Relay indications are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
14:57 hrs	220kV Ranchi- Chandil S/c	<u>At Ranchi</u> Tripped	<u>At Chandil</u> B-P, Zone-I, Fault location- 38.22 KM, Earth Fault
	220kV Hatia- Ranchi-I	<u>At Ranchi</u> Did not Tripped	<u>AT Hatia</u> Earth Fault
	220kV Hatia- Ranchi-II	<u>At Ranchi</u> Did not Tripped	<u>AT Hatia</u> Earth Fault
	Patraru U# 10	Due to electrical Jerk	
15:05-15:10 hrs	220kV PTPS- Hatia -I	<u>At Hatia</u> O/V	<u>At PTPS</u> Did Not Trip
	220kV PTPS- Hatia -II	<u>At Hatia</u> O/V	<u>At PTPS</u> Did Not Trip
	132kV PTPS- Hatia-I	<u>At PTPS</u> O/C	<u>At Hatia</u> Did not Tripped
	132kV PTPS- Kanke-Hatia-	<u>At PTPS</u> O/C	<u>At Kanke</u> Did not Tripped
	220kV PTPS- TTPS S/c	<u>At PTPS</u> O/V	<u>At TTPS</u> Did not Tripped
	TTPS U # 2	Tripped on O/V	

Analysis of PMU plots:

- From the Ranchi PMU plot 9kV Voltage dip has been observed in B-Ph at 14:57 hrs.
- Fault clearance time was approx.440 ms.



JUSNL and Powergrid may explain the following:

- Delayed tripping of Ranchi- Chandil S/c line from Ranchi end may be investigated and explain by PGCIL.
- Tripping of 220kV Patratu- Hatia D/c line and 220kV PTPS- TTPS S/c from Hatia end on over voltage
- Tripping of 132kV PTPS- Kanke-Hatia line from PTPS end on over current
- Status of 220/132kV ATRS at Hatia (tripped or not).

Deliberation in the meeting

PCC advised JUSNL submit detailed report to ERPC and ERLDC at the earliest.

ITEM NO. C.4: Total power failure at 400kV Mendhasal S/s of OPTCL system on 30-03-16 at 16:59 hrs.

At 16:59 hrs, 400kV Meeramandali- Mendhasal S/c tripped due to occurrence of SLG fault (i.e. R-N fault) from Meeramandali end.

Simultaneously, other 400kV lines emanating from Mendhasal s/s such as Mendhasal- N .Duburi S/c & Mendhasal- Baripada S/c were also tripped (relay indications not available).

After tripping of above mentioned lines, MW flow on both 400/220kV, 315 MVA ICTs at Mendhasal became zero.

400kV bus became dead at Mendhasal S/s and approx. 400 MW load loss occurred at Chandaka and its surrounded area.

In 42nd PCC, OPTCL explained that the presently the voltage is being measured from Phase to earth which might have measured high voltage during fault and caused for tripping of 400kV

Mendhasal- N. Duburi S/C and 400kV Mendhasal - Baripada S/C lines on over voltage. Therefore, they have changed the relay input voltage from ph-earth to ph-ph voltage.

PCC felt that the voltage of other phases would increase during line-to-ground fault, if earthing of CVT secondary is improper.

PCC advised OPTCL to check the CVT secondary earthing.

OPTCL agreed.

OPTCL may update.

Deliberation in the meeting

OPTCL informed that work is in progress.

ITEM NO. C.5: Multiple elements tripping at 400kV Bidhannagar S/s of WBSETCL system on 30-03-16 at 16:25 hrs.

At 16:25 hrs, R-Ph CT connected to Bus-A of bus coupler bay at 400kV Bidhannagar S/s busted due to the inclement weather condition. All the elements connected to the Bus-A were tripped from remote end. Simultaneously, the bus differential protection of Bus-B had operated and tripped all the elements connected to Bus-B of 400kV Bidhannagar S/s from local end. 400kV bus became dead at Bidhannagar.

In 42nd PCC, WBSETCL informed that R-Ph CT of bus coupler bay at 400kV Bidhannagar S/s busted due to the inclement weather condition. The bus differential protection of Bus-B was operated and all the elements connected to the Bus-A were tripped from remote end.

PCC felt that since the fault was in common zone of the bus differential protection, the differential protection for both Bus-A & B should have operated to clear the fault immediately.

PCC advised WBSETCL to check the bus differential scheme at 400kV Bidhannagar S/s.

WBSETCL may update.

Deliberation in the meeting

WBSETCL informed that work is in progress.

ITEM NO. C.6: Frequent Blackouts at Kanti TPS

On 7th April, 2016, total station power failure (Blackout) incident has occurred at Kanti TPS. There was some fault at 220KV Gopalganj side from Kanti TPS Switchyard and 220kV Muzaffarpur-Kanti D/C line tripped on Zone 3 before fault was cleared from Kanti TPS end. This had resulted in total power failure at Kanti TPS leading to Emergency situation with hot turbine coasting down without normal lub oil supply.

A special meeting was convened at ERPC, Kolkata on 18-04-2016 and the following decisions were taken:

- a) As a temporary measure, zone 1 and zone 2 time setting of all 220kV and 132kV lines at Kanti TPS end should be changed to instantaneous and zone 3 time setting as 200ms in order to clear the downstream faults from Kanti TPS end.
- b) Powergrid was advised to change the zone 3 time settings at Muzaffarpur (PG) end as per protection philosophy of ERPC.
- c) NTPC and Powergrid were advised to activate the PLCC scheme for 220kV Muzaffarpur-Kanti D/C by 26th April, 2016 and give feedback in 42nd PCC Meeting.

- d) On activation of PLCC system, Powergrid is to change the zone 2 time setting at Muzaffarpur (PG) end as per protection philosophy of ERPC.
- e) BSPTCL was advised to check the clearance between cross arm and jumper and rectify if required.
- f) BSPTCL was advised to review the protection system and relay coordination of 220kV Gopalgunj, Darbhanga and Begusarai and all 132kV feeders in around Kanti. Therefore, BSPTCL was advised to submit their relay details to Powergrid by 22nd April, 2016 for review. Powergrid was requested to study the details and give feedback in 42nd PCC Meeting scheduled to be held on 27th April, 2016.
- g) It was decided that the above temporary measure will be followed, till BSPTCL protection system is full proof.
- h) Further course of action will be decided in PCC Meeting for relay coordination in BSPTCL system in and around Kanti TPS.

In 42nd PCC, Kanti TPS, NTPC informed that zone settings at their end have been revised as per the recommendation. Regarding activation of PLCC scheme for 220kV Muzaffarpur-Kanti D/C line NTPC informed that cabling has been done but some parts in PLCC panels were defective and needs to be replaced.

Powergrid informed that they have not yet revised the zone 3 time setting at Muzaffarpur (PG) end.

PCC advised Powergrid to revise the zone 3 time setting at Muzaffarpur (PG) end as per protection philosophy of ERPC at the earliest.

PCC also advised Powergrid to implement the PLCC scheme for 220kV Muzaffarpur-Kanti D/C line at the earliest.

Members may update.

Deliberation in the meeting

PCC advised Powegrid, NTPC KTPS and BSPTCL to comply the above recommendations at the earliest.

ITEM NO. C.7: Disturbance at 220/132kV NJP S/s of WBSETCL system on 29.02.16 at 03:55 hrs.

WBSETCL reported that at 03:55 hrs, 220/132kV, 160 MVA TR-I,II & III, 220kV NJP-TLDP (IV)- I & II and 220kV Binaguri (PGCIL)- NJP Bus Section-A & B were tripped due to over voltage. 220kV bus voltage was recorded as 254 kV and 132kV bus voltage was recorded as 148 kV ay NJP.

Powergrid reported that 125 MVAR bus reactor-2 tripped at Binaguri end on Y ph differential protection and reactor Buch relay/PRV/WT1/OTI trip. After physical inspection, it is observed that R & Y phase bushing was heavily cracked from Turret/Bottom and B phase bushing was totally burst and heavy oil leakage was observed.

The tripping details are as follows:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
03:55	220/132kV, 160 MVA TR-I,II & III at NJP	HV side:- Over flux, 86 L & LV side:- 86 L	
	220kV NJP-TLDP (IV)- I & II	<u>At NJP</u> High Speed 3-Ph Trip relay	<u>At TLDP (IV)</u> 21 M, 23 Px, PLCC channel

hrs		(86/LO), Autorecloser L/O	unhealthy, 27 RYB, 30 C, 30 D, 86 A, 86 B, Autorecloser PTS switch relay
	220kV Binaguri (PGCIL)- NJP Bus Section-A & B	<u>At (NJP end)</u> Did Not Trip (as informed by WBSETCL)	<u>At PGCIL (end)</u> Trip Relay 96 BSA, 96 BSB (as informed by WBSETCL)
	125 MVAR Bus Reactor-II at Binaguri (PGCIL)	Y-Ph differential relay operated	

Analysis of PMU plots:

- No overvoltage has been observed from the Binaguri PMU plot
- From the Binaguri PMU plot 175kV dip has been in Y-Ph at around 03:55:39 hrs.
- 1.1 KA rise in line current of 400kV Binaguri- Purnea has been observed during the incident.
- Fault clearance time was approximately 80 ms.

In last PCC, WBSETCL informed that there was a high voltage at 220 kV Binaguri and NJP due to which all the ICT and 220kV Binaguri (PGCIL)- NJP Bus Section-A & B were tripped.

However, the exact cause of tripping of 220kV NJP-TLDP (IV)- I & II could not be ascertained.

Powergrid informed that as per their record there was no over voltage at Binaguri side and all equipments are intact.

PCC advised WBSETCL to get the tripping details of 220kV NJP-TLDP (IV)- I & II and submit a report on the incidence.

WBSETCL may explain.

Deliberation in the meeting

PCC advised WBSETCL to get the tripping details of 220kV NJP-TLDP (IV)- I & II and submit a report on the incidence.

ITEM NO. C.8: Members may update the following:

1. OPTCL may please update the latest status on following substations:

In last PCC, OPTCL informed that

- The issue of LBB maloperation at 220kV Meeramundali S/s at 04:59hrs on 18/09/15 has been taken up with Siemens: *Siemens has checked the LBB logic and found ok*
- OPTCL informed that they will review the logic of all the newly installed LBB protection: *Exploring for improvement in logic for tripping of single bus in case of LBB operation*
- Old distance protection relays in 132kV system at 220kV Tarkera S/s will be replaced after replacing old relays at 220kV level: *The replacement work of relays at Tarkera is in progress*

OPTCL may update.

Deliberation in the meeting

OPTCL informed that work is in progress.

Meeting ended with vote of thanks to the chair

Participants in the 44th PCC meeting

Venue: ERPC Conference Hall, Kolkata

Time: 11:00 hrs

Date: 08.06.2016 (Wednesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
1	A.K. Bandyopadhyay	MS, ERPC	9433068533	mserpc-power @nic.in	A.K. Bandyopadhyay
2	U.K. Verma	GM, ERLDC	08902496220	ujwal.kumar.verma @gmail.com	U.K. Verma
3	P.P. BANDYOPADHYAY	DGM(SO), ERLDC	7044083323	Pp_bandyopadhyay@erpc.co.in	P.P. Bandyopadhyay
4	S. BANERJEE	DGM ERLDC	9433041823	surejitb@gmail.com	S. Banerjee
5	P.S. Das	Assl. GM, ERPC	9433041837	psdas_psd@yahoo.com	P.S. Das
6	S. Bal	D.M. PGCL	9903180042	sukdev_123@rediffmail.com	S. Bal
7	S. Nag	DCE, DVC Maitim.	9477865520	sumita.nag@dvc.gov.in	S. Nag
8	S. Nayak	NTPC/ER-2	9437041581	snayak@ntpc.co.in	S. Nayak
9	S.K. Rai	NTPC/ER-1	9473400272	skrai02@ntpc.co.in	S.K. Rai
10	J. DUTTA	SF. O&S ODVC	9831515712	jayanta.deeta@dvc.gov.in	J. Dutt
11	M.K. Thakur	DM/ERPC	9432351832	mktlect@gmail.com	M.K. Thakur
12	B. NORTHA	Engg/ERLDC	9408180931		B. North
13	S. Sahay	Engg	9432013172	Schay.sena@gmail.com	S. Sahay
14	Ch. Mohan Rao	Dy. Mgr, PG, Odisha	9437962193	onmodisha@gmail.com	Ch. Mohan Rao
15	S.A. Anand	Sr. Engineer	9434735823	Shabbir.bit9@gmail.com	S.A. Anand
16	Sudeep Kumar	Sr. Engr.	9431820338	Sudeep.Kumar1234@gmail.com	Sudeep Kumar
17	RAJDEEP BHATTACHARJEE	FEE/Resident (BSPHCL) Engg.	9830380689	rekolbsphcl@gmail.com	Rajdeep
18	P.K. Senapathy	AGM/GMR	9777580352	Poasant.Senapathy@ gmr.org.in	P.K. Senapathy
19	H.P. Mahapatra	Mgr (P.I.)	9861164943	hpm.erpcl@gmail.com	H.P. Mahapatra
20	M.R. Mohanty	CEO, SLDC, OPTCL	9438907310	mmohanty113@gmail.com	M.R. Mohanty

Participants in the 44th PCC meeting

Venue: ERPC Conference Hall, Kolkata

Time: 11:00 hrs

Date: 08.06.2016 (Wednesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
21	L. Nayak	GM/OPTCL	9438907801	el.lanayak@optcl.co.in	
22	S. Mondal	CBSC	9163377092	sucharit.mondal@rp-sg.in	
23	SUDIPTA GHOSH	WBPDCL AM(PS)	9474363864	g-sudipta2@rediffmail.com	
24	P. K. Kundu	ACE, WBSLDC	9434910283	pkundu_1961@yahoo.co.in	
25	Kamales Maiti	ACE, WBSETCL	9434910282	ace.ctd16@gmail.com	
26	L. K. Jha	EEE/JUSNL, Chandi	9431707318	tejss_jusnl@rediffmail.com	
27	S. Mishra	CB(CRITL) JUSNL	9934544485	subhashis.mishra@gmail.com	
28	V. K. Bhoi	EEE/CRITL	7488284956	CBCRITL.JUSNL@rediffmail.com	
29	D. K. Singh	ESE, SLDC, BSPTCL	7763817716	sldc.bsab@gmail.com	
30	Jitesh kuma	EEE, CRITL BSPTCL	7763817783 9471153156	jiteshkum1@gmail.com	
31	S. KEJRIWAL	EE, ERX	9831919509	shyam.jes11@gmail.com	
32	G. Rao	EE, ERPC	9547891353	eseb-cca@yahoo.co.in	
33	D. K. Bauri	EE, ERPC	9883617236	eeop, erpc@gov.in	
34	R. P. KUNDU	Engg, ERDC	9903329591	rajpratim@gmail.com	
35	Sanchazi Deb	AM(PS), WBPDCL	9231898200	s.deb@wbpdcl.co.in	
36	PRASHANT KUMAR DAS	DGM(EL), SLDC OPTCL	9438907408	prashantk_das@yahoo.co.in	
37	S. K. Harichandran	OPTCL	9438907042	elr.s.kharichandran@optcl.co.in	
38	A. Bayen	APL	9204757804	akash.bayen@tatapostel.com	
39					
40					

REPORT ON TPF OF KTPS 400KV BUS ON 25 05 16

At 08:53:15 of 25/5/2016, all 400 kV lines associated to KTPS 400 kV Switchyard tripped resulting in loss of voltage at 400 kV Switchyard.

Bay No.	To	KTPS End	Remote End	Normalised at
421	Bokaro I	Tripped on O/V Stg II (V_{Ph-Ph})(59)	Zone II @ 99.5 kM	
425	Bokaro II		Manually made OFF	
409	Gaya I		Zone III, 1.65 kA at 230 kMs	10:44 Hrs.
413	Gaya II		Zone III, 2.26 kA at 215 kMs	10:41 Hrs.
415	Biharshariff I			9:52 Hrs.
419	Biharshariff II	No tripping	Tripped on overvoltage	10:12 Hrs.
401	ICT I	No Tripping	50n/51n	9:22 Hrs.
403	ICT II		50n/51n	9:19 Hrs.
407	Bus Reactor I			
427	Bus Reactor II			
406	ST # 1			
410	ST # 2			

The tripping resulted in outage of the only running unit # 2 of KTPS. The weather was extremely stormy at the time of trippings.

Analysis of Trippings:

1. There was a C-N transient fault within KTPS Bokaro Line 1 very near to KTPS end. BTPS end saw the fault in Z2 reach and tripped in Z2 time as carrier was not in service at that time.
2. KTPS end relay of BTPS line 1 (both M1 & M2) failed to trip and this led to the tripping of all other end relays.

3. Gaya both lines tripped in Zone 3, Biharshariff should have tripped in zone but did not trip for reasons maybe PGCIL may please explain.
4. ICT 1 & 2 tripped through D/E/F from 220KV side.
5. Due to tripping of all the lines there was load throw-off leading to overvoltage stage 1 followed by O/V Stage 2 (approx. 602ms later than O/V Stage 1) leading to tripping of all lines from KTPS end. O/V Stage 2 setting is V Ph-Ph >560KV i.e. 140%.
6. The Unit also tripped through O/V protection.

Tests Done and Remedial Measures taken:

1. CT Ckt of ABB (Main 1) relay was tested and it was found that the CT neutral formed after three phase CTs was not returning through relay 4th CT input but directly coming back to the CT. Thus the ABB relay had not operated for earth faults. After this was set right it was tested and seen to be operating properly for Earth Faults.
2. CT Ckt of SIEMENS (Main 2) relay was tested and it was found that the three phase wires from CT had come into relay as three phase currents but after neutral formation but the return path back to CT neutral was disconnected. Thus the 7SA relay would never get any zero sequence current and hence would not pick up for any earth fault. This was rectified and after that distance reach tests were done and the relay was seen to be operating satisfactorily for all earth faults.

List of important transmission lines (220 kV & above) in ER which tripped in May'16

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks/Deliberation in the meeting
Fault clearing time is violating protection standard (As per PMU data)													
1	220 KV SASARAM SAHUPURI	08.05.16	12:10	08.05.16	13:40	R-N FAULT	1000 ms approx	R-N , Z-3, 110 KM from Sasaram	Information yet to be received	No autoreclose operation observed in PMU data	No	No	Line tripped on zone 3 due to fault in downstream network at sahupuri end
2	400 KV JAMSHEDPUR-TISCO	15.05.16	17:28	15.05.16	18:07	R-N FAULT	400 ms approx	Information yet to be received	R-N, Z-2, F/C 7.96 kA, 36.4 km from JMDS	No autoreclose operation observed in PMU data	No	No	No information recieved from TISCO
3	400 KV BOKARO KODERMA	18.05.16	14:05	18.05.16	16:03	B-N FAULT	3000 ms approx	Information yet to be received	Information yet to be received	--	No	No	ICT at Bokaro also tripped at same time
4	220 KV SASARAM SAHUPURI	18.05.16	14:18	18.05.16	15:53	R-Y FAULT	920 ms approx	Information yet to be received	Information yet to be received	--	No	No	Line tripped on zone 3 due to fault in downstream network at sahupuri end
5	400KV GAYA - MAITHON-D/C	25.05.16	08:00 / 08:02	25.05.16	08:46 / 09:00	B-N FAULT	600 ms approx	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	High resistance fault, The fault was not observed by distance protection at Gaya end and identified by directional earth fault protection.
6	400KV GAYA- MAITHON-I	27.05.16	13:59	27.05.16	16:12	DT RECEIVED AT MAITHON	600 ms approx	Did not trip	DT Received	--	No	No	High resistance fault
7	400KV GAYA- MAITHON-II	27.05.16	13:59	27.05.16	17:00	R-B FAULT	600 ms approx	R-B-N ,Z-I F/C -R-6.94 KA, B-7.24 KA, 40.8 Km from Gaya End	R-B-N ,Zone-II, F/C -R-2.3 KA, B-2.24 KA, 250.7 Km from Maithon	--	No	No	High resistance fault
8	220 KV PATNA - KHAGUL	27.05.16	23:04	28.05.16	00:26	Y-N FAULT	900 ms approx	B-N,Zone I, F/C 6.4 kA, 10.35 km from Patna	Did not trip	No autoreclose operation observed in PMU data	No	No	Breaker Problem at Khagul
9	220 KV ARA - KHAGUAL-I	27.05.16	23:04	28.05.16	00:39	Y-N FAULT	900 ms approx	B-N, Z-III, 109.1 KM from Arah, F/C 1.095 kA	Information yet to be received	No autoreclose operation observed in PMU data	No	No	Breaker Problem at Khagul
10	220 KV PATNA - KHAGUL	28.05.16	15:52	28.05.16	16:33	B-N FAULT	1100 ms approx	Information yet to be received	Did not trip from Khagul	No autoreclose operation observed in PMU data	No	No	Same type of tripping occurred at 23:04 hrs on 27-05-16
11	220KV ARAH-KHAGUAL-I	28.05.16	15:52	28.05.16	20:38	B-N FAULT	1100 ms approx	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	Same type of tripping occurred at 23:04 hrs on 27-05-16, Breaker Problem at Khagul
Multiple tripping at same time													
1	400 KV SAGARDIGHI-DURGAPUR - I	04.05.16	21:20	04.05.16	22:10	Y-N FAULT	<100	Y-N , Z-I, 4.57 KA, 58.9 KM from Sagardighi	Information yet to be received	A/R successful at both end but line tripped due to fault in reclaim time	Yes	--	Power line crossing
2	400 KV SAGARDIGHI-DURGAPUR - II			04.05.16	22:13	Y-N FAULT	--	Y-N fault Zone 1	DT RECEIVED	--	No	--	Y-N fault Zone 1 at Sagardighi
3	765 KV GAYA-VARNASH-I	07.05.16	01:19	07.05.16	04:34	Y-N FAULT	<100	Zone 1	Information yet to be received	No autoreclose operation observed in PMU data	No	No	Gaya end autoreclosed and line was hanging from Varanasi end
4	400 KV BIHARSHARIFF-VARNASH-I			07.05.16	05:22	Y-N FAULT	<100	Zone 2	Information yet to be received	No autoreclose operation observed in PMU data	No	No	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks/Deliberation in the meeting
5	400 KV IND BHARAT - RAIGARH	13.05.16	01:10	13.05.16	03:12	Y - N FAULT	<100	Information yet to be received	Information yet to be received	A/R successful at both end but line tripped due to fault in reclaim time	No	No	Same type of tripping occurred at 15:25 hrs on 22-04-16, 07:52 hrs. on 14-03-16. In many instances in past, it has been observed these two lines tripped together
6	400 KV IND BHARAT - JHARSUGUDA			13.05.16	03:52	Y - N FAULT	<100	Y-N , Z-1, F/C- 5.87 KA	Y-N , F/C - 3.2 KA, F/D - 100% at Jharsuguda	A/R successful at both end but line tripped due to fault in reclaim time	No	No	
7	400 KV DURGAPUR-SAGARDIGHI-I	14.05.16	18:12	14.05.16	19:19	Y-N FAULT	<100	Y-N, Z-I, F/C 5.7 KA, 66.8 KM from DGP	Y-N, Z-I, F/C 3.9 KA 58.48 KM from Sagardighi	Unsuccessful auto-reclose operation observed in PMU data	No	No	Same type of tripping occurred at 21:20 hrs on 04-05-16, Power line crossing
8	401 KV DURGAPUR-SAGARDIGHI-II			14.05.16	19:09	Y-N FAULT	<100	Y-N, Z-I, F/C 5.7 KA, 55.25 KM from DGP	Y-N, Z-I, F/C 4.47 kA, 57.75 kA from Sagardighi	Unsuccessful auto-reclose operation observed in PMU data	No	No	Same type of tripping occurred at 21:20 hrs on 04-05-16
9	220 KV DALKHOLA - KISHANGANG-I	17.05.16	21:38	17.05.16	22:37	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	
10	220 KV DALKHOLA - KISHANGANG-II			17.05.16	22:47	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	
11	220 KV SILIGURI-KISHANGANG-I			17.05.16	22:51	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	Multi ckt tower
12	400 KV MALDA- NEW PURNEA-I			17.05.16	22:27	BREAKER OPENED AT NEW PURNEA END	--	Information yet to be received	Information yet to be received	--	No	No	Over voltage at New Purnea
13	400 KV TALCHER-ROURKELA-I, II	20.05.16	15:15	20.05.16	16:09	Y-B-N FAULT	<100	Y/B Phase Trip ,DISTANCE PROTECTION,Carrier ch-I/III RECD	Z-II, 235 KM from RKL F/C= I- 1.8 kA, II - 2.6 kA Did not trip from RKL	--	Yes	--	Sending DT from Rourkela end for zone 2 faults. Powergrid was advised to rectify.
14	400 KV TALCHER-ANGUL			20.05.16	16:36	Y-B-N FAULT	<100	Y,B Z-I	D/P, F/C 24 kA	--	Yes	--	400kV Angul Talcher Tripped on Y-ph to B-ph Fault.
15	400KV KAHALGAON - FARAKKA-IV	25.05.16	11:10	25.05.16	20:20	B-N FAULT	<100	B-N , Z-1, F/C - 27 Kamp , 6 Km from Kahalgaon	Information yet to be received	Unsuccessful auto-reclose operation observed in PMU data	No	No	Powerline crossing, OPGW snapping
16	400KV KAHALGAON - MAITHON-II			25.05.16	12:15	B-N FAULT	<100	Information yet to be received	Information yet to be received	Unsuccessful auto-reclose operation observed in PMU data	No	No	Over voltage
17	400KV KAHALGAON - BARH-I			25.05.16	12:12	R-N FAULT	<100	R-N , Z-1, 1.6 % from Kahalgaon , F/C - 29 Kamp	Information yet to be received	Unsuccessful auto-reclose operation observed in PMU data	No	No	Powerline crossing, OPGW snapping
18	400 KV FARAKKA -BAHARAMPUR	27.05.16	10:04	27.05.16	11:51	Y-N FAULT	<100	400 kV Y phase GT bushing burst at Farakka	Information yet to be received	No autoreclose operation observed in PMU data	Yes	--	
19	400 KV FARAKKA -KAHALGAON-II			27.05.16	12:06	Y-N FAULT	<100	400 kV Y phase GT bushing burst at Farakka	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
20	400 JEYPORE-GAZWAKA-I	30.05.15	19:01	30.05.16	23:25	Y-N FAULT	<100	Information yet to be received	Y-N	Unsuccessful auto-reclose operation observed in PMU data	Yes	No	400 kV JEY-Gaj#1 line tripped due to Ph-Ph(R-Y-N) Fault on Z-2.
21	400 JEYPORE-GAZWAKA-II			30.05.16	19:31	O/V AT GAJUWAKA	<100	DT Received	O/V	--	Yes	No	400 kV JEY-Gaj#2 line tripped due Direct Trip received from remote end.
22	HVDC_GAZWAKA			30.05.16	19:46/ 19:57	BOTH THE AC LINES TRIPPED	--	--	--	--	Yes	No	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks/Deliberation in the meeting
Fault Not observed in PMU data													
1	400KV MERAMUNDALI-NEW DUBURI-I	03.05.16	11:30	03.05.16	10:00	TRIPPED FROM MERAMUNDALI END ONLY	--	Information yet to be received	Information yet to be received	--	No	No	
2	765KV ANGUL-JHASUGUDA-I	03.05.16	12:55	03.05.16	13:05	TRIPPED FROM JHASUGUDA END ONLY	--	Information yet to be received	Information yet to be received	--	No	No	
3	220KV BIHARSHARIFF-TENUGHAT	04.05.16	16:05	04.05.16	16:57	R-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	
4	220KV GAYA-DEHRI-I	04.05.16	16:08	04.05.16	18:01	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	<i>fault</i>
5	220KV KORBA-BUDIPADAR-II	04.05.16	17:39	04.05.16	19:42	B-N FAULT	--	Information yet to be received	Information yet to be received	--	No	No	
6	765 KV SASARAM-FATHAPUR	05.05.16	07:45	05.05.16	09:45	DT RECEIVED AT SASARAM	--	DT Received	Information yet to be received	--	No	No	<i>PRV of lin reactor maloperated at Fathapur end.</i>
7	400 KV NEW PURNEA-BINAGURI-I	12.05.16	18:37	12.05.16	18:44	DT RECEIVED AT PURNEA	--	DT Received	Did not trip	--	No	No	<i>E/F at Binaguri</i>
8	400 KV BIHARSHARIFF-KODERMA-I	14.05.16	22:48	14.05.16	23:55	TRIPPED AT KODERMA END	--	Did not trip	Information yet to be received	--	No	No	
9	400 KV JEYPORE -GAZUWAKA-II	16.05.16	15:36	16.05.16	16:31	DT received at Jeypore	--	DT Received	Information yet to be received	--	No	No	<i>As per the information gathered from Gajuawaka s/s, TEED protection operated at their end and DT send to remote end. Hence, at Jeypore end, line tripped due to DT received from remote end.</i>
10	765 SASARAM-FATEHPUR	18.05.16	12:15	18.05.16	13:13	TRIPPED FROM FATEHPUR END	--	Did not trip	Tripped	--	No	No	<i>PRV of lin reactor maloperated at Fathapur end.</i>
11	400 KV KAHALGAON-LAKHISARAI-II	18.05.16	15:59	18.05.16	16:39	DUE TO TRIPPING OF L/R AT LAKHISARAI	--	DT Received	L/R at Lakhisarai tripped	--	No	No	<i>PRV of lin reactor maloperated at Lakhisarai end.</i>
12	400KV KAHALGAON-LAKHISARAI-II	19.05.16	12:00	19.05.16	12:15	DT RECEIVED AT KAHALGAON	--	DT Received	Information yet to be received	--	No	No	
No autorecloser operation observed in PMU data													
1	400 KV BARIPADA - TISCO	01.05.16	16:24	01.05.16	17:33	Y-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>autoreclose was unsuccessful due to permanent fault</i>
2	400 KV BIHARSHARIFF-MUZAFFARPUR-II	04.05.16	01:29	04.05.16	01:56	B-N FAULT	<100	B-N fault, F.D =111.14 km from BSF, F.C=4.019 KA	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>B-N zone 1, 7km from Muzaffarpur</i>
3	400 KV PATNA - KISANGANJ-I	04.05.16	05:32	04.05.16	10:27	Y-N FAULT	<100	Y-N fault, 346.3 Km from Patna, F.C= 864 A	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>Autorecloser was not in service.</i>
4	400 KV BARIPADA-NEW DUBRI	06.05.16	16:46	06.05.16	17:07	R-N FAULT	<100	R-N, A/R started but unsuccessful	R-N Z-I, 44%	No autoreclose operation observed in PMU data	Yes	--	<i>Auto reclose was successful but again fault occurred within reclaim time and line tripped.</i>
5	400 KV BOKARO-KODERMA-I	07.05.16	14:56	07.05.16	15:59	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>A/R is in service</i>

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Relay Indication REMOTE END	Auto Recloser status	DR/EL received within 24 Hrs	DR/EL received after 24 Hrs	Remarks/Deliberation in the meeting
6	765 KV ANGUL JHARSUGUDA	08.05.16	13:43	08.05.16	13:46	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>Auto-Reclose operated successfully at Angul end on R-ph Transient fault. But it is also observed that as soon as R-Ph CB tripped, it sent a DT to Sundergarh and thereby blocking AR at Sundergarh end as well as tripping their Main and Tie CBS. Problem found with relay configuration of LBB and the same was rectified now.</i>
7	400 KV FARAKKA - KAHALGAON-III	10.05.16	22:35	11.05.16	00:51	R-N FAULT.	<100	Information yet to be received	Zone-I, R-Phase, 14.36 KM from KHSTPP	No autoreclose operation observed in PMU data	Yes	--	<i>Auto reclose operated at Farakka end. Kahalgaon end needs to be checked.</i>
8	400 KV PATNA - KISANGANJ-II	10.05.16	23:06	11.05.16	00:01	Y-N FAULT	<100	Y-N, F.C=5.241KA, F.D=51.56 KM from Patna	Y-N, F.C=1.38KA, F.D=263KM from KSHNGNJ	No autoreclose operation observed in PMU data	No	No	
9	400 KV SASARAM - SARNATH	11.05.16	23:25	12.05.16	23:23	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	B Phase LA burst at Sasaram
10	400 KV JAMSHEDPUR- ADHUNIK-II	14.05.16	16:58	14.05.16	17:34	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>DT received at Jamshedpur end</i>
11	400 KV TISCO-BARIPADA	15.05.16	17:32	15.05.16	18:20	Y-N FAULT	<100	Information yet to be received	Y-N, Z-I, F/C 3.85 kA, 72.5 km from Baripada	No autoreclose operation observed in PMU data	No	No	<i>Persisting fault due to which A/R unsuccessful</i>
12	400 KV MERAMUNDALI-MENDASAL	16.05.16	14:30	16.05.16	15:20	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>PLCC is not in service.</i>
13	400 KV TALA-BINAGURI-IV	17.05.16	00:25	17.05.16	00:41	B-N FAULT	<100	Information yet to be received	B-N, Z-I, F/C : 3.67 KA, 95.91 km from Binaguri	No autoreclose operation observed in PMU data	No	No	<i>A/R successful at Binaguri end, Tala end A/R is not in service.</i>
14	765 KV NEW RANCHI - DHARAMJAYGARH-II	17.05.16	18:13	17.05.16	19:16	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	<i>Problem in A/R at New Ranchi. Same has been rectified.</i>
15	400 KV KAHALGAON-BARH-I	21.05.16	10:44	21.05.16	18:25	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
16	765 KV RANCHI-DHARAMJAYGARH-II	23.05.16	14:55	23.05.16	15:58	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	Yes	
17	400KV STERLITE-RAIGARH	23.05.16	16:34	23.05.16	17:35	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
18	400KV STERLITE- MEERAMANDALI	27.05.16	16:05	Tower collapse		B- N FAULT	<100	Information yet to be received	B-N ,Z-I, F/C -4.19 KA, 8.5 Km from Meramundali	No autoreclose operation observed in PMU data	No	No	

Annexure-C1

CT TEST REPORT FOR 402 DIA (DUBURI - 2 & MENDHASAL) DONE ON 1st & d JUNE'2016.

01.06.2016

sl no	Description of the CT	VOLTAGE	MODE	R-PH		Y-PH		B-PH	
				C(pf)	tanδ(%)	C(pf)	tanδ(%)	C(pf)	tanδ(%)
1	C and TANδ testing of 400kv duburi-2	2	UST-R	1124.94	0.319	1128.25	0.303	1115.23	0.319
		10	UST-R	1124.84	0.313	1128.29	0.292	1115.06	0.312
2	C and TANδ testing of 402 tie bkr			C(pf)	tanδ(%)	C(pf)	tanδ(%)	C(pf)	tanδ(%)
		2	UST-R	1121.75	0.346	1126.05	0.348	1110.43	0.43
		10	UST-R	1121.85	0.339	1126.16	0.343	1110.7	0.42

02.06.2016

sl.No.	Description of the CT	VOLTAGE	MODE	R-PH		Y-PH		B-PH	
				C(pf)	tanδ(%)	C(pf)	tanδ(%)	C(pf)	tanδ(%)
1	C and TANδ testing of 400kv duburi-1 bkr	2	UST-R	1122.3	0.37	1104.8	0.312	1127.62	0.327
		10	UST-R	1122.3	377	1104.62	0.299	1127.78	0.318
2	C and TANδ testing of 402 tie bkr			C(pf)	tanδ(%)	C(pf)	tanδ(%)	C(pf)	tanδ(%)
		2	UST-R	1104.93	0.372	1104.5	0.28	1120.19	0.38
		10	UST-R	1105.05	0.36	1104.87	0.272	1120.31	0.371

Leakage Current Test of Lightning Arresters.

1. 400kV System. (130kV X 3 stack 10KA)

Feeder Name	Ph	Counter Reading	It	Icor	Ir	% 3rd harmonics	Voltage	Temp	Date of Measurement
400kV Angul-I	R	00011	750	52	65	1	410	32	31-01-2015
	Y	00012	403	58	72	1	410	32	31-01-2015
	B	00014	851	66	12	1	410	32	31-01-2015
400kV Angul-II	R	000008	628	243	290	0.9	410	32	31-01-2015
	Y	000007	180	12	15	1.8	410	32	31-01-2015
	B	000010	1472	58	74	1.5	410	32	31-01-2015
400kV Ib-I	R	00013	665	104	127	1.3	410	32	31-01-2015
	Y	00009	394	102	106	2.5	410	32	31-01-2015
	B	00012	634	68	25	2	410	32	31-01-2015
400kV Ib--II	R	000006	525	132	290	0.9	410	32	31-01-2015
	Y	000004	145	15	10	1.6	410	32	31-01-2015
	B	000003	874	58	73	2	410	32	31-01-2015
400kV Kaniha-I	R	000038	845	76	96	2.1	410	32	31-01-2015
	Y	000005	360	64	81	2.9	410	33	31-01-2015
	B	000004	1227	52	65	0.9	410	33	31-01-2015
400kV Mendhasal-I	R	000229	874	18	22	1	410	31	31-01-2015
	Y	Probe could not be inserted							31-01-2015
	B	000004	1532	222	271	1	410	31	31-01-2015
400kV Duburi-II	R								31-01-2015
	Y								31-01-2015
	B	000004	126	4	5	0.9	410	31	31-01-2015
400kV ICT-I	R	000008	933	65	79	0.9	410	31	31-01-2015
	Y	000011	579	130	158	2.1	410	31	31-01-2015
	B	000004	680	119	145	1.3	410	31	31-01-2015
400kV ICT-II	R	000005	936	63	78	1.3	410	32	31-01-2015
	Y	000003	394	149	185	2.5	410	32	31-01-2015
	B	000013	675	104	127	1.3	410	31	31-01-2015

2. 220kV System. (95kV X 2 stack 10KA)

Feeder Name	Ph	Counter Reading	It	Icor	Ir	% 3rd harmonics	Voltage	Temp	Date of Measurement
220kV ICT-I	R	000004	1904	48	59	0.3	220	32	31-01-2015
	Y	000004	685	125	155	1.3	220	32	31-01-2015
	B	000005	1202	320	397	0.8	220	32	31-01-2015
220kV ICT-II	R	000008	933	45	79	0.9	220	31	31-01-2015
	Y	000011	579	130	158	2.1	220	31	31-01-2015
	B	000004	680	119	145	1.3	220	31	31-01-2015
220kV Duburi-II	R	00106	798	15	20	0.3	220	34	31-01-2015
	Y	00107	740	26	26	0.3	220	33	31-01-2015
	B	00229	654	34	42	0.8	220	33	31-01-2015
220kV Duburi-I	R		55	5	6	0.5	220	32	31-01-2015
	Y	00106	78	6	8	0.3	220	32	31-01-2015
	B	00101	104	4	5	0.2	220	33	31-01-2015
220kV Kaniha-I	R	00111	604	9	11	0.3	220	31	31-01-2015
	Y	00101	836	14	17	0.2	220	32	31-01-2015
	B	00105	314	20	25	0.4	220	32	31-01-2015
220kV Kaniha-II	R	00103	299	17	20	0.4	220	31	31-01-2015
	Y	00101	845	19	23	0.4	220	31	31-01-2015
	B	00202	577	36	44	0.5	220	31	31-01-2015
220kV TTPS-I	R	00105	213	21	25	4.8	220	31	31-01-2015
	Y	00101	1337	32	39	0.4	220	31	31-01-2015
	B	00104	1427	13	16	0.7	220	31	31-01-2015
220kV TTPS-II	R	00220	276	10	12	0.3	220	30	31-01-2015
	Y	00105	1071	18	22	0.3	220	30	31-01-2015
	B	00105	856	18	22	0.3	220	30	31-01-2015
220kV NALCO-II	R	00101	450	18	22	0.3	220	30	31-01-2015
	Y	00101	543	31	37	0.4	220	30	31-01-2015
	B	00104	594	22	26	0.7	220	30	31-01-2015
220kV NALCO-I	R	00101	328	23	27	0.5	220	30	31-01-2015
	Y	00101	557	17	21	0.3	220	30	31-01-2015
	B	00202	592	29	34	0.5	220	30	31-01-2015
220kV Bhanjanagar-II	R	00110	1163	28	34	0.5	220	30	31-01-2015
	Y	00112	511	14	17	0.5	220	30	31-01-2015
	B	00107	406	22	27	0.3	220	30	31-01-2015
220kV Bhanjanagar-I	R	00101	256	13	15	0.4	220	30	31-01-2015
	Y	00101	1337	22	27	0.4	220	30	31-01-2015
	B		1225	21	26	0.4	220	30	31-01-2015
220kV Bidanasi	R	00105	451	9	10	0.4	220	30	31-01-2015
	Y	00101	932	16	22	0.5	220	30	31-01-2015
	B	00111	514	13	16	0.5	220	30	31-01-2015

MAJOR SYSTEM IMPROVEMENT WORK DONE-MERAMUNDALI GRIDSUBSTATION

1. 400kV Circuit Breaker Replacement.

Sl No	Date	Circuit Breaker Replaced.
1	20-02-2014	Replacement of 400 kv Sf6 Breaker in Dia 405 52 B(Tie CB of JSPL, RSTPS)
2	02-12-2014	Replacement of 400 kv Sf6 Breaker in Dia 407 52 C(Bus-II side ICT-II)
3	24-12-2014	Replacement of 400 kv Sf6 Breaker in Dia 402 52 A(Bus-I side Mendhasal-I)
4	13-03-2015	Replacement of 400 kv Sf6 Breaker in Dia 401 52 A(Bus-I side IB Thermal -II)
5	16.10.2015	Replacement of 400 kv Sf6 Breaker in Dia 402 52 B(Tie CB of Mendhasal-I, Duburi-II)
6	19.10.2015	Replacement of 400 kv Sf6 Breaker in Dia 404 52 A(Bus-I side Duburi-I)
7	08.04.2016	Replacement of 400 kv Sf6 Breaker in Dia 403 52 B(Tie CB of Angul-II, Duburi-I)
8	25.02.2016	Replacement of 400 kv Sf6 Breaker in Dia 405 52 C(Bus-II side RSTPS)

2. 400kV Circuit Breaker under Replacement.

- i. 401 Tie (Ib-II Angul-I),
- ii. 402 Dub-II main Bus-II,
- iii. 403 Ib-I main Bus-II

Work in progress, expected to be commissioned by July'2016.

3. 400kV Circuit Breaker Major Repair.

Accumulator of 400 kV BHEL circuit Breaker in 400 kV Angul-II (Dia 403).

4. 220kV Circuit Breaker Replacement.

Sl No	Date	Circuit Breaker Replaced.
1	19-03-2014	Replacement of 220 kv Sf6 Breaker in Auto Transformer -III Bay
2	24-04-2014	Replacement of 220 kv Sf6 Breaker in kaniha 1 Ckt
3	17-08-2014	Replacement of 220 kv Sf6 Breaker in TTPS-II Ckt
4	03-07-2015	Replacement of 220 kv Sf6 Breaker in Auto Transformer -I Bay
5	11-02-2016	Replacement of 220 kv Sf6 Breaker in Duburi-II Ckt
6	22-03-2016	Replacement of 220 kv Sf6 Breaker in TBC Bay

5. Replacement of Relays , Bus bar protection & Event loggers.

Sl.No.	Date	Relay ,protection replaced & commissioned
1	10-02-2015	Replacement of Electromagnetic Back up Relay by new Numerical relay in 220 kv bays
2	24-02-2015	Installation of New Numerical Distance protection Relay in 220 kv Kaniha II bay(Main II P442)
3	18-02-2015	Installation of New Numerical Distance protection Relay in 220 kv TTPS II bay(Main II P442)
4	03.03.2015	Installation of New Numerical Distance protection Relay in 220 kv Duburi II bay(Main II P442)
5	13.03.2015	Installation of New Numerical Distance Protection Relay in 220 kv kaniha I bay(Main II P442)
6	04-04-2015	Commisioning of 220 kv Event logger.
7	13-05-2015	Commissioning of 220 kv Bus bar protection panel
8	14.05.2015	Installation of New Numerical Distance protection Relay in 220 kv NALCO II(Main I P444) bay
9	26.05 2015	Installation of new numerical Distance protection Relay in 220 kv Duburi II (main I P444)bay
10	01.06.2015	Installation of new numerical Distance protection Relay in 220 kv NALCO I (Main I P444)bay
11	06.06.2015	Installation of new numerical Distance protection Relay in 220 kv TTPS I (Main I P444)bay
12	20.11.2015	Installation of new numerical Distance protection Relay in 220 kv Bhanjanagar I (Main I P444)bay
13	05.12.2015	Installation of new numerical Distance protection Relay in 220 kv Bhanjanagar II (Main I P444)bay
14	12.01.2016	Installation of new numerical Distance protection Relay in 220 kv Bidanasi (Main I P444)bay
15	09.02.2016	Installation of new numerical Distance protection Relay in 220 kv TTPS II (Main I P444)bay
16	25.02.2016	Installation of new numerical Distance protection Relay in 220 kv Duburi I (Main I P444)bay
17	29.02.2016	Installation of new numerical Distance protection Relay in 220 kv Kaniha I (Main I P444)bay

6. Other major repair work regarding protection system

1	13-04-2015	Rectification of control cables for 400 kv bays for Indication circuit of circuit breakers and isolators.
2	17-03-2015	Rectification of Control cables of Bus bar protection of 440 kv system.
3	21-04-2015	Rectification of control cables for 220 kv Bays for indication circuit of circuit breakers and isolators.
4	23-03-2015	Replacement of R phase CT of 220 kv kaniha 1 Ckt
5	05-07-2015	Cable rectification work of 132 kv Auto III CB