

Minutes of 48th PCC meeting

Date: 31.10.2016 Eastern Regional Power Committee 14, Golf Club Road, Tollygunge Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 48TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 20.10.2016 (THURSDAY) AT 11:00 HOURS

List of participants is enclosed at Annexure-A.

<u> PART – A</u>

ITEM NO. A.1: Confirmation of minutes of 47th Protection sub-Committee Meeting held on 19th September, 2016 at ERPC, Kolkata.

The minutes of 47th Protection Sub-Committee meeting held on 19.09.16 circulated vide letter dated 07.10.16.

Members may confirm the minutes of 47th PCC meeting.

Deliberation in the meeting

Members confirmed the minutes of 47th PCC meeting.

<u> PART – B</u>

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN SEPTEMBER 2016

ITEM NO. B.1: Multiple trippings at IBEUL on 27-09-16

The following lines were tripped on 27-09-2016:

- 400 kV IBEUL Raigarh
- 400 kV IBEUL Raigarh S/C
- 400 kV IBEUL Jharsuguda S/C

Sequence of events is enclosed at Annexure-B1.

Powergrid and IBEUL may explain.

Deliberation in the meeting

IBEUL vide mail dated 19th October 2016 informed the following:

- IBEUL end relay of 400 KV Raigarh IBEUL S/C line has sensed the fault in R& B phase at 15:45:29 hrs. However, B phase current was almost zero amp at IBEUL end and R phase current 5.439 KA.
- Due to heavy wind and rain in Jharsuguda area, B phase jumper got opened on Location No 39 (Tower No 39) and R-ph to ground fault occurred in tower no. 28 simultaneously within 2 sec.
- After completion of jumper maintenance and tree cutting work in 400kV IBEUL RAIGARH line, the line was successfully charged at 17:04 hrs on 28/09/2016.

Powergrid informed that no autoreclosure was initiated for 765 kV Jharsuguda-Dharamjaigarh line from Jharsuguda end at 16:45:27 hrs. Timing recorded at DR may be considered as 15:45:27 hrs.

Due to B phase jumper snapping of 400 kV IBEUL-Raigarh S/C at 15:45:29 hrs, Raigarh end relay sensed the fault in Z-II. But this fault was not sensed by IBEUL end relay due to low B phase

current (While Raigarh end F/C current was 5.05 kA) Open conductor relay should be picked up at IBEUL end.

At 15:45:31 hrs, another R-N fault was sensed by Jharsuguda and IBEUL end relay in Z-I protection. As per PG, the fault was in LILO part. It may happen fault was occurred at both the circuit.

ITEM NO. B.2: Disturbance at 220/132 kV NJP System on 01.09.2016 at 09:40 hrs.

1. Single line diagram: Submitted



2. Pre fault conditions: Submitted

3. Detailed analysis of tripping incident: Submitted

As 220 KV NJP – TLDP – III & IV was under shutdown, Discharge rod was connected to Transfer bus through R phase isolator dropper of 220 kV NJP – TLDP IV bay. At 09:41 hrs, partially closing R phase isolator arm of 220/132 kV ATR I caused electrical flushing and made non-fatal injury to the nearby workers. This incident resulted bus fault and tripped of all elements connected to Bus I along with B/C. Both 220 kV Bus I & II extension breaker at POWERGRID tripped for this incident. 220/132 kV ATR II was manually switched off after this incident.

Time	Name	Local end	Remote end
00.40	160 MVA 220/132/33kV Transformer-I &III	Over-Flux , 86L (HV) & 86(L) IV [OF Settings-Alarm-109%, Trip-112%] BB protection : RADSS, BZ-A trip	NA
hrs	220 kV PGCIL(Binaguri)-NJP Bus Section CB A & B	96BSA & 96 BSB trip	NA
	220 kV Bus-Coupler	96 B1 trip	NA

4. Remedial action taken : Submitted

Spurious partial closing of one pole (R-ph) of 220 kV Isolator arm due to malfunction of TB Isolator associated with 160 MVA 220/132/33 kV Tr-1 caused electrical flash as reported. Reason for such malfunction of Isolator arm is to be investigated & ascertained by committee.

Analysis of PMU plots:

- 12 kV voltage dip observed in R phase at Binaguri PMU.
- Fault clearing time 40 ms.

Status of Reporting: Tripping report with EL received from WBSETCL on 26-09-16

WBSETCL and Powergrid may explain.

Deliberation in the meeting

WBSETCL explained that

- Due to maloperation of R phase isolator arm driving mechanism of 220/132 kV ATR I, an R-N fault was initiated in Bus-A of 220kV NJP S/s.
- Busbar protection has operated and tripped of all the elements connected to Bus A along with B/C.
- Both 220 kV Bus A & B extension breakers at NJP (POWERGRID) were tripped as per the scheme.

PCC Recommendation

PCC felt that tripping of both the 220kV NJP (POWERGRID) lines for a fault in one bus section is not in order and advised WBSETCL to review the busbar protection scheme.

PCC also advised WBSETCL to submit the enquiry committee report on malfunction of 220 kV Isolator arm driving mechanism of 220/132 kV ATR I.

ITEM NO. B.3: Disturbance at 220kV Tarkera S/s on 22-09-16 at 15:38 hrs.

1. Single line diagram: Submitted



- 2. Pre fault conditions: Submitted
- 3. Detailed analysis of tripping incident: Submitted

At 15:38 hrs, heavy flash was observed at 132kV PT due to partial snapping of R phase jumper connection to Potential Transformer. All 220/132kV Auto Transformers were tripped from 220kV side on operation of directional Over current Earth fault protection.

The Bus bar protection (SIEMENS 7SS52) also operated for Bus-II only. all the feeders connected to Bus – II along with B/C tripped due to operation of bus bar protection. The relay indications are as follows:

Time	Name	Local end	Remote end	
	220 kV/Tarkora – Pourkola II	<u>At Tarkera</u>	Did not trip at romoto and	
	220 KV TAIKEIA – KUUIKEIA II	Bus bar protection	Did flot trip at remote end	
	220/132 kV ATR - II at	At 220 kV side	At 132 kV side	
	Tarkera	Bus Bar protection	Master trip	
	220/132 kV ATR – III & IV at	At 220 kV side	Did not trip at 122 kV sido	
	Tarkera	Bus Bar protection	Did hot trip at 152 kv side	
15.27	220 kV Tarkera –	<u>At Tarkera</u>	Did not trip at romoto and	
10.57 brc	Budhipadar –II	Bus bar protection	Did not trip at remote end	
1115		<u>At Tarkera</u>		
	220 kV Tarkera - Rengali II	Bus bar protection, back up	R-Y, 1.36 km from Rengali	
		B-N, E/F		
	220/132 kV ATR - I at	At 220 kV side	At 132 kV side	
	Tarkera	Bus Bar protection	B phase E/F	
	220 kV Tarkora DSD II	<u>At Tarkera</u>	Did not trip at romoto and	
15:37 hrs 15:37 hrs	ZZUKV TAIKETA - KJF - H	Bus bar protection	Did flot trip at remote end	
		Non directional Over		
	132kV Tarkera- Budhipadar	Current Earth Fault Relay		
		(CDG-31)		
15:37	122kV/Tarkora Daiganganur	Non directional Over		
hrs	152KV Tarkera- Kajyangpur-	Current Earth Fault Relay		
	2	(CDG-31)		
	132kV Tarkera- Rajgangpur-		Directional O/C & E/F	
	1		Protection (7SJ62)	

4. Disturbance record: Submitted

5. Remedial action taken : Submitted

- Malopearion of the Bus bar protection (SIEMENS 7SS52) has been discussed with SIEMENS. Relay DR data has been sent to SIEMENS for necessary analysis at their end and taking remedial measures.
- Now the Bus bar protection is kept out of service.

Analysis of PMU plots: At 15:37:45 hrs 18 kV voltage dip has been observed in R, Y & B – phase voltage at Rourkela PMU data. Fault clearance time was 880 ms.

Status of Reporting: Tripping reports from OPTCL has been received on 24-09-16.

OPTCL may explain.

Deliberation in the meeting

OPTCL explained the disturbance as follows:

- *R-ph fault occurred at 132kV bus due to partial snapping of R phase jumper connection to 132kV Potential Transformer.*
- Since no bus bar protection was available for 132kV bus, 220/132kV ATR-I & III tripped on backup directional Over current Earth fault protection to clear the fault from 220kV bus-I.
- However, the Bus bar protection (SIEMENS 7SS52) of 220kV Bus-II has also operated simultaneously and tripped all the feeders connected to Bus – II along with B/C. 220/132kV ATR-II & IV also tripped from 220 kV side on operation of the bus bar protection.
- OPTCL confirmed that 220 kV Tarkera Rengali II was tripped only from Tarkera end on busbar protection and the line did not trip from Rengali end as shown in relay indications table.
- Maloperation of the Bus bar protection (SIEMENS 7SS52) has been discussed with SIEMENS. SIEMENS engineers will verify the scheme. Present, the busbar protection scheme is kept out of service.
- The 132kV lines connected to the source were tripped on over current E/F protection.

PCC Recommendation

PCC advised OPTCL to change non directional over current E/F relays in 132 KV lines with directional relays.

ITEM NO. B.4: Disturbance at 400kV Khahalgaon S/s on 28-09-16 at 06:50 hrs.

- 1. Single line diagram: Submitted
- 2. Pre fault conditions: Submitted

400 KV Bus reactor#2 is out of service since Dec'2014.

3. Detailed analysis of tripping incident: Submitted

At 06:50 hrs, all breakers connected to Bus – I at Kahalgaon tripped on bus differential protection due to failure of B phase CT of 400 kV Farakka – Kahalgaon – II main bay. At same time, 400 kV Kahalgaon – Farakka – III & IV tripped from Kahalgaon end on Z-IV. 400 kV Kahalgaon – Maithon – I & II tripped on overvoltage at Kahalgaon in O/V stage II. 400 kV Kahalgaon – Barh – I tripped on TEED protection. Relay indications are as follows:

Name & timing	Relay at Kahalgaon end	Relay at remote end
400 kV Kahalgaon – Farakka – IV (06:50:09.030 hrs)	Main & Tie breaker tripped on Z-IV. (Time delay setting was 350 ms but line tripped after 120 ms)	Z-II started but did not trip
400 kV Kahalgaon – Farakka – III (06:50:09.030 hrs)	Main & Tie breaker tripped on Z-IV. (Time delay setting was 350 ms but line tripped after 120 ms)	Z-II started but did not trip
400 kV Kahalgaon – Maithon – I (06:50:09.108 hrs)	Main & Tie breaker tripped on O/V stage – II (DR is yet to be received)	Information yet to be received
400 kV Kahalgaon – Farakka – II (06:50:09.108 hrs)	Main breaker tripped in differential protection of Bus I. Tie breaker tripped on O/V stage II protection of 400 kV Kahalgaon – Maithon – I (Same dia)	B-N, Z-II started at 06:50:08.918 hrs. Z-I picked up at 06:50:09.066 hrs and only B phase pole open. Later at 6:50:09.449 hrs Z-I picked up for Y-N fault and all three

		breakers tripped (5 kV voltage dip observed at BSF PMU at same time).
400 kV Kahalgaon – Maithon – II (06:50:09.245 hrs)	Main breaker tripped in bus differential protection of bus - I & Tie breaker tripped on O/V stage – II (DR is yet to be received)	Information yet to be received
400 kV Kahalgaon – Barh – I (06:50:09.300 hrs)	TEED Protection (Mal-operation)	Z-II started, line tripped on direct trip receipt.

4. Disturbance record: Submitted

5. Remedial action taken : Submitted

- Faulty equipments (i.e. 02 nos CTs & 02 nos set of insulator stacks of isolator) were identified & replaced with new one.
- 400 KV Kh- FKK#3 & 4 line is the property of PGCIL & maintenance involving OEM/expert service is in PGCIL scope. Matter is taken up with OEM i.e. M/s ALSTOM through PGCIL for root cause analysis of MICOM P444 operation at less time delay than set time delay for Zone#4 operation.
- Old 400 KV CTs (>25 yrs) is already under replacement plan in phased manner at NTPC Kahalgaon. 42 nos. of 400 KV CTs are already replaced.

Analysis of PMU plots:

- At Biharshariff PMU data, 70 kV voltage dip has been observed in B phase.
- Fault Clearance time was 120 ms. approximately.

Status of Reporting:

- NTPC Kahalgaon has submitted the tripping report along with DR on 02-10-16
- NTPC Farakka has submitted the tripping report along with DR along with DR on 01-10-16
- NTPC Barh has submitted the tripping report along with DR along with DR on 01-10-16

NTPC may explain the following:

- Reason for Z-IV operation of 400 kV Kahalgaon Farakka III & IV
- O/V protection operation of 400 kV Kahalgaon Maithon I & II
- TEED protection operation of 400 kV Kahalgaon Barh I at Kahalgaon end.

Deliberation in the meeting

NTPC explained the disturbance as follows:

- B-N fault was initiated in Bus-I due to failure of B phase CT of 400 kV Farakka Kahalgaon II main bay.
- Bus differential protection operated and tripped all the associated breakers connected to Bus I as per the scheme.
- However, 400 kV Kahalgaon Farakka III & IV tripped from Kahalgaon end on Zone-IV (Micom P442) within 100-120 msec. NTPC informed that the relay was maloperated and tripped the line within 120 ms even though the zone-IV time setting was higher.
- NTPC informed that the line belongs to Powergrid and protection system is being maintained by Powergrid. The malfunction of the relay (Micom P442) has been informed to Powergrid for rectification.
- 400 kV Kahalgaon Maithon II (line length 175 km) was idle charged from Maithon end has caused over voltage and both 400 kV Kahalgaon Maithon I & II tripped on over voltage

stage-II. 400 kV Kahalgaon – Farakka – II also tripped due to being on same dia.

- 400 kV Kahalgaon Barh I tripped on TEED protection through low impedance TEED relay (ABB RET).
- Unit#2 tripped on loss of excitation with Under-voltage.
- Detailed presentation is enclosed at Annexure-B4

Powergrid informed that 125MVAR bus reactor at 400kV Maithon S/s has been commissioned on 29-09-2016 and it will resolve the over voltage problem.

PCC Recommendation

PCC advised NTPC and Powergrid to check the Micom P442 of 400 kV Kahalgaon – Farakka – III & IV and TEED protection of 400 kV Kahalgaon – Barh – I.

ITEM NO. B.5: Disturbance at 400 kV Baripada S/s on 28.09.16 at 10:08 hrs.

1. Single line diagram: Submitted



2. Pre fault conditions: Submitted

Bus-I

315 MVA ICT-I 315 MVA ICT-II Pandiabili Duburi Bus-II Keonjhar TISCO Jamshedpur kharagpur

3. Detailed analysis of tripping incident: Submitted

400 kV bus I was under shutdown due to jumpering work. So all main CBs connected to bus I were in open condition. At 10:08 hrs, bus differential protection of 400kV Bus-II at Baripada S/s operated due to mal-operation of GIS bus duct gas density monitor and tripped all main breakers connected to bus II. All the feeders and ICTs were connected only to the element in same bay through tie bay. At the same time tie bay between 400kV Baripada- Duburi S/c & 400kV Baripada- Jamshedpur S/c tripped due to DT receipt. So these two circuits tripped from Baripada end only.

Relay indications are given below:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
03:50 hrs	400kV Bus-I at Baripada	Planned shutdown	
	400kV Bus-II at Baripada	Became dead after tripping all the Main CBs of lines connected to Main Bus-II due to operation of bus differential protection	
10:08 hrs	400kV Baripada- N.Duburi S/c & 400kV Jamshedpur- Baripada S/c	At Baripada Tie CB tripped (both Ckt on same Dia) on operation of DT receipt	

4. Disturbance record: Submitted

5. Remedial action taken : Not Submitted

Analysis of PMU plots:

• From the Talcher & Jeypore PMU plot no signature of fault has been observed.

Status of Reporting: Tripping report along with DR has been received from PGCIL on 02-10-16.

Powergrid may explain the following:

 Reason for tripping of Tie CB of 400kV Jamshedpur & N.Duburi at Baripada on operation of DT receipt.

Deliberation in the meeting

Powergrid explained the disturbance as follows:

- Bus differential protection of 400kV Bus-II at Baripada S/s operated due to mal-operation of GIS bus duct gas density monitor and tripped all the main breakers connected to bus II.
- The bus duct gas density monitor has been replaced.
- DT was initiated at Baripada due to PLCC maloperation because of E/F in DC supply of PLCC system and resulted in tripping of 400kV Jamshedpur & N.Duburi lines. The same has been rectified later.

ITEM NO. B.6: Tripping of Tenughat U # 2, Patratu U # 10 and 400/220kV, 315 MVA ICT-I, II & III at Biharshariff S/s on 02.09.16, 19:32 hrs.

- 1. Single line diagram: Not Submitted
- 2. Pre fault conditions: Not Submitted
- 3. Detailed analysis of tripping incident: Not Submitted

- As per information received from BSPTCL & JUSNL through telephonic conversation at 19:19 hrs, Tenughat U #2 tripped due to low drum level.
- From the SCADA data dumped at ERLDC, it seems that after tripping of Tenughat U # 2, loading on 400/220kV, 315 MVA ICT-I, II & III at Biharshariff went upto 260MW/ICT.
- Further, at 19:31 hrs, running unit of Patratu U # 10 also tripped (reason awaited).
- Thus after tripping of running units of Tenughat & Patratu, the loading on said ICTs went beyond 270 MW/ICT and it tripped instantaneously on actuation of backup overcurrent protection from 400kV side.

After tripping of all 315 MVA ICTs at Biharshariff, load at Biharshariff, Fatuah, Darbhanga and its surrounded area were being fed from 220kV Ranchi- Hatia D/c and due to this reason the said line were getting heavily overloaded. Thus to avoid the further overloading tripping of the said lines, 220kV Tenughat- Biharshariff S/c was manually opened.

Due to tripping of all 315 MVA ICTs at Biharshariff and manually opened of 220kV Tenughat-Biharshariff S/c line, load loss of approximately 690 MW occurred at Biharshariff, Fatuah, Darbhanga & its surrounded area.

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
	Tenughat U # 2	Tripped due to low drum level	
19:19 hrs			
	Patratu U # 10	Tripped (Reason awaited)	
19:32 hrs	315 MVA 400/220 kV ICT I	Tripped on operation of back	up overcurrent protection
	315 MVA 400/220 kV ICT II	from 400kV side.	
	315 MVA 400/220 kV ICT III		

4. Disturbance record: Not Submitted

5. Remedial action taken : Not Submitted



Analysis of PMU plots:

• From the Biharshariff PMU plot no signature of fault was observed.

Status of Reporting: Report from PGCIL, JUSNL & BSPTCL is yet to be received.

BSPTCL and JUSNL and Powergrid may explain.

Deliberation in the meeting

JUSNL representative was not available in the meeting.

Powergrid informed that loading of 315 MVA ICTs at Biharshariff has increased after tripping of Tenughat U # 2, Patratu U # 10. First ICT-3 was tripped form 220kV end on over current protection. The other two ICTs were tripped from 400kV end on over current protection due to over load.

Powergrid informed that protection system at 220kV Biharshariff (BSPTCL) end is being maloperated due to mixing of control cables and DC supply in the control room.

BSPTCL informed that 220kV Tenughat-Biharshariff line was opened manually.

ERLDC informed that BSPTCL has not taken permission from them for opening of the line. PCC felt that opening of line without taking code from RLDC is violation of Grid code and advised BSPTCL to take care in future.

PCC Recommendation

PCC advised BSPTCL to carry out the following:

- Investigate the reason for tripping of ICT-3 at Biharshariff from 220kV end.
- Take the appropriate action to eliminate short circuit between control cables and DC supply

ITEM NO. B.7: Disturbance at 400kV Biharshariff (PG) and 220 kV Biharshariff S/s (BSPTCL) on 07-09-16 at 03:59 hrs.

1. Single line diagram: Submitted



2. Pre fault conditions: Submitted

3. Detailed analysis of tripping incident: Submitted

At 03:57 hrs, 220 KV Biharshariff – Begusarai – II tripped along with 132 kV Biharshariff – Samastipur, 400/220 kV ICT – II, III and 220/132 kV ATR - I at Biharshariff. On investigation, it was found that R phase jumper of 220 KV Biharshariff – Begusarai – II was snapped at tower location 154 (7km from Biharshariff).

Time	Details of tripping	Relay at local end	Relay at remote end
(Hrs)			
	220 kV Biharshariff- Begusarai-II	R phase jumper snapped, 7kr	n from Biharshariff
03:57 hrs	400/220 kV ICT – II at	Tripped from 220 kV (BSPTCL) side, 86 (Master trip relay)	
	Biharshariff	Did not trip at 400 kV side	
	400/220 kV ICT – III at	220 KV side: 86 (Master trip i	relay)
	Biharshariff	400 kV side: Backup OC trip,	86A/B
	220/132 kV ATR - I at	REF, 86T (Master trip relay)	
	Biharshariff		
	132 kV Biharshariff – Samastipur	Reason yet to be received	

4. Disturbance record: Submitted

5. Remedial action taken : Submitted

After resetting of relay 220 KV Biharsharif-Begusarai ckt-l charged at 04:35 hrs & ckt –II charged at 18:30 hrs from Biharsharif end after replacement of the damaged jumper with new one.

Analysis of PMU plots:

- At Biharshariff PMU data, 80 kV voltage dip has been observed in R-phase.
- Fault Clearance time was less than 100 ms.

Status of Reporting:

- Detail report along with DR & EL was received from BSPTCL on 17-09-16.
- Detail report with DR & EL received from PG on 26-09-16.

BSPTCL and Powergrid may explain the following:

- The reason for tripping of 400/220 kV ICT II & III, 220/132 kV ATR I at Biharshariff
- Tripping of 132 kV Biharshariff Samastipur.
- In DR file for the tripping of 220 kV Biharshariff Begusarai II, R phase E/F and R phase series fault was detected within 300 ms. BSPTCL may explain.

Deliberation in the meeting

BSPTCL informed that R-N fault occurred in 220 kV Biharshariff- Begusarai -II due to jumper snapping at 7 km from Biharshariff end. BSPTCL updated the relay indications as follows:

Time	Details of tripping	Relay at local end	Relay at remote end
(Hrs)			
	220 kV Biharshariff- Begusarai -II	Z-I, 7 km from Biharshariff,	Tripped Manually
03:57 hrs	220 kV Biharshariff- Begusarai -I	Tripped Manually	Over current E/F protection
	400/220 kV ICT – II at	Tripped from 220 kV (BSPTCL) side, 86 (Master trip relay)	
	Biharshariff	Did not trip at 400 kV side	
	400/220 kV ICT – III at	220 KV side: 86 (Master trip	relay)
	Biharshariff	400 kV side: Backup OC trip, 86A/B	
	220/132 kV ATR - I at	Non directional E/F relay	
	Biharshariff		

BSPTCL informed that retrofitting of numerical relays at Begusarai S/s has been done after this disturbance.

PCC Recommendation

PCC felt that Begusarai end of 220 kV Biharshariff- Begusarai -II should clear the fault and advised BSPTCL to coordinate Begusarai end line relays.

PCC felt that 400/220 kV ICTs and 220/132 kV ATR – I should not trip for a line fault and advised BSPTCL to coordinate the relays with line protection relays.

ITEM NO. B.8: Tripping of 220 KV Biharshariff - Begusarai D/C line on 18-09-16 at 09:28 hrs.

- 1. Single line diagram: Submitted
- 2. Pre fault conditions: Submitted

3. Detailed analysis of tripping incident: Submitted

At 09:28 hrs, 220 KV Biharshariff - Begusarai D/C tripped on Y-B fault causing power failure at Begusarai and Darbhanga.

Time	Details of tripping	Relay at local end	Relay at remote end
(Hrs)			
	220 kV Biharshariff- Begusarai -II	Y-B, Z-I, 35.9 km from	SOTF, Directional O/C
09:28 hrs		Biharshariff, IR=0.49 KA,	
		IB= 5.28 KA, IY=4.88 KA	
	220 kV Biharshariff- Begusarai -I	Did not trip	Y-B

4. Disturbance record: Submitted

5. Remedial action taken : Submitted

- After resetting of relay 220 KV Biharsharif-Begusarai ckt-I charged at 09:40 hrs & ckt –II charged at 10:10 hrs from Begusarai end and 10:05 hrs from Biharsharif end stood ok.
- The Distance protection of the 220 KV ckt I &2 checked at GSS Biharsharif on dt 14/10/16and found ok.

Analysis of PMU plots:

- At Biharshariff PMU data, 15 kV voltage dip has been observed in Y & B phase.
- Fault Clearance time was less than 100 ms.

Status of Reporting: BSPTCL has submitted the tripping report along with DR on 26.09.16.

BSPTCL may explain the following:

- Reason for tripping of both 220 KV Biharshariff Begusarai D/C may be explained by BSPTCL.
- Bihar SLDC may furnish amount of energy un-served and duration of disturbance.



Deliberation in the meeting

BSPTCL explained that there was Y-B fault in 220kV Begusarai S/s while charging the line isolator of MTPS line. 220 kV Biharshariff- Begusarai –II tripped from Biharshariff end on zone 1 which was supposed to trip in zone 2. The relay has been tested and settings have been verified.

PCC Recommendation

PCC felt that since the distance to the fault was showing half of the actual fault distance, the CT and PT ratio selected in the numerical relay may not be appropriate.

PCC advised BSPTCL to verify the CT and PT ratio in the numerical relay.

ITEM NO. B.9: Tripping of 220 KV Biharshariff - Fatuha D/c line on 20-09-16 at 15:44 hrs.

- 1. Single line diagram: Submitted
- 2. Pre fault conditions: Submitted

3. Detailed analysis of tripping incident: Submitted

At 15:44 hrs, R-N fault was initiated due to bursting of R-Ph CT of 220kV Patna- Fatuah S/c (idle charged from Fatuah end) at Fatuah end. The following lines tripped:

- 220kV Biharshariff- Fatuah Ckt-I tripped from Biharshariff end on zone 2
- 220kV Biharshariff- Fatuah Ckt-II tripped from Fatuah end on Z-I relay.

Time	Details of tripping	Relay at local end	Relay at remote end
(Hrs)			
	220kV Biharshariff- Fatuah –I	At Biharshariff	At Fatuah
15:44 hrs		R-Ph, Zone-2, fault location	Did Not Trip
		49.86 km ,fault current	
		IR=3.083 kA ,	
		IY=848.3A,IB=992.7A .	

	Relay Trip Time =79.9ms,fault duration =325 ms	
220kV Biharshariff- Fatuah –II	At Biharshariff	At Fatuah
	Dia Not Trip	R-N , ZONE-1, fault location 0.5389 km, fault
		current
		IR=2.907kA,IY=584.80A,
		IB=960.60A, Relay Trip
		duration =50 ms

4. Disturbance record: Submitted

5. Remedial action taken : Submitted

- The Damaged R-phase CT of 220 KV Fatuha -PG (patna) was replaced,
- The reverse polarity of the 220 kv CT in 220 kv Biharsharif ckt II at GSS Fatuha was corrected and the Bay was taken into service at 14:30 Hrs on dated 21/09/2016.

Analysis of PMU plots:

- From the Biharshariff PMU plot 25kV voltage dip was observed in R-Ph at 15:44:46 hrs.
- Fault clearance time was 350 ms.

Status of Reporting: BSPTCL has submitted the tripping report along with DR on 26.09.16.

BSPTCL may explain the following:

- 220kV Biharshariff- Fatuah ckt-II at Biharshariff end should clear the fault on Zone-II.
- As per relay setting submitted by BSPTCL, Zone-IV time setting at both Biharshariff & Fatuah S/s is 1200 ms. However, as per CEA standard protection philosophy it should be 500 ms. Thus BSPTCL may check and apply the setting as per CEA standards.



Deliberation in the meeting

BSPTCL explained that R-N fault was occurred in 220kV Patna- Fatuah S/c (idle charged) due to bursting of R-Ph CT at Fatuah end. 220kV Biharshariff- Fatuah Ckt-I tripped from Biharshariff end on zone 2.

However, 220kV Biharshariff- Fatuah Ckt-II which was supposed to trip from Biharshariff end on zone 2 had tripped from Fatuah end on Zone 1. It was found that the line CT connection at Fatuah was in reverse therefore the relay pickup the fault in bus side. The same has been rectified.

ITEM NO. B.10: Disturbance at 132 kV Purnea S/s on 12-09-16 at 22:40 hrs.



1. Single line diagram: Submitted

2. Pre fault conditions: Submitted

3. Detailed analysis of tripping incident: Submitted

At 22:40 Hrs, 132 kV Purnea (PG) – Purnea (BSPTCL) – III tripped due to snapping of Y phase jumper near gantry at BSPTCL s/s. At same time, 132 kV Purnea (PG) – Kishangunj – Forbisgunj and 132 kV Purnea (PG) – Purnea (BSPTCL) – I & II tripped from Purnea (PG) end on O/C (as per BSPTCL report). After tripping of 132 kV Purnea (PG) – Purnea (BSPTCL) T/C & 132 kV Purnea (PG) – Kishangunj – Forbisgunj, load at adjacent area and Nepal was catered through 220 KV Purnea-Madhepura – I & II which tripped from Purnea end on O/C. Antecedent flow was 150 MW per circuit.

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
22:40	132 kV Purnea (PG) – Purnea (BSPTCL) – III	Yet to be received	E/F
Hrs	132 kV Purnea (PG) Purnea (BSPTCL) I & II	O/C at PG end	Did not trip
	132 kV Purnea (PG) – Kishangunj –	O/C at PG end	Did not trip
	220 KV Purpea-Madhenura – L& II	Ω/C at Purnea end	Did not trin
			Did flot trip

4. Disturbance record: Not Submitted

5. Remedial action taken : Submitted

• Snapped Y-Phase jumper near gantry of 132 KV Purnea(PG)- Purnea bay was replaced and jumper connection of other phases was also tightened. System was normalised at 02:32 Hrs on 13.09.2016.

Analysis of PMU plots:

 17.5 kV voltage dip observed in Y phase at Binaguri PMU. Fault clearing time is 350 ms approximately.

Status of Reporting:

- BSPTCL has submitted the tripping report on 17-09-16.
- Tripping report is to be received from PG.

BSPTCL and Powergrid may explain the following:

- POWERGRID may explain reason for tripping 132 kV Purnea (PG) Purnea (BSPTCL) I & II, 132 kV Purnea (PG) Kishangunj Forbisgunj from Purnea (PG) end.
- As per Binaguri PMU data, fault clearance time was approx. 350 ms (Z-II timing). BSPTCL & POWERGRID may investigate delayed clearance of fault as any fault at 132 level should be cleared within 160 ms. as per Clause 3(e) of CEA Grid Standards 2010.
- Bihar SLDC may submit the amount of energy un-served due to this incident.

Deliberation in the meeting

BSPTCL explained that there was a Y-N fault in 132 kV Purnea (PG) – Purnea (BSPTCL) – III due to snapping of Y phase jumper near gantry at Purnea BSPTCL s/s. Purnea (BSPTCL) end tripped on O/C, E/F protection. 132 kV Purnea (PG) – Purnea (BSPTCL) – I & II tripped from Purnea (PG) end on over current relay due to over load. Pre fault load in each ckt was 80 MW.

Thereafter, the following elements tripped on over current relays due to over load:

- 132 kV Purnea (PG) Kishangunj Forbisgunj tripped from PG end
- 3X100 MVA, 200/132 KV ATRs at GSS Madhepura
- 132 KV Madhepura-Supaul D/C line

PCC Recommendation

PCC advised BSPTCL to coordinate the over current relays of 3X100 MVA, 200/132 KV ATRs at GSS Madhepura and 132 KV Madhepura-Supaul D/C line relays so that the line will trip before the ATRs.



BSPTCL added that 220/132 KV Kishanganj (New) GSS is charged on 5/10/2016. New 132 lines emanating are:

1)132 KV Kishanganj(New)-Kishanganj(Old) D/C. 2)132 KV Kishanganj(New)-Forbesganj D/C.

With this, the burden on 132 KV Purnea (BSPTCL) will be reduced and power to Dohabi(Nepal) can be fed smoothly.

ITEM NO. B.11: Disturbance at 132kV Purnea and 220kV Madhepura S/s on 27-09-16 at 19:00 hrs.



1. Single line diagram: Submitted

2. Pre fault conditions: Submitted

3. Detailed analysis of tripping incident: Submitted

- At 18:53 Hrs,132 KV Purnea-Forbesganj line tripped from Purnea(B) end on distance protection and from Forbesganj end on O/C relay.
- At the same time 132 KV Purnea(PG)-Kishanganj-Forbesganj T/L tripped from Purnea(PG) end on zone 2, distance protection relay.
- At 19:00 Hrs. 3X100 MVA 220/132 KV Transformers tripped on overload at GSS Madhepura

SI.No.	Name of Bay / Line	Local End Relay Indications	Remote End Relay Indications
1.	132 KV Purnea(B)-Fobesganj T/L	Zone-1, 18.44 KM	R-phase, O/C, 67/67N, 86
2.	132 KV Purnea(PG)-Kishanganj- Forbisgank Ckt T/Ls	anj- R-Ph, zone 2, No trippir distance=203.4 Km.	
3.	3X100 MVA, 200/132 KV ATRs at GSS Madhepura	s at O/C relay in all three 200/132 KV ATRs GSS Madhepura	
4.	132 KV Forbesganj-Kataiya T/Ls	No Tripping	No Tripping
5. 132 KV Madhepura-Supaul T/L-1 O/C		O/C	No tripping
6.	132 KV Madhepura-Supaul T/L-2	O/C	No Tripping

- 4. Disturbance record: Not Submitted
- 5. Remedial action taken : Submitted
 - The problem of snapped jumper and conductor and broken insulator disc was attended and rectified.
 - Overcurrent relay settings at GSS Kataiya ,GSS Supaul and GSS Madhepura were checked and corrected.

Status of Reporting: BSPTCL has submitted the tripping report

BSPTCL and Powergrid may explain.

Deliberation in the meeting

BSPTCL explained that there was a R-N fault in 132 KV Purnea(B)-Fobesganj line and Purnea(B) cleared the fault on zone 1 protection. But Fobesganj end failed to clear the fault hence the 132 KV Purnea(PG)-Kishanganj-Forbisganj line tripped from Purnea(PG) end on zone 2 protection. As a result, the following elements tripped on over current protection due to over load:

- 3X100 MVA, 200/132 KV ATRs at GSS Madhepura
- 132 KV Madhepura-Supaul D/C line

BSPTCL informed that Forbesganj end relays are old not operating properly and the line would be taken under long shutdown for reconductoring work.

PCC Recommendation

PCC advised BSPTCL to change the relays at Forbesganj.

ITEM NO. B.12: Continuous tripping in 400kV Binaguri-Bongaigaon and 220kV CHPC-Birpara sections.

Repeated tripping of 400kV Binaguri-Bongaigaon sections and 220kV CHPC-Birpara-I & II have been observed in the recent past. The details of trippings are indicated at the **Annexure-B12**. Powergrid/ENCIL/Bhutan may confirm the details of preventive maintenance and other necessary actions being taken to prevent such trippings.

Powergrid/ENCIL/Bhutan may explain.

Deliberation in the meeting

Powergrid explained that it is a lightening prone area and repeated faults are being occurred due to insulators failure.

Powergrid informed that they will replace the porcelain insulators with polymer insulators up to Bhutan boarder. Faults will be reduced after the insulator replacement.

PCC Recommendation

PCC felt that Bhutan also has to take corrective action to prevent the number of trippings.

PART- C:: OTHER ITEMS

ITEM NO. C.1: Tripping incidences in the month of September, 2016

Other tripping incidences occurred in the month of September 2016 which needs explanation from constituents of either of the end is given at **Annexure- C1**.

Members may discuss.

Deliberation in the meeting

Constituents explained the tripping incidences. The revised list is enclosed at Annexure- C1.

ITEM NO. C.2: Protection Committee visit to BSPTCL and JUSNL Sub-stations

In view of repeated uncoordinated trippings in BSPTCL and JUSNL systems, 31st TCC/ERPC formed a committee of following protection engineers 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 Jiten Das, Asst GM, PGCIL
- Shri S. B. Prasad, ESE, BSPTCL
- Shri Vidyasagar Singh, ESE, JUSNL

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.

A special meeting was held on 08.06.16 to discuss the observations of the site visit of Chandil, Ramchandrapur, Adityapur & adjoining substations by ERPC team. In the meeting it was emphasized that the distance protection along with the back-up protection of JUSNL system (comprising of 220kV Ramchandrapur, Chandil & Hatia-II and 132 kV Adityapur & Hatia-I) needs to be reviewed for proper protection co-ordination. It was decided that the Protection team will carry out the setting calculations for all the 220 kV & 132 kV lines along with the 220/132 kV ICTs based on the data provided by JUSNL which shall be implemented by JUSNL.

In 33rd TCC, it was advised JUSNL to comply the recommendations given by the ERPC protection team.

Thereafter, a special meeting was held in ERPC on 08.07.16 to review the protection settings of all the 220 kV & 132 kV lines along with the 220/132 kV ICTs of 220/132kV Ramchandrapur, Chandil & Hatia-II and 132 kV Adityapur & Hatia-I substations of JUSNL. Representatives of DVC, WBSETCL and ERLDC as members of ERPC Protection team attended the meeting.

After detail study of the data as submitted by JUSNL, it was observed that there was some missing data/mismatch in the information. Therefore, it was felt that the complete details of all Lines (i.e. Line length, Single or double circuit) originating from the following Sub-stations Bus along with Transformer data (MVA, % Z, Voltage Ratio) are required for finalizing the protection settings for all the 220 kV & 132 kV lines:

- 1. 220KV Ramchandrapur
- 2. 132KV Ramchandrapur
- 3. 132KV Tamar
- 4. 132KV Golmuri
- 5. 132KV Rajkharswan
- 6. 220KV Chandil
- 7. 132KV Chandil
- 8. 132KV Adityapur
- 9. 220KV PTPS
- 10. 132KV PTPS

- 11. 132KV Lohardaga
- 12. 132KV Namkum
- 13. 132KV HEC
- 14. 132KV Kanke
- 15. 132KV Kamdara
- 16. 132KV Hatia I
- 17. 132KV Hatia 2
- 18. 220KV Hatia 2
- 19. 132KV Sikidri

JUSNL has submitted the desired information and the same has been circulated to protection team.

Protection settings of all the 220 kV & 132 kV lines along with the 220/132 kV ICTs of 220/132kV Ramchandrapur, Chandil & Hatia-II and 132 kV Adityapur & Hatia-I substations of JUSNL were finalized in a special meeting on 28.07.2016. JUSNL was advised to implement the settings.

In 46th PCC, JUSNL informed that they have incorporated the recommended settings at 220 kV Chandil, Hatia-I and 132 kV Hatia-II sub-stations. 220 kV Ramchandrapur & 132 kV Adityapur Sub-stations will be implemented by 1st week of September, 2016.

PCC advised JUSNL to submit a report on improvements observed in protection system performance after implementation of the recommended settings.

JUSNL agreed.

Information received from JUSNL is enclosed at Annexure-C2

JUSNL may update.

Deliberation in the meeting

JUSNL vide mail dated 5th October 2016 informed that the relay settings have been changed for all the lines of 220kV Chandil, Ramchndrapur and 132kV Adityapur as per the ERPC committee recommendations.

ITEM NO. C.3: PROTECTION PHILOSOPHY OF EASTERN REGION

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

Sl.	Zone	Direction	Protected Line Reach	Time Settings	Remarks
No.			Settings	(in Seconds)	
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	As per CEA
			For double ckt- 150 % of the protected line	the 50% of the shortest line ; 0.35- otherwise	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.

JITPL, MPL and Adhunik may submit the revised zone settings data at the earliest.

Deliberation in the meeting

PCC advised JITPL, MPL and Adhunik to submit the zone settings information to ERPC.

ITEM NO. C.4: 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 the 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 (WBPDCL)-	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 (WBPDCL)	Completed on 25 th February, 2016
18)	400kV Bakreswar (WBPDCL)	Completed on 26 th February, 2016

Nomination for the audit has been received from DVC, WBSETCL and ERLDC.

Schedule for the audit is given below:

Date of Audit	Substations
01-11-2016	765 kV GAYA
	400kV BIHARSHARIFF(PG)
02 11 2016	&
02-11-2016 to 04-11-2016	220KV BIHARSHARIFF(B)
	UFR Testing
	132/33 KV Bari Pahari (Bihar Sharif), 132/33 KV
	Nalanda and 132/33 KV Rajgir

Powergrid requested to nominate the member and coordinate.

Deliberation in the meeting

Members noted.

ITEM NO. C.5: 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.

A hands on training program was held from 05/09/2016 to 09/09/2016 at ERPC Kolkata.

PRDC updated the latest status of the implementation of the project and informed the following:

- > Data collection for Odisha including IPPs has been completed.
- Data collection for JUSNL and DVC (located at Jharkhand) is going on and around 40 substations have been completed.
- > Data collection for DVC (located in West Bengal) has also been started.
- > Data collection for West Bengal, WBPDCL, DPL and CESC will be started after Puja.

PCC requested all the respective members to extend their supports for data collection of their substations.

Members may note.

Deliberation in the meeting

Members noted.

<u>PART- D</u>

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 D.1 Disturbance at 220 kV Sasaram S/s on 28-08-16 at 10:38 hrs & 11:10 hrs.

1. Single line diagram: Submitted.

2. Pre fault conditions: Submitted

Pre Fault data on 28.8.16 at 10:00 hrs in Pusauli GSS:

Voltage of 132 KV Kudra –Pusauli (PG)	134.4 KV
Load on 220 Pusauli (PG)- Pusauli	125.2 MW
Load on 132 KV Kudra – Pusauli (PG)	55.1 MW

Pre Fault data on 28.8.16 at 11:00 hrs in Pusauli GSS:

Load on 220 KV ARA (PG)-pusauli	9.7 MW
Load on 132 KV Kudra –Pusauli (PG)	6.1 MW

3. Detailed analysis of tripping incident: Submitted

At 10:38 hrs, 220 kV Sasaram- Nandokhar S/C along with 220/132 kV ATRs at Nandokhar tripped due to Y-N fault in 132 kV Kudra – Nadokhar S/C.

In order to restore supply to Khurda, 132 kV Kudra – Nadokhar S/C was charged at 11:10 hrs. At the same time, 220 kV Arrah –Nadokhar tripped from Arrah end with relay indication Y-N fault with distance of 113 km from Arrah(PG) end and fault current of 0.9 kA. On investigation, it was found there was a clearance problem between 132 kV Kudra – Nadokhar S/C and 33 kV feeders of 132/33 kV Khurda S/S.

4. Relay indications: Submitted

Time	Details of tripping	Relay at local end	Relay at remote end
(Hrs)			
10:38 hrs	132 kV Nandokhar - Kudra S/C	Y-N, F/C 2.76 KA	Yet to be received
	220 kV Sasaram- Nandokhar S/C	Y-N, Z-III, 92.76 km from Sasram, F/C 1.76 kA	Did not trip
	150 MVA, 220/132 kV ATR-II at Nadokhar	HV- Over-current , Earth fault LV- Over-current earth fault	
11:10 hrs	220 kV Arrah- Nandokhar S/C	Tripped	Earth Fault

5. Disturbance record: Sequence of events submitted

6. Remedial action taken: Submitted

During patrolling it was found that clearance between Y phase conductor of 132 Kv Nadokhar - Kudra Transmission line and 33 KV Kudra –Chenari line was not sufficient.

Clearance between Y phase conductor of 132 Kv Nadokhar -Kudra Transmission line and 33 KV Kudra –Chenari line was increased. After rectification, the line was Charged.

Analysis of PMU plots:

At 10:38 hrs

- 30 kV voltage dip in Y phase is observed at 10:38:16.700 hrs. 7 kV voltage dip in R phase is observed at 10:38:18.700 hrs.
- Fault clearing time is 1500 ms.

At 11:10 hrs

- 25 kV voltage dip in Y phase is observed at 11:10:33.700 hrs. 25 kV voltage dip in R phase is observed at 11:10:34.400 hrs.
- Fault clearing time is 900 ms.

Status of Reporting: BSPTCL has submitted the tripping report on 30-08-16.

In 47th PCC, BSPTCL informed that –

- > The 132 kV Sasaram- Nadokhar was made T-connection at Kudra Substation.
- There was a clearance problem between 132 kV Kudra Nadokhar S/C and 33 kV Kudra Chenari line of 132/33 kV Khurda S/S..
- > The distance protection at Nadokhar end did not pick up the fault.
- Finally the 132 kV Kudra-Nadokhar line tripped in E/F at Nadokhar end as the earth fault setting is non-directional with definite time of 500 ms.
- > 150 MVA, 220/132 kV ATR-II at Nadokhar also tripped on E/F.

After detailed discussion, PCC advised the following-

- Any transmission line of 132 kV and above voltage level should not be made T-connection without any prior intimation to ERLDC/ERPC. BSPTCL should remove the T-connection of 132 kV Sasaram- Nadokhar at Kudra Substation at the earliest.
- The distance protection settings of 132 kV Sasaram- Nadokhar line need to be reviewed at both the end for the T-Connection of the line at Kudra S/s.
- BSPTCL was advised to review the E/F settings of lines and recommended to adopt directional feature with IDMT characteristics.

> BSPTCL was also advised to check the CB opening timings at Nadokhar end.

BSPTCL may update.

Deliberation in the meeting

PCC advised BSPTCL to submit a report on observations at the earliest.

Item No D.2 Disturbance at 220 kV Khagul (BSPTCL) S/s on 30-08-16 at 19:18 hrs

In 47th PCC, BSPTCL was advised the following-

- The reverse zone protection may be implemented for all the 220 kV and 132 kV lines as per the Protection Philosophy of ER (In SEL311 the Z3 (reverse) may be used for Z4-Reverse zone protection & Z4 (forward) may be used for Z3 zone protection).
- To review the E/F settings of all 220 kV and 132 kV lines with recommendations to adopt directional feature with IDMT characteristics.

BSPTCL may update.

Deliberation in the meeting

PCC advised BSPTCL to comply the observations at the earliest.

Item No D.3 Multiple elements tripping at 132kV Purnea (PG) and 132kV Purnea (BSPTCL) system on 14-08-16 at 12:32 hrs.

At 12:32 hrs, 132 kV Purnea (PG) - Kishangunj – Forbisgunj line tripped from Purnea end on zone 2 and 132 kV Purnea (BSPTCL) - Forbisgunj line tripped from Purnea(B) end on zone 2. Both lines did not trip from remote end.



Relay indications:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end
12:32	132 kV Purnea (PG) -	Z-II, 146.8 km, IA=1.045KA, IB=779.5A,	Did not trip from

Kishangunj - Forbisgunj	IC=270.7A	Forbisgunj
132 kV Purnea (BSPTCL)	- Z-II, 88.49 KM, IA-339.7A, IB-601.7A, IC-	Did not trip from
Forbisgunj	279. 6A, O/C - B phase , E/F	Forbisgunj

Status of Reporting:

• BSPTCL has submitted the tripping report on 30-08-16.

Analysis of PMU plots:

• 4 kV voltage dip observed in R & Y phase at Binaguri PMU. Fault clearing time 2000 ms.

BSPTCL and **Powergrid** may explain the following:

- The reason for tripping of 132 kV Purnea (PG) Kishangunj Forbisgunj & 132 kV Purnea (BSPTCL) – Forbisgunj
- The reason for not-tripping of both the circuits from Forbisgunj end.
- The reason for delayed fault clearing, as per Binaguri PMU data, fault clearance time was approx. 2000 ms.

In 47th PCC, BSPTCL informed that 132 kV Purnea (PG) - Kishangunj – Forbisgunj & 132 kV Purnea (BSPTCL) – Forbisgunj lines were tripped on transient fault.

BSPTCL failed to explain the exact cause of disturbance in the meeting.

The following points are still not cleared from the report and needs explanation from BSPTCL:

- The reason for non-tripping of both the circuits from Forbisgunj end.
- The reason for delayed fault clearing, as per Binaguri PMU data, fault clearance time was approx. 2000 ms.

BSPTCL may update.

Deliberation in the meeting

PCC advised BSPTCL to submit a report on observations at the earliest.

Item No D.4 Tripping of 132kV BTPS-Bighati line-1 and subsequent tripping of BTPS Unit #1, 2, 4 & 5 at 11:05 hrs on 01.09.2016

WBPDCL vide letter dated 02.09.2016 informed that at 11:05 hrs on 01.09.2016, 132kV BTPS-Bighati line-1 tripped due to snapping of B-ph conductor at 5.04 km (tower location 73 & 74) from Bighati end.

Bighati end tripped on zone 1 protection but BTPS end tripped on zone 5 after 1005 ms.

Due to delayed fault clearance from BTPS end, all the running units (Unit #1, 2, 4 & 5) of BTPS tripped.

WBPDCL requested for reviewing of the protection setting for proper relay coordination.

In 47th PCC, PCC advised WBSETCL and WBPDCL to review the relay settings bilaterally with intimation to ERPC/ERLDC.

WBSETCL and WBPDCL may update.

Deliberation in the meeting

PCC advised WBSETCL and WBPDCL to review the settings.

Item No D.5 Total Power failure at 220/132kV Biharsharif S/s of BSPTCL system on 26-06-16 at 07:28 hrs.

1. Single line diagram:



2. Pre fault conditions: Submitted

Name of feeder	Power flow in MW	Name of feeder	Power flow in MW
220KV ICT1	170	132KV Baripahari ckt 1	30
220KV ICT2	170	132KV Baripahari ckt 2	30
220KV ICT3	170	132KV Hathidah ckt 1	00
220KV FATHUA CKT 1	110	132KV Hathidah ckt 2	00
220KV FATHUA CKT 2	110	132KV L28(Nalanda)	20
220KV Begusarai ckt 1	70	132KV L29(Rajgir)	20
220KV Begusarai ckt 2	70	132KV Nawada	35
220KV Bodhgaya ckt 1	00	132KV Ekangarsarai	20
220KV Bodhgaya ckt 2	00	132KV Sheikhpura	00
150MVA Tr no 1	48		
150MVA Tr no 2	48		
150MVA Tr no 3	48		

3. Tripping incident details:

At 07:28 hrs, R phase jumper of wave trap of 220 kV Biharshariff- Bodhgaya-II snapped at Biharshariff end and 220 kV Biharshariff- Bodhgaya-II tripped on zone 1 from Biharshariff end. Simultaneously the following elements tripped:

- 400/220 kV 315 MVA ICT II at Biharshariff (PG) on back up O/C, R-N from 400 kV side.
- 400/220 kV 315 MVA ICT III tripped from 220 kV side
- After tripping of ICT II & III, 400/220 kV ICT I at Biharshariff tripped on overload from 400 kV side.
- 220kV Biharsharif-Begusarai ckt-ll tripped from Biharshariff end on zone 1

• 150 MVA, 220/132kV ATR-I at 220 kV Biharshariff (Bihar) S/s on REF protection

At the time of incident, 220 kV Tenughat Biharshariff was not in service due to tower collapse. So, 220/132 kV Biharshariff (BSPTCL) S/S became after tripping of ICTs and power failure occurred at Biharshariff, Begusarai and Fatua.

4. Relay indications:

Time (Hrs)	Details of tripping	Relay at local end	Relay at remote end		
07:28	220 kV Biharshariff- Bodhgaya-II	Micom P442/(R-N fault) Distance relay, Zone 01	NA		
hrs	220 kV Biharshariff- Begusarai-II	Siemens 7SA52,Zone-1	NA		
	315 MVA 400/220 kV ICT II	Back up O/C protection in R-	Phase from 400 kV side		
	315 MVA 400/220 kV ICT III	Tripped from 220 kV side Tripped on Overload at 400 kV side			
	315 MVA 400/220 kV ICT I				

Analysis of PMU plots:

- From the Biharshariff PMU plot 80 kV voltage dip has been observed in R-Ph at 07:28 hrs
- Fault Clearance time was less than 100 ms.

Powergrid and BSPTCL may explain the following:

- BSPTCL may furnish the tripping details of 220 kV Biharshariff- Bodhgaya-II at Bodhgaya end.
- BSPTCL may explain the tripping of 220 kV Biharshariff- Begusarai-II
- BSPTCL explain the tripping of 150 MVA, 220/132kV ATR at 220 kV Biharshariff (Bihar) S/s.
- Powergrid may explain the tripping of 400/220 kV ICT I & II on backup O/C protection as the fault was cleared within 100 msec, (as per PMU data).
- Bihar SLDC may furnish amount of energy un-served and duration of disturbance.

In 45th PCC, BSPTCL explained the disturbance as follows:

- There was a fault in 220 kV Biharshariff- Bodhgaya-II near to 220kV Biharshariff S/s and the line tripped from Biharshariff end on Zone 1 but did not trip from Bodhgaya end.
- 220 kV Biharshariff- Bodhgaya line-I tripped from Bodhgaya end on high set O/C protection.

BSPTCL failed to explain the following:

- Tripping of 315 MVA ICT-II from 220kV side
- Tripping of 150 MVA, 220/132kV ATR-I from 220kV side
- Tripping of 220 kV Biharshariff- Begusarai-II from Biharshariff end on zone 1.

PCC could not able to conclude the tripping incidence and advised BSPTCL to submit a detailed report within a week.

Thereafter BSPTCL submitted a presentation and DR of Begusarai end.

In 46th PCC, BSPTCL failed to explain the cause of unwanted tripping of 150 MVA, 220/132kV ATR-I from 220kV side on REF protection and 220 kV Biharshariff- Begusarai-II from Biharshariff end on zone 1.

PCC advised BSPTCL to submit the schematic diagram and other connectivity details of REF protection of 150 MVA, 220/132kV ATR-I.

PCC also advised to submit the softcopy of DR files of 220 kV Biharshariff- Begusarai line tripping.

BSPTCL may explain.

Deliberation in the meeting

PCC advised BSPTCL to submit the details.

Item No D.6 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.

In 46th PCC, Powergrid informed that study is in progress.

Powergrid submitted a report which is enclosed at Annexure- D6.

Members may note.

Deliberation in the meeting

Members noted.

Item No D.7 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

Members noted.

Item No D.8 Members may update the following:

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

In last PCC, OPTCL informed that

OPTCL informed that they will review the logic of all the newly installed LBB protection: 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

Deliberation in the meeting

OPTCL informed that the replacement work of relays at Tarkera is in progress.

2. Disturbance at 400/220kV Indravati (PG) and 400/220kV Indravati (OPTCL) S/s on 11-06-16 at 19:59 hrs.

In 45th PCC, OHPC, was advised the following:

- OHPC should check and restore the bus bar protection at 220 kV Indravati (OHPC) S/s.---OHPC informed that they will test the bus bar protection of 220 kV Indravati (OHPC) S/s on 25th Aug, 2016.
- PCC felt that 400/220kV ICT-I&II should clear the fault on backup overcurrent protection before tripping of 400kV lines from PG end and advised OHPC to install directional O/C relays at both HV & LV side of 400/220kV ICT-I&II. Proper time coordination should be done with the adjacent line relays.

OHPC may update.

Deliberation in the meeting

PCC advised OHPC to comply the observations at the earliest.

3. Disturbance at 220/132kV Budhipadar S/s of OPTCL System on 14-07-16 at 16:33 hrs

In 46th PCC, OPTCL was advised to collect the tripping details of 132 kV Budhipadar – Lapanga –I, 132 kV Tarkera – Kalunga-Budhipadar and 132 kV Budhipadar – Rajgangpur lines at 16:51 hrs and

submit a report to ERPC and ERLDC.

Time	Name	Local end	Remote end
	132 kV Budhipadar – Lapanga - I	Did not trip	O/C, E/F at Lapanga
16:51 Hrs	132 kV Tarkera – Kalunga _ Budhipadar	Did not trip	E/F, D/P at Tarkera
1113.	132 kV Budhipadar - Rajgangpur	Did not trip	Tripped from Rajgangpur

4. In 42nd PCC, on multiple elements tripping at 400kV Bidhannagar S/s of WBSETCL system on 30-03-16 at 16:25 hrs, 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 the scheme will be tested during next opportunity shutdown.

- 5. In 46th PCC BSPTCL was advised
 - PCC advised BSPTCL to check all the distance relays at Forbisganj end and take the appropriate action to restore the protection system.
 - PCC felt that BSPTCL is not getting any additional benefit for keeping two circuits connected in the Kishanganj – Forbisganj section as the Purnea-Kishanganj section is single circuit, Therefore, PCC advised BSPTCL to keep only one circuit in service for the Kishanganj – Forbisganj section. This will ease the relay zone setting problem for 132 KV Purnea (PG)-Kishanganj-Forbisganj line.
 - Since there is no protection available at 132kV Kishanganj S/s, PCC advised BSPTCL and Powergrid to co-ordinate the zone settings of the line considering 132 KV Purnea (PG)-Kishanganj-Forbisganj line as a single section.

BSPTCL may update.

Deliberation in the meeting

PCC advised BSPTCL to comply the observations at the earliest.

6. Disturbance at 220 kV Bakreswar (WBPDCL) S/s on 19-08-16 at 13:39 hrs.

In 47th PCC, WBPDCL was advised to check the CB at Bakreswar end of 220 kV Bakreswar – Gokhorno –I line.

WBPDCL may update.

Deliberation in the meeting

PCC advised WBPDCL to comply the observations at the earliest.

Item No D.9 Any other issues.

1. Multiple tripping of 400kV lines from Jamshedpur(PG) on 26-08-16 and 29-08-16

On 26.08.2016, 400KV Mejia Substation had taken shutdown of 400kV Jamshedpur-Mejia Line. At 9:27 Hrs, the line was switched off from Mejia end. DT was received at Jamshedpur after opening Mejia circuit from remote end. R phase tie breaker at Jamshedpur failed to open due to problem in trip coil. Flashover occurred when R phase isolator was tried to open (R Phase was idle charged from Jamshedpur end.

On 29.08.2016 at 13:38 Hrs, Direct Trip command was received at Jamshedpur in 400kV Andal Ckt-I & II. Both the lines were in charged condition from remote end. On receipt of the Direct Trip command, the Main & Tie CBs of Andal Ckt-II tripped at Jamshedpur end. For Andal Ckt-I, the tie CB got tripped, however for Main CB only R & Y Phase got tripped. The B pole of the Main CB of Andal Ckt-I at Jamshedpur did not open causing operation of LBB protection. This caused operation of the 400kV Bus Bar-I protection resulting into tripping of Main CBs of the feeders connected with Bus-I. Simultaneously DT was sent for Baripada (Both main & tie breakers got tripped), Adhunik –II (Due to not considering tie breaker status in logic) & TISCO (due to problem in wiring) circuits

Members may discuss.

Deliberation in the meeting

Powergrid informed that R phase tie breaker at Jamshedpur failed to open due to mechanical problem. The operating mechanism of CB got rusted and jammed. The same has been replaced.

PCC decided to discuss the tripping in next PCC meeting and advised Powergrid and DVC to collect the related information and send to ERPC and ERLDC.

2. Zone-2 setting of long line followed by short line

As per ERPC/CEA protection guidelines Zone-2 time setting of two adjacent lines needs to be properly co-ordinated to avoid undesirable trippings on account of racing between relays. In the past major disturbances occurred due to lack of proper coordination in Zone-2 time setting.

For proper coordination of operation of Zone-2 Distance Protection, an effort has been made to list out the adjacent shortest line for 400 kV transmission lines, and all the lines whose Zone-2 reach is overlapping with that of adjacent lines have been highlighted. The details are given in **Annexure-D9.2**.

Concerned transmission utilities are requested to review the same and share the present Zone-2 time setting and update in case of mismatch.

Deliberation in the meeting

PCC advised all the constituents to go through the Annexure and review the settings with intimation to ERPC and ERLDC.

3. Line over voltage protection settings for 400 kV and 765 kV Lines in Eastern Region

Last year over voltage protection setting for all 400 kV and above lines was collected from the constituents. However, in the meantime many changes took place in the system, which includes commissioning of new lines as well as LILO of existing line.

Further CEA guidelines suggest that the following should be considered while setting over voltage protection in transmission line.

FOR 400kV LINES: Low set stage (Stage-I) may be set in the range of 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II) may be set in the range 140% - 150% with a time delay of 100milliseconds.

FOR 765kV LINES: Low set stage (Stage-I) may be set in the range of 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II) may be set in the range 140% - 150% with a time delay of 100milliseconds.

However, for over voltage Stage-I protection, a time grading of 1 to 3 seconds may be provided between overvoltage relays of double circuit lines. Grading on overvoltage tripping for various lines emanating from a station may be considered and same can be achieved using voltage as well as time grading. Longest timed delay should be checked with expected operating time of Over-fluxing relay of the transformer to ensure disconnection of line before tripping of transformer.

It is desirable to have Drop-off to pick-up ratio of overvoltage relay better than 97% (Considering limitation of various manufacturers relay on this aspect).

Present overvoltage setting record available at ERLDC is given in **Annexure-D9.3**. Concerned transmission utilities are requested to provide the missing information and updated the exiting one (if any).

Deliberation in the meeting

PCC advised all the constituents to go through the Annexure and update the settings, if any.

Meeting ended with vote of thanks to the chair

Innexuse - A

Participants in 48th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata

Time: 11:00 hrs

Date: 20.10.2016 (Thursday)

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20	D.K.Das	Addl. CE, (Testing) WBSETCL	9434910544	AllipdasQuobsetch.co.in cectoubsetal Qgm	blat .

"Coming together is a beginning, staying together is progress, and working together is success." --Henry Ford

[Page 1]
Participants in 48th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata

Time: 11:00 hrs

Date: 20.10.2016 (Thursday)

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26	N.K. Jena	AGM, SLOC	9438907552	ele nkjer @ aklow	AL
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33	P.P. Jene	AFE, ERPC	9776198061	branay bynen of generin	Fre
34	Severden charles	FEE BSPICE	7091097883	Ved Ydev @ gmail. cm	de.
35	Sudifter Ghosh	Mar Hoppel	-9474363864	J-sudiptate rediffmail	I. Thank
36	Sanchari Deb	AM, WBPDCL	9231898200	S. deb@ asbpdch. co.in	S.Deb Zolue/1
37	Sanfosh Kuman Randa.	AE, SLDS, PYC	9728192927	Santostr 90 panda@ gmail.cm	8p-20/10/16
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39	1.2				
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"Coming together is a beginning, staying together is progress, and working together is success." -Henry Ford

Annexure-B1

Brief report of multiple tripping incident at IBEUL on 27-09-16

Sequence of events

- At 16:45:27.673 hrs, 765 kV Jharsuguda Dharamjaigarh successfully auto-reclosed on B phase transient fault. Breaker was closed at 16:45:28.750 hrs.
- At 16:45:28.920 hrs, voltage dip observed in B phase for 600 ms in Rourkela PMU
- At 15:45:29.011 hrs, time delayed E/F & O/V relay picked up for 400 kV IBEUL Raigarh at IBEUL end till 15:45:31.579 hrs (Almost same timing as PMU) but no line tripped.
 - At this time, R & Y phase current increased to 600 A & B phase current decreased to 12 A(Antecedent current were 177, 159, 120 A)
 - R & B Phase voltage increased to 260 kV and B phase voltage decreased to 196 kV
 - After 600 ms voltage and current (except B phase current) came to antecedent value.

Sequence of events (contd)

- At 15:45:31.561 hrs, R phase breaker of 400 kV IBEUL Raigarh S/C opened due to R-N, Z-I fault. As the fault was in permanent nature, all three phase breakers opened at 15:45:32.738 (R phase breaker opening time) at IBEUL end.
- At 15:45:31.538 hrs & 15:45:32.738 hrs O/V & E/F relay picked up (at both instants) for 400 kV IBEUL Jharsuguda S/C. But line did not trip at IBEUL end.

Phase voltage was more than 250 kV for few cycles

- At 15:45:31.566 hrs, R phase breaker of 400 kV IBEUL Jharsuguda S/C opened at Jharsuguda end due to R-N, Z-I fault. As the fault was in permanent nature, all three phase breakers opened at 15:45:32.727 (R phase breaker opening time) at Jharsuguda end.
 - Line was did not trip from IBEUL end. But due to unavailability of source IBEUL bus became dead.

Sequence of events (contd)

- After initial line patrolling, nothing was found
- 400 kV IBEUL Jharsuguda S/C was at 16:36 hrs.
- Charging attempt was taken for 400 kV IBEUL Raigarh S/C at 18:41 hrs. But line tripped on SOTF
- At 18:41:17.644 hrs. 400 kV IBEUL Jharsuguda tripped from IBEUL end due to operation of O/V stage II relay. R phase voltage was 339 kV.
 - A/R started at Jharsuguda end for R-N, Z-I fault at 18:41:17.458 hrs but all three phase breakers tripped at 18:41:17.732 hrs after DT receipt from IBEUL(remote) end
- After detailed patrolling it was found, R phase jumper broke over the cross arm.
- Line was restored at 17:04 hrs on 28-09-16

Points which are not clear

- Reason for 600 ms wide B phase voltage dip at Rourkela PMU at 16:45:28.920 hrs.
 - Time delayed E/F & O/V relay picked up for 400 kV IBEUL Raigarh at same time
- Reason for tripping of 400 kV IBEUL Jharsuguda S/C from Jharsuguda end on Z-I.
 - Unsuccessful A/R operation in PMU data
 - O/V & E/F relay picked up at IBEUL end
 - Over-reaching of Z-I relay is suspected
- Reason for overvoltage at IBEUL end during switching on of 400 kV IBEUL Raigarh at 18:41 hrs
 - A/R started at Jharsuguda end of 400 kV IBEUL
 Jharsuguda S/C for R-N, Z-I fault but all three phase
 breakers tripped after DT receipt from IBEUL(remote) end

PMU plots

Successful auto reclose of 765 kV Jharsuguda – Dharamjaigarh



Tripping of 400 kV Jharsuguda – IBEUL – Raigarh at 15:45 hrs



Tripping of 400 kV Jharsuguda – IBEUL – Raigarh at 18:41 hrs







1







OBSERVATIONS

> 400 KV Kh- FKk#3 &4 tripped at 06:50:09.05 hrs on Zone#4 protection after approx 100-120 ms through Micom P442 relay. However Set time delay is 350 ms. No change observed in PLCC counter as per scheme.

➢ Line is the property of PGCIL & maintenance involving OEM/expert service is in PGCIL scope. Matter is already taken up with PGCIL.

> 400 KV Kh- Maithon #2 line was idle charged from Maithon end. Afterwards, 400 KV Stage#2 Over voltage protection (140%, Inst) operated at Kahalgaon end at 06:50:09.191 hrs . Direct trip was sent through PLCC from Kahalgaon end as per scheme.





4



RESTORATION

> 400 KV Bus#1 was charged at 08:29 hrs after verification & isolation of faulty section i.e. 400 KV Kh-Farakka#2 main bay.

All lines except 400 KV Kh-Farakka#2 line was taken in service one by one after getting clearance & charging code from ERLDC.

All other breakers associated with 400 KV Bus#1 was taken in service one by one.

RESTORATION OF 400 KV KH-FARAKKA#2 LINE

> On 30/09/2016, Line was taken in service through its tie bay at 16:37 hrs on 01/10/2016 with main bay (i.e. 3052) equipments still in isolated condition. Tracking from corona ring to top stack of insulator of isolator (Y phase) of 400 KV Kh-Farakka#2 main bay was physically seen & Line was immediately switched off at 18:21 hrs after getting clearance from ERLDC.

Line was charged at 16:37 hrs on 01/10/2016 through its tie bay & kept under observation. Hot spot (>6 deg C from ambient temp) was found inside top insulator stack & hot spot region was increasing towards bottom with time. Line was switched off at 23:33 hrs after getting clearance from ERLDC.

Both Insulator stacks of isolator (3089B- Y phase) along with Current transformer were replaced with new one. Line was finally taken in service on 05th Oct 2016 through its tie bay on 16:48 hrs. Main bay was also taken in service at 17:31 hrs same day.

CONCLUSION

➢ Faulty equipments (i.e. 02 nos CTs along with CT control cables & 02 nos set of insulator stacks of isolator) was identified & replaced with new one.

> 400 KV Kh- FKK#3 & 4 line is the property of PGCIL & maintenance involving OEM/expert service is in PGCIL scope. Matter is taken up with OEM i.e. M/s ALSTOM through PGCIL for root cause analysis of MICOM P444 operation at less time delay than set time delay for Zone#4 operation.

> Old 400 KV CTs (>25 yrs) is already under replacement plan in phased manner at NTPC Kahalgaon. 42 nos. of 400 KV CTs are already replaced.

> BHEL has already visited the site on 15th Oct 2016 for RCA.

SI No	NAME OF THE ELEMENT	TRIPPING DATE	TRIPPING TIME	REASON
1	400 kV BINAGURI-BONGAIGAON-I	02/08/2016	13:56	Y-N FAULT
2	400 kV BINAGURI-BONGAIGAON-I	11/08/2016	12:45	B-N FAULT,204.4 KM FROM BINAGURI END,F.C 1.59KA
3	400 kV BINAGURI-BONGAIGAON-III	13/08/2016	13:14	Y-N FAULT
4	400 kV BINAGURI-BONGAIGAON-IV	15/08/2016	22:26	R&B PH,(222.2 KM FROM BINAGURI END,Z-2,F.CR-PH-1.94kA,B- PH-2.025kA)(4.99kM FROM BONGAIGAON END, Z-1,F.CR PH- 9.733KA,B PH-9.679KA)
5	400 kV BINAGURI-BONGAIGAON-IV	18/08/2016	20:41	Y-N FAULT
6	400 kV BINAGURI-BONGAIGAON-I	24/09/2016	23:30	R-B FAULT
7	400 kV BINAGURI-BONGAIGAON-II	24/09/2016	23:30	R-B FAULT
8	400 kV BINAGURI-BONGAIGAON-III	28/09/2016	17:27	Y-B-N FAULT @ BINAGURI,162KM,F.CY PH -3.4 KA
9	400 kV BINAGURI-BONGAIGAON-II	03/10/2016	11:46	B-N FAULT
10	400 kV BINAGURI-BONGAIGAON-III	04/10/2016	11:25	R-Y-N FAULT, 119KM FROM BINAGURI
11	220kV CHUKHA-BIRPARA-I	25/08/2016	17:03	TRIPPED AT CHUKHA END ONLY(LBB OPERATED)
12	220kV CHUKHA-BIRPARA-II	25/08/2016	17:03	TRIPPED AT CHUKHA END ONLY(LBB OPERATED)
13	220kV CHUKHA-BIRPARA-II	04/09/2016	07:31	Y-B FAULT
14	220kV CHUKHA-BIRPARA-I	15/09/2016	12:47	R-Y FAULT
15	220kV CHUKHA-BIRPARA-II	15/09/2016	12:47	R-Y FAULT
16	220kV CHUKHA-BIRPARA-II	15/09/2016	14:54	Y-B FAULT
17	220kV CHUKHA-BIRPARA-II	16/09/2016	12:23	R-N FAULT
18	220kV CHUKHA-BIRPARA-II	19/09/2016	17:10	B-N FAULT
19	220kV CHUKHA-BIRPARA-I	19/09/2016	22:10	R-Y-B FAULT
20	220kV CHUKHA-BIRPARA-II	19/09/2016	22:10	R-Y-B FAULT
21	220kV CHUKHA-BIRPARA-I	21/09/2016	02:08	R-N FAULT
22	220kV CHUKHA-BIRPARA-I	25/09/2016	08:34	ALL LINES TRIPPED FROM CHUKHA END ONLY
23	220kV CHUKHA-BIRPARA-II	25/09/2016	08:34	ALL LINES TRIPPED FROM CHUKHA END ONLY
24	220kV CHUKHA-BIRPARA-I	03/10/2016	14:13	B-N FAULT, 1.55KA, 50.34KM FROM BIRPARA
25	220kV CHUKHA-BIRPARA-II	03/10/2016	14:13	B-N FAULT, 1.57KA, 59.39KM FROM BIRPARA

Annexure-C1

	List of important transmission lines (220 kV & above) in ER which tripped in September'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 FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Remarks
				Fau	lt clearii	ng time is vio	lating	protection standa	rd (As per PMU o	data)			
1	220 KV MAITHON-DUMKA-II	02.09.16	15:51	04.09.16	19:06	R-B FAULT	500 ms approx	R-B, Z-II, DEF(started)	Information yet to be received		<u>Yes</u>	No	
2	220 KV BIHARSARIF-TENUGHAT	07.09.16	12:03	07.09.16	12:31	B-N FAULT	320 ms approx	B-N, Z-II	B-N, Z-I, 31.73 km from Tenughat	No autoreclose operation observed in PMU data	No	<u>Yes</u>	No carrier aided protection
3	220KV BOLANGIR-SADHEPALLY	12.09.16	05:07	12.09.16	06:27	BACK UP O/C & EARTH FAULT	400 ms approx	Back up o/c and E/F protection	Did not trip	No autoreclose operation observed in PMU data		No	Zone setting at Bolangir end may be reviwed
4	220 KV ROURKELA - TARKERA -II	19.09.16	12.02	19.09.16	17:14	B-N FAULT	600 ms approx	B-N, Z-I, IC -9.810 KA, 5.671 KM from RKL, A/R successful at RKL end	B-N, Z-II, F/C: 5.26 KA, 15.1 KM from Tarkhera	No autoreclose operation observed in PMU data	<u>Yes</u>	<u>Yes</u>	Fault was cleared within 350 ms from Tarkhera end and PLCC was out of service
5	400/220 kV 315 MVA ICT-II @ ROURKELA	17.07.10	12.03	19.09.16	13:02	B-Ph O/C & BACKUP E/F	600 ms approx		B-Phase O/C & E/F relay at 220 kV side (Non directional)		<u>Yes</u>	<u>Yes</u>	ICT tripped again at 13:12 hrs on back up over current protection
6	220KV BARIPADA - BALASORE -I	22.09.16	18:04	22.09.16	22.09.16 19:15 B-N FAULT 400 ms approx B-N, Z-II, If=1.782KA, Dist- approx 74.54km from Baripada Did not trip No autoreclose op observed in PMN		No autoreclose operation observed in PMU data	No	No	220KV Balasore-N.Duburi tripped at same time from N. Duburi end only with relay indication B-N, Z- II, If-1.55KA, Distance-128.5KM			
7	220KV BARIPADA - BALASORE -II			22.09.16	19:15	B-N FAULT	400 ms approx	B-N, Z-II, If=1.793KA, Dist:- 98.2KM from Baripada	Did not trip	No autoreclose operation observed in PMU data	No	No	
			Multiple tripping at same time										
1	<u> 220 kv Birpara - Salakati-i</u>	01 00 16	22.22	02.09.16	00:15	R - N FAULT	<100	R-N, Z-I, A/R successful at Birpara	Information yet to be received	At Birpara end A/R successful	<u>Yes</u>	No	
2	220 KV BIRPARA - SALAKATI-II	01.09.10	23.22	02.09.16	01:03	R - Y FAULT	<100	Z-I started but breaker opened after DT receipt	Information yet to be received		<u>Yes</u>	No	
3	220 KV TARKERA - RENGALI - II	09.09.16	01:08	09.09.16	01:48	B-N FAULT	PMU data not avbl	B-N, Z-I, 2.5 kA, 54 km from Tarkhera		PMU data not avbl	No	No	Mal-operation of bus bar protection at Tarkhera
4	220 KV CHPC -BIRPARA-I			15.09.16	13:10	R-Y FAULT	<100	Information yet to be received	R-Y, 46.76 km from Birpara		No	<u>Yes</u>	
5	220 KV CHPC -BIRPARA-II	15.09.16	12:47	16.09.16	01:38	R-Y FAULT	<100	Information yet to be received	R-Y, Z-I		No	<u>Yes</u>	Charging attempt was taken at 12:54 hrs. & 14:00 hrs. But line did not hold
6	220 KV BEGUSARAI-BIHARSHARIFF <u>D/C</u>	18.09.16	08:38	18.09.16	10:10	Y-B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
7	220 KV BUDHIPADAR-KORBA-II	20.09.14	20:05	20.09.16	21:15	R-B FAULT	<100	R-B Fault, Z-I, 7.7 KM from Budhipathar, Ir=7.26 KA , Ib= 15.73 KA	Information yet to be received		No	No	
8	220 KV BUDHIPADAR-RAIGARH	20.07.10	20:05	22.09.16	19:12	R-B FAULT	<100	R-B Fault,Z-I, 10.2 KM from Budhipathar, Ir=6.47 KA , Ib= 9.04 KA	Information yet to be received		No	No	
9	220 KV RAMCHANDRAPUR - CHANDIL	AMCHANDRAPUR - CHANDIL 22.09.16 14:36		22.09.16	17:10	B-N FAULT	<100	B-N, Z-I, F/C 13.28 kA, 3.78 km from RCP end	RYB, Master trip, E/F	No autoreclose operation observed in PMU data	Yes	No	
10	315 MVA_ICT_I & II AT JAMSHEDPUR			22.09.16	15:19 / 15:15	MASTER TRIP RELAY OPERATED	<100	Information yet to be received	Master trip relay at RCP (220 kV end)		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 FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Remarks
11	400 KV BIHARSHARIFF-BALIA -I	24.09.16	11:50	24.09.16	12:45	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	400 KV BIHARSHARIFF-BALIA -II tripped from Balia end at same time
12	400 KV BINAGURI - BONGAIGAON <u>I</u>			25.09.16	00:03	R-B FAULT	<100	R-B-N, ZI, 190.52 km from Binaguri	R-B-N, Z-I, 50.32 Kms. From Bongaigaon		No	<u>Yes</u>	
13	400 KV BINAGURI - BONGAIGAON II	24.09.16	23:30	24.09.16	23:57	R-B FAULT	<100	R-B-N, ZI, 190.52 km from Binaguri	R-B-N, Z-I, 56.11 Kms. From Bongaigaon		No	<u>Yes</u>	As per DR data, R phase tie breaker was open at Bongaigaon end prior to the tripping
14	400 KV ARAMBAG-BIDHANNAGAR	25.09.16	09:30	25.09.16	13:44	Y-N FAULT	<100	Y-N, Z-I, 52 km from Arambag	Y-N, Z-I, 50 km from Bidhannagar		No	No	400 KV PPSP-BIDHANNAGR D/C tripped at same time (Different fault. Bus fault at PPSP end)
15	220 KV CHUKHA-BIRPARA -I	25.00.14	09.24	25.09.16	09:47	LBB OPERATED AT CHUKHA		LBB	Did not trip		No		Reason of LBB operation is yet to
16	220 KV CHUKHA-BIRPARA -II	23.07.10	00.34	25.09.16	09:18	LBB OPERATED AT CHUKHA		LBB	Did not trip		No		be received
						Fault	Not ob	served in PMU d	ata				
1	400 KV RANCHI-CHANDWA-I	03.09.16	16:49	03.09.16	17:41	DEF AT RANCHI		DEF at Ranchi	DT reiceived		No	No	
2	400 KV LAKHISARAI-BIHARSARIF-I	06.09.16	03:39	06.09.16	05:33	TRIPPED FROM BIHARSARIF END		Did not trip	Information yet to be received			No	
3	400 KV KOLAGHAT - CHAIBASA	06.09.16	14:41	06.09.16	18:21	O/V VOLTAGE RELAY MALFUNCTION AT CHAIBASA		Information yet to be received	0/V	-	No	No	O/V relay malfunction
4	220 KV PUSAULI - SAHUPURI	08.09.16	01:49	08.09.16	02:38	SPOURIOUS TRIPPING		Information yet to be received	Information yet to be received		No	No	
5	400 KV JHARSUGUDA - ROURKELA <u>-II</u>	09.09.16	13:03	09.09.16	13:20	DT RECEIVED AT JHARSUGUDA		DT reiceived	Information yet to be received		No	No	Retrofication work of AR relay was under process
6	<u>220 KV FARAKKA - LALMATIA</u>	14.09.16	17:02	14.09.16	17:47	DC SUPPLY FAILURE AT LALMATIA			DC supply failure		No	No	
7	220 KV BUDHIPADAR -KORBA-I	18.09.16	23:01	18.09.16	23:32	SPOURIOUS TRIPPING		Information yet to be received	Information yet to be received		No	No	
8	400 KV GMR - MERAMUNDALI	19.09.16	12:51	19.09.16	17:23	DT RECEIVED AT MERAMUNDALI.		Information yet to be received	DT reiceived		No	No	Tripped during testing
9	400/220 kV 315 MVA ICT-II @ ROURKELA	19.09.16	13:12	19.09.16	18:20	MALOPERATION OF BACK UP OVER CURRENT AT 400 KV SIDE					<u>Yes</u>	Yes	Mal-operation of B-Phase O/C & E/F relay at 400 kV side
10	220 KV BIRPARA-SALAKATI-I	19.09.16	17:23	19.09.16	19:46	EARTH FAULT		Time delayed earth fault at Birpara	Information yet to be received		<u>Yes</u>	No	E/F triggered due to unbalance in line current
11	765KV JHARSUGUDA - DHARAMJAYGARH-I	22.09.16	11:21	22.09.16	12:01	DT RECEIVED AT JHARSUGUDA		DT reiceived	Information yet to be received		No	No	
12	400 KV FARAKKA- KAHALGAON-IV	25.09.16	00:50	25.09.16	01:22	D/T RECEIVED AT FARAKKA		DT reiceived	Information yet to be received		No	No	
13	400 KV BARIPADA-TISCO	28.09.16	01:33	28.09.16	02:02	DT RECEIVED AT TISCO		DT reiceived	Information yet to be received		No	No	
14	765 KV NEW RANCHI - DHARAMJAYGARH -I	28.09.16	11:50	28.09.16	13:28	DT RECEIVED AT NEW RANCHI.		DT reiceived	Information yet to be received		No	No	
15	400 KV SASARAM - VARANASI	28.09.16	02:46	28/09/2016	16:17	PLCC MAL FUNCTION AT SASARAM					No	No	

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Reason	Fault Clearance time in msec	Relay Indication LOCAL END	Indication Relay Indication Auto Recloser statu		DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	Remarks
16	400KV ARAMBAG-KOLAGHAT	30.09.16	06:40	30/09/2016	07:28	DT RECEIVED AT ARAMBAG		DT reiceived	DT reiceived		No	No	PLCC problem
					Ν	lo autoreclos	er oper	ation observed in	n PMU data				
1	400 KV MPL-RANCHI-II	02.09.16	16:35	02.09.16	16:56	R-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	PLCC problem
2	400 KV MPL-RANCHI-II	03.09.16	14:56	03.09.16	15:45	R-N FAULT	<100	R-N, Z-I, F/C : 13.9 kA, 7.8 KM from MPL	R-N, Z-II, F/C :1.7 kA	No autoreclose operation observed in PMU data	No	No	PLCC problem
3	400KV MERAMANDALI-STERLITE- <u>II</u>	10.09.16	16:21	10.09.16	17:22	Y-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
4	400 KV SEL - MERAMUNDALI-II	13.09.16	14:31	13.09.16	15:45	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
5	400 KV BIHARSHARIF - BALIA-II	19.09.16	15:51	20.09.16	19:28	Y-PHASE CT BURST AT BALIA END	<100	R-Y-N,Z-II, 245 KM from BSF, Ir-2.361 kA, Iy-3.234 kA	Y-N	No autoreclose operation observed in PMU data	No	No	
6	400KV SEL - MERAMUNDALI-I	22.09.16	15:25	22.09.16	18:03	B-N FAULT	<100	Information yet to be received	Information yet to be received	No autoreclose operation observed in PMU data	No	No	
7	400 KV KOLAGHAT - CHAIBASA	28.09.16	12:04	28.09.16	12:30	B-N FAULT	<100	B-N, Z-I, F/C 14.17 kA, 3.462KM from KTPS	B-N, Z-II, F/C 1.7 kA, 246km from Chaibasa	No autoreclose operation observed in PMU data	Yes	No	



JHARKHAND URJA SANCHARAN NIGAM LIMITED

(CIN No. - U40108JH2013SGC001704)

Office of the Electrical Executive Engineer, Transmission Division, Ranchi Kusai Colony, P.O. + P.S. -: Doranda, Ranchi, Jharkhand :- 834002, Mobile:- 9431707302, Email:- <u>eeetdr@gmail.com</u>

Dated .. 23.09.2016/

From,

Er. Raju Mahtha Electrical Executive Engineer.

To,

The Electrical Superintending Engineer, Transmission Circle, Ranchi

Sub:- Refer to Un-coordinated trappings in JUSNL system.

Sir,

Please find below the action taken by our side on recommendation given by ERPC,

Kolkata, Details are givenm below:-

- 1. Through Relay Coordination of GSS Hatia-I, Hatia-II, Namkum, Kanke and Lohardaga has been done in the month of Feb-Mar 2016 by M/S Alstom T&D India Lmited.
- 2. Checking of secondary circuit at 220/132 KV GSS Hatia-II, 132/33 KV GSS Hatia-I & Kanke has been done in the month of July 2016 by M/S LB Engineering Limited, Kolkata and T&C Wing, Ranchi.
- New setting provided by ERPC has been implemented at 220/132 KV Grid Sub-Station Hatia-II and 132/33 KV Grid Sub-Station Hatia-I by CRITL, Ranchi. Rest will be implemented by CRITL, Ranchi shortly.
- 4. Appointment of consultant agency for preparation of DPR is under process at HQ, level.

Yours Faithfully

(Er. Raju Mahtha) Electrical Executive Engineer Transmission Division, Ranchi

Subject: Re: Regarding the Relay settings at 220kV Chandil, 220kV R and 132 kV Adityapur To: Tr Circle JSR steisr juspl@rediffmail.com>	amchand	rapur				
	Date	10/05/16 05:33 PM				
	From:	"Ankan Kumar Bandyopadhyay	a" <mser< th=""><th>pc-pov</th><th>ver@nic</th><th>: in></th></mser<>	pc-pov	ver@nic	: in>
Sir						
Thanks a Lot. Give feedback on experience of any improvement		Sector in the sector sector is a				
AK Bandyopadhyaya 9433068533						
On 10/05/16 04:29 PM, Tr Circle JSR <tcjsr_jusnl@rediffmail.com> with the second secon</tcjsr_jusnl@rediffmail.com>	rote:					
anda, hina pana inggana kawan na kana na manan panakangkan na manakan manakan kanakangkan na na na kana na man		$(1, 2, 2^{-1}, 1^{-1}, 1^{-1}, 2^{-1}, 1^{-1}, 2^{-1$	1 ¹² -1			
Sir,						
With reference to the above subject, this is for your kind information	n that as p	er your data study and instruction	is, relays	settings	s of the	
respective feeders are changed in the below mentioned Grid Sub Stations -						
220kV GSS Chandil		eners and all the information	$\widehat{p}^{1}\omega^{n}\phi^{1}\phi^{2}\phi^{2}\phi^{2}\phi^{2}\phi^{2}\phi^{2}\phi^{2}\phi^{2$	$\mathcal{A}^{(i)}_{i}$		
1. 220kV STPS Line						
2. 220kV Ramchandrapur Line						
3. 220kV Ranchi PGCIL Line						
4. 132kV Golmuri Line- 1						
5. 132KV GOIMUN LINE- 2 6. 132KV RKSN Line						
7 132kV Adityapur Line	42.00	1977年代11月1日在北京委員会区内市	4-24			
220kV GSS Ramchandrapur						
1. 220kV Chandil Line						
2. 220kV Joda Line						
3. 132kV Adityapur Line- 1						
4. 132kV Adityapur Line- 2						
132kV GSS Adityapur	Cristin Sec.	$(f_{i}) \in \operatorname{det}(L) \in \operatorname{det}(T_{i}) \cong \operatorname{det}(G_{i}) \cap \operatorname{det}(G_{i})$				
1. 132kV Ramchandrapur Line- 1						
2. 132kV Ramchandrapur Line- 2						
3. 132kV UML Line- 1						
4. 132KV UML LINE- 2						
6. 132kV RKSN Line						
0. ISERVICION ENIO		and second standing address	2000			
This is for your kind information and further reference.						
Thanking you,						
Regards						
		$= (A, B_{AA}, A, B_{A}, A, B_{A}, B, C, M, M,$	27-10			
ajit kumar						
ELECTRICAL SUPERINTENDING ENGINEER						
TRANSMISSION CIRCLE, JUSNL,						
JAMSHEDPUR						
		Section in the section of the sectio	$\{y^{i,q}, x^{i,q}\}$	31		

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GLASTERNER PRESERVICE

1/1

REPORT ON TRIPPINGS OCCURED ON 15.04.16 AT 12:17HRS AND SUBSEQUENT BUS VOLTAGE ZERO CONDITION AT JEYPORE

Background:On 15.04.16, Bus voltage at 400/220KV Jeypore substation has become zero after tripping of 400KV Rengali-Indravati Line at both ends. It has happened thrice in a year span i.e 1st on 21.05.15, 2nd on 10.03.16 and the present case. Further, it happens only when 400KV Indravati- Rengali line trips at Indravati s/s and power flow feed from Indravati-Jeypore line at Jeyporebecomes zero.In such case, only line left for feeding power to jeyporeis 400KV Jeypore-Bolangir line as no infeed from Jayanagar at Jeypore and OHPC at Indravati in summer. Further, after tripping of 400KV Rengali-Indravati Line, 400KV Jeypore-Bolangir line trips on over voltage after some time leading to bus dead condition at Jeypore s/s.



Connectivity diagram of Lines:

Details of FSC:

- 1. 400KV Jeypore-Gazuwaka D/C line with 50% compensation/
- 2. 400KV Jeypore-Bolangir S/C line with 63%(approx) compensation. Earlier this line was connected at Meramundalifrom Jeyporewith a line length of 456KM and 40% compensation and now, it has aLILO at Bolangir (287.7KM) with no modification in FSC at Jeypore. As a result, now the compensation of this line is around 63%.

Sequence of	Tripping occurred	in present case:

SL	TIME OF	TRIPPED LINE	CAUSE OF TRIPPING	STAUS OF AUTO
NO	TRIPPING			RECLOSE
01	12:17:31hrs	400KV Rengali–	Transient Fault: 1.84kA, B-N ,	A/R Blocked due
		Indravatiline	222.32Km from Rengali.	to Over Voltage.
			Subsequent over voltage	
			immediately after tripping of	
			one pole and prior to A/R	
			caused three phase tripping at	
			Rengali and sent DT to Indravati.	
02	12:23:19hrs	400KV Jeypore-Bolangir	Over Voltage stage-1	NA
		Line		
04	12:29:32 hrs	400KV Jeypore-	Tripped due to DT receipt as	NA
		Gazuwaka Line - II	these lines were hand tripped at	
05	12:29:48 hrs	400KV Jeypore-	Gazuwaka-1&2 as informed by	NA
		Gazuwaka Line - I	them.	
07	12:48:21 hrs	220KV Jeypore-	Hand Tripped	NA
		Jayanagar-1&2		
07	12:43:21 Hrs	400KV Jeypore-Indravati	Hand Tripped	NA
		line		

Analysis:

Based on the trip reports received from sites and collected PMU plots from ERLDC, the following analysis was done.

- 1. Initially, B-ph (RYB nomenclature) of 400KV Rengali- Indravati line tripped due to transient fault at a distance of 222.32 km from Rengali S/S and after few milliseconds, over voltage stage-2 (Inst.) operated in R-PH and tripped the line on over voltage sending a DT signal to Indravati S/S and blocking A/R operation. Tripping reports of Rengali&Indravati are enclosed for your reference.
- 2. The status of power flow as per PMU at Jeypore is shown below.

- 3. From the plot, there was a power import of around 450MW from Bolangir and around 270MW from Indravati and the total power was fed to SR-1 through 400KV Jeypore-Gazuwaka D/C line except some less power export (around 25MW seen from FHTR of Jeypore) to 220KV OPTCL lines before tripping of 400KV Rengali- Indravati line.
- 4. After tripping of 400KV Rengali- Indravati line, the flow in 400KV Jeypore-Bolangir line has increased to 700MW with some oscillation as shown in PMU plots below. At the same time, power flow in 400KV Jeypore-Indravati line has reversed and feeding OPTCL N/W loads at OHPC through Indravati S/S and the same is evident from above plot.
- 5. Bus Voltage profile at Jeypore S/S after tripping of Rengali Indravati line as follows as per PMU plots. Voltage oscillations were observed in the plot. There was sudden dip in voltage due to sudden increase in loading of Jeypore-Bolangir line and later on, the rise in voltage observed.

- 6. After 5mins of Renagli-Indravati line tripping, 400KV Jeypore-Bolangir line tripped on over voltage satge-1. Hence, the total power infeed to jeypore has become zero as there is no power flow from 220KV OPTCL lines at Jeypore and OHPC at Indravati. The same can be seen in PMU plot of Jeypore power as shown above. The trip report of Bolangir line is enclosed.
- 7. Later, other lines at Jeypore&Indravatiwere hand tripped due to bus dead and no voltage.

Suspected reasons for Sudden Voltage rise:

It is suspected that the following factors may contribute for voltage rise in Jeypore-Bolangir line after tripping of 400KV Rengali-Indravati line and causing tripping of Jeypore-Bolangir line on voltage and making Bus voltage zero at Jeypore s/s.

- a) Overcompensation of FSC in Jeypore-Bolangir line after LILO of Jeypore-Meramundali line at Bolangir. Earlier, compensation was 40% for 456 KM line length (Jeypore- Meramundali) and now it has become around 63% for 287.7 Km (Jeypore-Bolangir line).
- b) Filter bank insertion at Gazuwaka to boost the voltage whenever voltage dips below 360KV. In the instant case, 80 KV Voltage dip was observed in Jeypore bus voltage after Bolangir

line is over loaded after Regali-Indravati line tripping. So, the filter bank cut off voltage values needs to be checked as it may contribute overvoltage if not bypassed once voltage normalized. As per information gathered from Gazuwaka, there was no such abnormality

observed during that period.

- c) Condition of R-Ph CVT of Bolangir Line at Jeypore as in all the cases over voltage observed in R-Ph only. But in the instant tripping, over voltage found to be observed in other phases also. However, It has been checked at site and no abnormality has been found.
- d) Further, the frequent trippings on south bus at Gazuwaka HVDC B/B station due to pollution tracking maybethe reason for the possibility of pole blocking and consequent over voltage on Eastern bus.

FAULT FINDINGS&REMEDIAL ACTIONSTAKEN :

- (1) The polarity of neutral CT used in NGR bypassing scheme of 50MVAR Line Reactor of 400KV Rengali-Indravati Line at Rengali was found to be reversed, which might have been triggering Reactor REF relay, thereby Reactor protection has been operated in case of thorough fault condition too and sending direct trip to remote end. This polarity reversal in NCT has been rectified.
- (2) Proper assignment of Digital as well as Analogue signals in DR and EL done at Rengali, which was found to be mis-matching with actual signal due to NTAMC wirings and retrofitting works done for implementation of NTAMC. Due to this mismatching of signals, it was very difficult to identify the signals for which actual tripping occurred.
- (3) The contact in auxiliary relay of Auto Reclosure Lock Out relay at Indravati was found to be burnt and chattering in case of A/R block action. Due to this in spite of receiving A/R lock out signal from remote end, A/R blocking did not occur and the line remained hanging from Indravati end. This auxiliary relay has been replaced with spare one.

The report is being submitted based on prevailing data available with us. Further study of the case is under process to avoid such incidents in future.

(S.K.Naik) Ch.Mgr(AM) POWERGRID Bhubaneswar.

Enclosures:1.Tripping Reports of all substations as mentioned above 2. PMU Plots collected from ERLDC.

Box Partine Partine Partine Partial (mm) Partia (mm) Partial													Annex	ure-D9.	.2
Image: Probability Image:	SL No	Zone-2 timer setting at	For line No of Lengt circuits (km)	of Length uits (km)	Zone-2 Reach in %	Zone-2 reach of protected line	Shortest line at remote end	Length (km)	Considering reach i.e l	ldeal Zo Jpto 80º	ne-1 %	Considering Zon by 30% i.e. Zon upto 50% (as philo Zone-2 reach	e-1 unde e -1 reac per ERP(sophy)	r reaches h is only C/CEA	
Interaction Grankhpur Dor.C 241 150% 392 Consthpur-UP D/C 46 37 Y 0.5 to 0.6 2.3 Y 0.5 to 0.6 Purnea D/C 242 150% 363 Purnea-Kishangani D/C 71 N 0.35 45 Y 0.5 to 0.6 6 7 Y 0.5 to 0.6 6 5 Y 0.5 to 0.6 6 7 Y 0.5 to 0.6 7 Y 0.5 to 0.6 7 Y 0.5 to 0.6 7 Y <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th>iengui (kii)</th><th></th><th></th><th>(Beyound 80% upto 120/150%) of the shortest line Starts at (km)</th><th>Zone -2 Overlap ?</th><th>Zone-2 Time setting</th><th>(Beyound 50% upto 120/150%) of the shortest line Starts at (km)</th><th>Zone -2 Overlap ?</th><th>Zone-2 Time setting</th></td<>							iengui (kii)			(Beyound 80% upto 120/150%) of the shortest line Starts at (km)	Zone -2 Overlap ?	Zone-2 Time setting	(Beyound 50% upto 120/150%) of the shortest line Starts at (km)	Zone -2 Overlap ?	Zone-2 Time setting
Image: Number of the stand of the			Gorakhpur	D/C	261	150%	392	Gorakhpur-Gorakhpur-UP D/C	46	37	Y	0.5 to 0.6	23	Y	0.5 to 0.6
Pures D/C 242 150% 363 Purnes/Rhanganj D/C 71 57 Y 0.5 to 0.6 36 Y 0.5 to 0.6 2 Purnes Muzzafarpur D/C 71 157 N 0.55 66 7 Y 0.5 to 0.6 57 Y 0.5 to 0.6 7 Y 0.5 to 0.6 20 Y 0.5 to 0.6 36 Y 0.5 to	1	Muzaffarpur	Biharshariff	D/C	133	150%	200	Biharsariff Lakhisarai D/C	89	71	N	0.35	45	Y	0.5 to 0.6
Purnes Muzzafarpur D/C 242 150% 363 Muzzafarpur Binarsaff D/C 133 107 Y 0.510.0.6 67 Y 0.510.0.6 2 Purnes Binarsaff Labrasaff Lab			Purnea	D/C	242	150%	363	Purnea-Kishanganj D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
Parte Kishangari D/C 71 157 N 0.35 36 N 0.35 BBrasarifi-Aktistrani D/C 231 150% 347 Bbrasarifi-Aktistrani D/C 80 71 Y 0.510.0.6 427 Y 0.510.0.6 207 Y 0.510.0.6 307 Y 0.510.0.6 307 Y 0.510.0.6 308			Muzzafarpur	D/C	242	150%	363	Muzzafarpur-Biharsariff D/C	133	107	Y	0.5 to 0.6	67	Y	0.5 to 0.6
2 Purnea Binarsariff D/C 213 150% 337 Binarsariff 210 151 91 151 92 171 Y 0.5 to 0.6 45 Y 0.5 to 0.6 Binaguri D/C 173 150% 251 Midiaf-arrankshanbar D/C 49 32 Y 0.5 to 0.6 40 Y 0.5 to 0.6 40 Y 0.5 to 0.6 3 Kishangani D/C 348 150% 107 Purnea Kishangan other Kishanbang D/C 69 55 N 0.35 34 Y 0.5 to 0.6 Binaguri D/C 69 150% 140 Patna-Barb D/C 69 55 N 0.35 34 Y 0.5 to 0.6 23 Y 0.5 to 0.6 34			Kishanganj	D/C	71	150%	107	Kishangaj-Purnea other ckt	71	57	N	0.35	36	N	0.35
Heads D/C 167 150% 251 Models-Farska D/C 40 32 Y 0.5 to 0.6 200 Y 0.5 to 0.6 Binguri Shamp Purnea D/C 108 150% 252 Binguri Shamp) (0.7 10 55 to 0.6 49 Y 0.5 to 0.6 Binguri Shamp Patna D/C 34 150% 107 Purnes (Shamp) (0.7 10 55 to 0.6 34 Y 0.5 to 0.6 Binguri D/C 100/C 98 150% 1140 Patna PD/C 69 55 N 0.35 34 Y 0.5 to 0.6 Gorskhpur D/C 349 150% 1140 Patna PD/C 69 55 N 0.35 34 Y 0.5 to 0.6 23 Y <	2	Purnea	Biharsariff	D/C	231	150%	347	Biharsaiff-Lakhisarai D/C	89	71	Y	0.5 to 0.6	45	Y	0.5 to 0.6
Image: Image: <thimage:< th=""> <thimage:< th=""> <thimage:< td="" th<=""><td></td><td></td><td>Malda</td><td>D/C</td><td>167</td><td>150%</td><td>251</td><td>Malda-Farraka D/C</td><td>40</td><td>32</td><td>Y</td><td>0.5 to 0.6</td><td>20</td><td>Y</td><td>0.5 to 0.6</td></thimage:<></thimage:<></thimage:<>			Malda	D/C	167	150%	251	Malda-Farraka D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
Rshangal Purnea D/C 71 150% 107 Purnea Kishangal Otter (xt) 71 57 N 0.35 36 N 0.35 Bingaguri D/C 348 150% 147 Binaguri-Kishanhanj Otter (xt) 98 78 N 0.35 34 Y 0.510.06 A Patna D/C 69 150% 140 Patna Barh D/C 69 55 N 0.35 344 Y 0.510.06 Grankhur D/C 69 150% 0.33 244 Conshpur-Grahpar-UPU/C 69 55 N 0.35 344 Y 0.510.06 Kahajago D/C 30 150% 521 Kshangal-Purnea D/C 71 57 Y 0.510.06 24 Y 0.510.06 Barh D/C 0.3 150% 103 Barth-Patna abhr/C/C 70 7 0.510.06 55 N 0.35 344 Y 0.510.06 55 N 0.35			Binaguri	D/C	168	150%	252	Binaguri-Kishanhanj D/C	98	78	Y	0.5 to 0.6	49	Y	0.5 to 0.6
3 Kishangan Patna D/C 348 150% 521 Patna Barh D/C 69 55 Y 0.5 to 0.6 34 Y 0.5 to 0.6 Bard D/C 98 150% 140 Patna Barh D/C 69 55 N 0.35 34 Y 0.5 to 0.6 Patna D/C 93 150% 140 Patna Barh Other Ck 69 55 N 0.35 34 Y 0.5 to 0.6 Patna D/C 349 150% 524 Gorakhpur-Gorakhpur-D/C 46 33 Y 0.5 to 0.6 36 Y 0.5 to 0.6 Kishangan D/C 348 150% 521 Kishangal-Purnea D/C 69 55 N 0.35 34 N 0.5 to 0.6 5 Y			Purnea	D/C	71	150%	107	Purnea Kishangaj other ckt	71	57	N	0.35	36	N	0.35
Braguri Dr.C 98 150% 147 Binaguri-Kishanhanj other ckt 98 78 N 0.35 49 N 0.35 4 Patna D/C 69 150% 103 Patna-Barh O/C 69 55 N 0.35 34 Y 0.510.06 6 Gorakhyoru D/C 49 150% 524 Korograkhyoru-UP 0.510.06 224 Y 0.510.06 6 Kahalgaon D/C 217 150% 326 Khalgaon-BankaD/C 48 38 Y 0.510.06 24 Y 0.510.06 6 Barh D/C 49 150% 521 Kishangaj-Purnea D/C 71 57 Y 0.510.06 5	3	Kishanganj	Patna	D/C	348	150%	521	Patna-Barh D/C	69	55	Y	0.5 to 0.6	34	Y	0.5 to 0.6
4 Patna D/C 93 150% 140 Patna-Barh D/C 69 55 N 0.35 34 Y 0.5 to 0.6 Patna D/C 349 150% 103 Patna-Barh OthC/C 69 555 N 0.35 34 N 0.35 Garakhpur D/C 349 150% 524 Gorakhpur-Gorakhpur-UPD/C 46 37 Y 0.5 to 0.6 23 Y 0.5 to 0.6 Kishangani D/C 348 150% 521 Kishangal-Purnea D/C 48 38 Y 0.5 to 0.6 36 Y 0.5 to 0.6 Barh D/C 93 150% 140 Barh-Patna D/C 69 55 N 0.35 34 N 0.35 Balla D/C 195 150% 278 Balla-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Balla D/C 105 150% 213 Sasara N			Binaguri	D/C	98	150%	147	Binaguri-Kishanhanj other ckt	98	78	N	0.35	49	N	0.35
Barh Patna D/C 69 150% N 0.35 3.4 N 0.35 Gorakhyur D/C 349 150% 52.4 Gorakhyur-			Patna	D/C	93	150%	140	Patna-Barh D/C	69	55	N	0.35	34	Y	0.5 to 0.6
Image: brack of the stand of the s	4	Barh	Patna	D/C	69	150%	103	Patna-Barh other ckt	69	55	N	0.35	34	N	0.35
Kahalgaon D/C 217 150% 326 Khalangi-PurenaBakaD/C 48 38 Y 0.5 to 0.6 24 Y 0.5 to 0.6 5 Patna Barh D/C 348 150% 521 Kishangi-Purena D/C 69 555 N 0.35 34 Y 0.5 to 0.6 Barh D/C 69 150% 103 Barh-Patna D/C 69 55 N 0.35 34 N 0.35 Balia D/C 185 150% 278 Balia-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Balia D/C 180 150% 123 Sasaram 50 71 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Varanasi S/C 143 120% 123 Sasaramth/3/C 82 66 N 0.35 41 N 0.35 Varanasi S/C 143 120% 124 Varanasi/20/arara		-	Gorakhpur	D/C	349	150%	524	Gorakhpur-Gorakhpur-UP D/C	46	37	Ŷ	0.5 to 0.6	23	Y	0.5 to 0.6
Patna Rishanganj D/C 34 150% 521 Kishanganj C 71 57 Y 0.5 to 0.6 36 Y 0.5 to 0.6 5 Patna Barh D/C 93 150% 140 Barh-Patna D/C 69 55 N 0.35 34 N 0.35 Balia D/C 195 150% 278 Balia-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Balia D/C 195 150% 278 Balia-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Balia D/C 195 150% 315 Biharsaiff-Lakhisarai D/C 89 71 Y 0.5 to 0.6 45 Y 0.5 to 0.6 Malingari D/C 143 120% 172 Varansi-Saranthi S/C 70 56 N 0.35 49 N 0.35 Allahabad S/C 172 150%<			Kahalgaon	D/C	217	150%	326	Khalgaon-BankaD/C	48	38	Ŷ	0.5 to 0.6	24	Y	0.5 to 0.6
Patna Barn D/C 93 150% 140 Barh-Patna other okt 69 55 N 0.35 34 Y 0.5 to 0.6 Balia D/C 69 150% 103 Barh-Patna other okt 69 55 N 0.35 34 N 0.35 Balia D/C 165 150% 278 Balia-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Baliasmatif D/C 120 150% 293 Bilansaiff-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 Mainagar D/C 210 150% 123 Sasaran-Mabinagar D/C 89 71 Y 0.5 to 0.6 55 N 0.35 34 N 0.35 Varanasi S/C 143 120% 172 Varanasi S/C 70 56 N 0.35 35 N 0.35 A Maithon D/C 120			Kishanganj	D/C	348	150%	521	Kishangaj-Purnea D/C	/1	57	Ŷ	0.5 to 0.6	36	Y	0.5 to 0.6
5 Patra Barn D/C 69 150% 10.3 Barla-Mau D/C 99 55 N 0.35 3.44 N 0.35 Balla D/C 185 150% 278 Balla-Mau D/C 9 7 Y 0.510.0.6 5 Y 0.510.0.6 Blharsariff D/C 195 150% 293 Balla-Mau D/C 9 7 Y 0.510.0.6 5 Y 0.510.0.6 Blharsariff D/C 105 150% 315 Bilharsariff D/C 89 71 Y 0.510.0.6 45 Y 0.510.0.6 Varanasi S/C 143 120% 172 Varansi-Saranthi S/C 70 56 N 0.35 41 N 0.35 Althon D/C 212 120% 254 Allahad-Varansi S/C 98 78 N 0.35 49 N 0.35 Althon D/C 125 150% 144 Malthon-MPE L/C	-	Datas	Barh	D/C	93	150%	140	Barn-Patna D/C	69	55	N	0.35	34	Y	0.5 to 0.6
Balla D/C 185 120% 278 Balla-Mad D/C 9 7 Y 0.510.6 5 Y 0.510.6 Balla D/C 195 150% 293 Balla-Mau D/C 9 7 Y 0.510.6 5 Y 0.510.6 Allahaba D/C 120 150% 315 Bilarsaiff-Lakhisarai D/C 89 71 Y 0.510.6 45 Y 0.510.6 Varansi S/C 121 120% 172 Varansi-Saranthis/C 70 56 N 0.35 35 N 0.35 Allahaba S/C 212 120% 254 Allahaba/Varansi/S/C 98 78 N 0.35 35 N 0.35 Allahabad S/C 212 120% 244 Allahabad/Varansi/S/C 98 78 N 0.35 36 N 0.35 Chandwa D/C 216 150% 414 Malthon-MPLD/C 32 255<	5	Patha	Barn	D/C	69	150%	103	Barn-Patna other ckt	69	55	N	0.35	34	N	0.35
Baila D/C 190 190% 293 Baila-Mail D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 6 Nabinagar D/C 150% 315 Biharsafiff D/C 82 66 N 0.35 41 N 0.35 Varanasi S/C 143 120% 172 Varansi-Saranathi S/C 70 56 N 0.35 35 N 0.35 7 Gaya Maithon D/C 276 150% 414 Maithon-MPLD/C 32 25 Y 0.5 to 0.6 16 Y 0.5 to 0.6 7 Gaya Maithon D/C 276 150% 176 Chandwa-N.Ranchi D/C 68 54 Y 0.5 to 0.6 34 Y 0.5 to 0.6 6 Muzzafarpur D/C 123 150% 176 Chandwa-N.Ranchi D/C 68 54 Y 0.5 to 0.6 34 Y 0.5 to 0.6 50 Y <td< td=""><td></td><td></td><td>Balia</td><td>D/C</td><td>185</td><td>150%</td><td>278</td><td>Balia-Mau D/C</td><td>9</td><td>/</td><td>Y</td><td>0.5 to 0.6</td><td>5</td><td>Y</td><td>0.5 to 0.6</td></td<>			Balia	D/C	185	150%	278	Balia-Mau D/C	9	/	Y	0.5 to 0.6	5	Y	0.5 to 0.6
Biharsariff D/C 210 150% 315 Biharsariff D/C 89 71 Y 0.510.0.6 45 Y 0.500.0.6 6 Nainagar D/C 82 150% 123 Sasaram-Nabinagar D/C 82 666 N 0.35 41 N 0.35 7 Varanasi S/C 143 120% 172 Varansi-Saranathis/C 70 566 N 0.35 49 N 0.35 7 Gaya Maithon D/C 127 150% 414 Maithon-MPL D/C 32 25 Y 0.5 to 0.6 16 Y 0.5 to 0.6 7 Gaya Chandwa D/C 176 Chandwa-N.Ranchi D/C 68 54 Y 0.5 to 0.6 34 Y 0.5 to 0.6 7 Muzzafarpur D/C 133 150% 200 Muzzafarpur-Biharsariff D/C 133 107 N 0.35 67 N 0.5 to 0.6 Y 0.5 to 0.6			Balla	D/C	195	150%	293	Balla-Mau D/C	9	/	Ŷ	0.5 to 0.6	5	Y	0.5 to 0.6
6 Sasaram Natolinagar D/C 82 150% 123 Sasaram-Nabinagar D/C 82 66 N 0.35 41 N 0.35 Varanasi S/C 143 120% 172 Varansi-Saranathi S/C 70 56 N 0.35 35 N 0.35 Allahabad S/C 121 120% 254 Allahabad-Varanasi S/C 98 78 N 0.35 44 N 0.35 Allahabad D/C 177 150% 176 Chandwa-Nanchi D/C 32 25 Y 0.5 to 0.6 16 Y 0.5 to 0.6 Koderma D/C 173 150% 176 Chandwa-Nanchi D/C 68 54 Y 0.5 to 0.6 34 Y 0.5 to 0.6 Koderma D/C 133 150% 347 Purneakishanga D/C 113 107 N 0.35 67 N 0.35 Purnea D/C 201 150% 315 </td <td></td> <td></td> <td>Binarsaritt</td> <td>D/C</td> <td>210</td> <td>150%</td> <td>315</td> <td>Binarsaitt-Laknisarai D/C</td> <td>89</td> <td>/1</td> <td>Ŷ</td> <td>0.5 to 0.6</td> <td>45</td> <td>Y</td> <td>0.5 to 0.6</td>			Binarsaritt	D/C	210	150%	315	Binarsaitt-Laknisarai D/C	89	/1	Ŷ	0.5 to 0.6	45	Y	0.5 to 0.6
Waranas S/C 143 120% 112 Waranasi S/C 70 56 N 0.35 35 N 0.35 Allahabad S/C 212 120% 254 Allahabad-Varanasi S/C 98 78 N 0.35 49 N 0.35 7 Gaya Malthon D/C 276 150% 414 Malthon-MPLD/C 32 25 Y 0.5 to 0.6 16 Y 0.5 to 0.6 Koderma D/C 177 150% 176 Chandwa-N.Ranchi D/C 68 54 Y 0.5 to 0.6 34 Y 0.5 to 0.6 Koderma D/C 125 150% 188 Koderma-Bokaro D/C 100 80 N 0.35 67 N 0.35 Purnea D/C 231 150% 347 Purnea Kishangaj D/C 71 57 Y 0.5 to 0.6 411 Y 0.5 to 0.6 Sasaram D/C 19 150% 342	6	Sasaram	Nabinagar	D/C	82	150%	123	Sasaram-Nabinagar D/C	82	00	IN N	0.35	41	IN N	0.35
Atlaftabile S/C 212 120% 234 Atlaftable/Variatis S/C 98 78 N 0.35 49 N 0.35 7 Gaya Maithon D/C 276 150% 414 Maithon-MPL D/C 32 25 Y 0.5 to 0.6 16 Y 0.5 to 0.6 Chandwa D/C 117 150% 176 Chandwa-N.Ranchi D/C 68 54 Y 0.5 to 0.6 34 Y 0.5 to 0.6 Koderma D/C 125 150% 188 Koderma-Bokaro D/C 100 80 N 0.35 67 N 0.5 to 0.6 Sasaram D/C 231 150% 347 Purnea Kishangaj D/C 71 57 Y 0.5 to 0.6 41 Y 0.5 to 0.6 Sasaram D/C 210 150% 347 Sasaram-Nabinagar D/C 82 65 Y 0.5 to 0.6 41 Y 0.5 to 0.6 Sasaram D/C 189 150%<			Varanasi	5/0	143	120%	172	Varansi-Saranathi S/C	70	56	N	0.35	35	N	0.35
Angle of the standard o			Allallabau	3/0	212	120%	204	Alididudu-Valididasi S/C	98	78	IN V	0.35 0 E to 0 6	49	IN V	0.35
A big Chandwa D/C 117 130% 176 Chandwa Raffield D/C 88 34 1 0.506 34 1 0.510.6 34 1 0.510.6 34 1 0.510.6 35 34 1 0.510.6 35 10.5 35 10.5 10.5 10.5 10.5 10.5 10.5 10.5	7	Cava	Chandwa		2/0	150%	414	Chandwa N Danahi D/C	32	Z3 E4	T V	0.5 to 0.6	10	I V	0.5 to 0.6
No. No. <td>/</td> <td>Gaya</td> <td>Kodorma</td> <td></td> <td>117</td> <td>150%</td> <td>1/0</td> <td>Kodorma Pokaro D/C</td> <td>00</td> <td>24</td> <td>ř N</td> <td>0.5 10 0.6</td> <td>54</td> <td>ř V</td> <td>0.5 to 0.6</td>	/	Gaya	Kodorma		117	150%	1/0	Kodorma Pokaro D/C	00	24	ř N	0.5 10 0.6	54	ř V	0.5 to 0.6
Biharsariff D/C 133 130% 200 Md22alalpd1-binalatili D/C 133 107 N 0.33 07 N 0.33 B Purnea D/C 231 150% 347 Purnea Kishangaj D/C 71 57 Y 0.5 to 0.6 41 Y 0.5 to 0.6 Sasaram D/C 210 150% 315 Sasaram-Nabinagar D/C 82 65 Y 0.5 to 0.6 41 Y 0.5 to 0.6 Sasaram D/C 89 150% 134 Lakhisari-Biharsaiff Other ckt 89 71 N 0.35 45 N 0.5 to 0.6 Koderma D/C 111 150% 277 Banka-Khalgaon D/C 48 38 Y 0.5 to 0.6 24 Y 0.5 to 0.6 Balia D/C 111 150% 362 Balia-Mau D/C 9 7 Y 0.5 to 0.6 5 Y 0.5 to 0.6 9 Lakhisari D/C 89 71			Muzzafarpur		120	150%	200	Muzzafarpur Bibarsariff D/C	100	107	IN N	0.35	50	T N	0.5 10 0.0
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			Durpoa		221	150%	200	Purpoa Kishangai D/C	71	57	V	0.55 0.5 to 0.6	26	V	0.55
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Sasaram		231	150%	315	Sasaram-Nabinagar D/C	82	57	V I	0.5 to 0.6		V	0.5 to 0.6
$\frac{1}{10} + \frac{1}{10} $	8	Bibarsariff	Lakhisari		210	150%	13/	Jakhisarai-Bibarsaiff Other ekt	80	71	N	0.3 10 0.0	41	N	0.3 10 0.0
$\frac{1}{10} + \frac{1}{100} + \frac{1}{$	Ũ	Dinarsarin	Banka	D/C	185	150%	277	Banka-Khalgaon D/C	/8	38	V	0.55 0.5 to 0.6	24	V	0.55
$\frac{1}{10} + \frac{1}{10} $			Koderma	D/C	103	150%	166	Koderma-Bokaro D/C	100	30 80	N	0.3 10 0.0	50	V	0.5 to 0.6
9 Lakhisari D/C 89 150% 0.01 <th0< td=""><td></td><td></td><td>Balia</td><td>D/C</td><td>241</td><td>150%</td><td>362</td><td>Balia-Mau D/C</td><td>9</td><td>7</td><td>Y</td><td>0.5 to 0.6</td><td>5</td><td>Ŷ</td><td>0.5 to 0.6</td></th0<>			Balia	D/C	241	150%	362	Balia-Mau D/C	9	7	Y	0.5 to 0.6	5	Ŷ	0.5 to 0.6
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			Biharsariff	D/C	89	150%	134	Biharsaiff-Lakhisarai D/C	89	71	N	0 35	45	N	0.35
Banka Biharsariff D/C 185 150% 277 Biharsariff-Lakhisari D/C 89 71 Y 0.5 to 0.6 45 Y 0.5 to 0.6 10 Banka Biharsariff D/C 185 150% 277 Biharsariff-Lakhisari D/C 89 71 Y 0.5 to 0.6 45 Y 0.5 to 0.6 Kahalgaon D/C 48 150% 72 Khalgaon-BankaD/C 48 38 N 0.35 24 N 0.35 Lakhisari D/C 145 150% 218 LakhisarifFD/C 89 71 Y 0.5 to 0.6 45 Y 0.5 to 0.6 Banka D/C 48 150% 72 Banka-Khalgaon Other ckt 48 38 N 0.35 24 N 0.35	9	Lakhisari	Kahalgaon	D/C	145	150%	218	Khalgaon-BankaD/C	48	38	Ŷ	0.5 to 0.6	24	γ	0.5 to 0.6
10 Banka 10 <th1< td=""><td></td><td></td><td>Biharsariff</td><td>D/C</td><td>185</td><td>150%</td><td>277</td><td>Biharsaiff-Lakhisarai D/C</td><td>89</td><td>71</td><td>Ŷ</td><td>0.5 to 0.6</td><td>45</td><td>Ŷ</td><td>0.5 to 0.6</td></th1<>			Biharsariff	D/C	185	150%	277	Biharsaiff-Lakhisarai D/C	89	71	Ŷ	0.5 to 0.6	45	Ŷ	0.5 to 0.6
Lakhisari D/C 145 150% 218 Lakhisarif D/C 89 71 Y 0.5 to 0.6 45 Y 0.5 to 0.6 Banka D/C 48 150% 72 Banka-Khalgaon Other ckt 48 38 N 0.35 24 N 0.35	10	Banka	Kahalgaon	D/C	48	150%	72	Khalgaon-BankaD/C	48	38	N	0.35	24	N	0.35
Banka D/C 48 150% 72 Banka-Khalgaon Other ckt 48 38 N 0.35 24 N 0.35			Lakhisari	D/C	145	150%	218	Lakhisarai-Biharsaiff D/C	89	71	Ŷ	0.5 to 0.6	45	Ŷ	0.5 to 0.6
			Banka	D/C	48	150%	72	Banka-Khalgaon Other ckt	48	38	N	0.35	24	Ν	0.35

11	Kahalgaon	Farraka	D/C	95	150%	143	Farraka -Malda D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
	Ű	Farraka	D/C	95	150%	143	Farraka -Malda D/C	40	32	Y	0.5 to 0.6	20	Y	0.5 to 0.6
		Maithon	D/C	172	150%	258	Maithon-MPL D/C	32	25	Y	0.5 to 0.6	16	Y	0.5 to 0.6
		Kahalgaon	D/C	95	150%	143	Khalgaon-BankaD/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
		Kahalgaon	D/C	95	150%	143	Khalgaon-BankaD/C	48	38	Y	0.5 to 0.6	24	Y	0.5 to 0.6
		Malda	D/C	40	150%	60	Malda-Farraka D/C	40	32	N	0.35	20	Ν	0.35
12	Farraka	Bahrampur	S/C	71	120%	85	Bahrampur-Sagardighi D/C	26	21	N	0.35	13	Y	0.5 to 0.6
		Sagardighi	S/C	72	120%	86	Sagardighi-Bahrampur D/C	26	21	N	0.35	13	Y	0.5 to 0.6
		Durgapur	D/C	146	150%	219	Durgapur-Bidhannagar D/C	11	9	Ŷ	0.5 to 0.6	6	Ý	0.5 to 0.6
		Purnea	D/C	167	150%	251	Purnea Kishangai D/C	71	57	Y	0.5 to 0.6	36	Y	0.5 to 0.6
13	Malda	Farraka	D/C	40	150%	60	Farraka -Malda D/C	40	32	N	0.35	20	N	0.35
		Purnea	D/C	168	150%	252	Purnea Kishangai D/C	71	57	Ŷ	0.5 to 0.6	36	Y	0.5 to 0.6
		Kishangani	D/C	98	150%	147	Kishangai-Purnea D/C	71	57	N	0.35	36	Ŷ	0.5 to 0.6
		Rangpo	D/C	12	150%	18	Rangpo-Binaguri D/C	12	9	N	0.35	6	N	0.35
		Bongaigaon	D/C	218	150%	327	Bongaigaon-BTPS D/C	3 12	2	Y	0.5 to 0.6	2	Y	0.5 to 0.6
14	Binaguri	Bongaigaon	D/C	210	150%	332	Bongaigaon-BTPS D/C	3.12	2	v	0.5 to 0.6	2	v	0.5 to 0.6
		Tala	D/C	145	150%	218	Tala -Malbase S/C	24	10	V V	0.5 to 0.6	12	v	0.5 to 0.6
		Tala	S/C	140	120%	168	Tala -Malbase S/C	24	19	V V	0.5 to 0.6	12	v	0.5 to 0.6
		Malbase	S/C	125	120%	150	Malbase -Tala S/C	24	10	V	0.5 to 0.6	12	v	0.5 to 0.6
		Farraka	5/0	71	120%	85	Farraka -Malda D/C	40	32	N	0.3 10 0.0	20	N	0.3 10 0.0
		Sanardinhi	D/C	26	150%	30	Sagardighi-Bahrampur D/C	26	21	N	0.35	13	N	0.35
15	Bahrampur	loorat	5/0	165	120%	109	Joorat Subbasaram S/C	62	50	N	0.35	22	V	0.55
		Bhoramara	5/0	100	120%	150	Bhoromara Babrampur other ckt	100	50 80	N	0.35	50	N	0.3 10 0.0
		Earraka	5/0	72	120%	150	Earraka Malda D/C	40	22	N	0.35	20	N	0.35
		Pabrampur	5/0	72	120%	20	Pahrampur Sagardighi D/C	40	JZ 21	N	0.35	12	N	0.35
16	Sagardighi	Durgopur		10	150%	39 100	Durgapur Pidhappagar D/C	20	21	IN V	0.50 0 E to 0 6	13	IN V	0.35
		Subbasaram	5/0	246	120%	205	Subbasaram Joorat S/C	62	50	I NI	0.3 10 0.0	22	V I	0.5 to 0.6
		Earraka	5/0	240	120%	275	Earraka, Malda D/C	40	20	N V	0.55 0 E to 0 6	32	I V	0.5 to 0.6
		Sagardighi		140	150%	219	Failaka -ivialua D/C	40	32	I V	0.5 to 0.6	20	T V	0.5 to 0.6
17	Durgopur	Bidbappagar		120	150%	192	Bidbappagar Durgapur D/C	20	21	T NI	0.5 10 0.0	13	T N	0.5 10 0.0
17	Duiyapui	biuriaririayai	5/0	177	100%	17	Biuriarinagai - Durgapur D/C	1	9	IN V	0.50 0 E to 0.4	0	N V	0.55
		Maithon	3/0	71	120%	212	Jamseupur - Adhumik D/C	22	25	ř V	0.5 to 0.6	14	ř V	0.5 to 0.6
		Durgopur	D/C	11	150%	100	Ivialition-iviFLD/C	32	25	T NI	0.5 10 0.0	10	T N	0.5 10 0.0
10	Pidbappagar	Durgapur	D/C	105	150%	17	Durgapur-Biuriannagar D/C	105	9	IN NI	0.35	0	IN N	0.35
10	biunannayai	PP3P Arombogh	D/C	100	100%	2/8	PPSP-Biulialinayal D/C	C01	148 E1	IN NI	0.35	93	IN N	0.35
		Alambayn	3/0	114	120%	137	Alambag-Kolaynat S/C	04	51	IN V	0.35	32	IN V	0.35
19	PPSP	Bionannagar	D/C	185	150%	2/8	Bidnannagar-Durgapur D/C	11	9	ř V	0.5 to 0.6	0	ř V	0.5 10 0.6
		Alambayn	D/C	210	100%	310	Alambay-Kolaynat S/C	04	51	ř V	0.5 to 0.6	32	ř V	0.5 to 0.6
		Biuliariliagai	3/0	114	120%	137	Biuriarinagai - Durgapur D/C	105	9	ř N	0.5 10 0.6	0	ř V	0.5 10 0.6
20	Arambagh	PP3P Dekroower TDS	D/C	210	100%	310	PPSP-Biulialiliagai D/C	100	148	IN NI	0.35	93	ř N	0.5 10 0.6
		Bakreswar TPS	5/0	130	120%	150	Arambag-Bakreswar S/C	130	104	IN N	0.35	65	IN N	0.35
		Kolagnat TPS	5/0	04	120%	11	Kolagnat-Arambagh S/C	64	51	IN	0.35	32	IN N	0.35
21	Bakreswar TPS	Arambagn	5/0	130	120%	156	Arambag-Kolagnat S/C	64	51	N N	0.35	32	N N	0.35
		Jeerat	5/0	162	120%	194	Jeerat-Subhasgram S/C	63	50	N	0.35	32	Y	0.5 to 0.6
		Banrampur	5/0	165	120%	198	Banrampur-Sagardigni D/C	26	21	Y	0.5 to 0.6	13	Y	0.5 to 0.6
22	Jeerat	Bakreswar TPS	5/0	162	120%	194	Arambag-Bakreswar S/C	130	104	N	0.35	65	N	0.35
		Subnasgram	5/0	63	120%	/6	Subhasgram-Jeerat S/C	63	50	N N	0.35	32	N N	0.35
		Kolaghat TPS	5/0	134	120%	161	Kolaghat-Arambagh S/C	64	51	N	0.35	32	N	0.35
22	Culture and the	Sagardighi	5/0	246	120%	295	Sagardighi-Bahrampur D/C	26	21	Y	0.5 to 0.6	13	Y	0.5 to 0.6
23	Subnasgram	Jeerat	5/0	63	120%	/6	Jeerat-Subhasgram S/C	63	50	N N	0.35	32	N	0.35
		Haidia IPS	D/C	90	150%	135	Haidia-Subnasrgram other ckt	90	12	Ń	0.35	45	N	0.35
	1	Arambagh	5/0	64	120%	11	Arambag-Kolaghat S/C	64	51	N	0.35	32	N	0.35
24	Kologbat TDS	Jeerat	S/C	134	120%	161	Jeerat-Subhasgram S/C	63	50	N	0.35	32	N	0.35

24	ινυαγματικο	1/1	0.10	00	4000/	110		00	70	N.I.	0.05	10		0.05
	Ũ	Kharagpur	5/0	98	120%	118	Kharagpur-Baripada S/C	98	/8	N	0.35	49	N	0.35
		Chaibasa	S/C	240	120%	288	Chaibasa-Jamsedpur S/C	46	37	Y	0.5 to 0.6	23	Y	0.5 to 0.6
		Kolaghat TPS	S/C	98	120%	118	Kolaghat-Arambagh S/C	64	51	N	0.35	32	N	0.35
25	Kharagpur	Baripada	S/C	98	120%	118	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Chaibasa	S/C	161	120%	193	Chaibasa-Jamsedpur S/C	46	37	N	0.35	23	Y	0.5 to 0.6
		Kharagpur	S/C	98	120%	118	Kharagpur-Baripada S/C	98	78	N	0.35	49	Ν	0.35
		N. Duburi	S/C	190	120%	228	N. Duburi-Meeramandali D/C	90	72	Ν	0.35	45	Ν	0.35
24	Dorinodo	Pandiabilli	S/C	302	120%	362	Pandiabilli-Mendasal D/C	28	22	Y	0.5 to 0.6	14	Y	0.5 to 0.6
20	Бапраца	Keonjhar	S/C	156	120%	187	Keonjhar-Rengali S/C	100	80	Ν	0.35	50	Ν	0.35
		Jamsedpur	S/C	108	120%	130	Jamsedpur - Adhunilk D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		TISCO	S/C	140	120%	168	TISCO-Baripada S/C	33	26	Y	0.5 to 0.6	16	Y	0.5 to 0.6
		Baripada	S/C	190	120%	228	Baripada-Kharagpur S/C	98	78	Ν	0.35	49	Ν	0.35
27	N. Duburi	Pandiabilli	S/C	143	120%	172	Pandiabilli-Mendasal D/C	28	22	Y	0.5 to 0.6	14	Y	0.5 to 0.6
		Meramandali	D/C	90	150%	135	Meramandali-GMR S/C	8	6	Y	0.5 to 0.6	4	Y	0.5 to 0.6
		Baripada	S/C	302	120%	362	Baripada-Kharagpur S/C	98	78	Ν	0.35	49	Y	0.5 to 0.6
28	Pandiabilli	N. Duburi	S/C	143	120%	172	N. Duburi-Meeramandali D/C	90	72	N	0.35	45	Ν	0.35
		Mendasal	D/C	28	150%	42	Mendasal Pandiabilli D/C	28	22	N	0.35	14	Ν	0.35
		Pandiabilli	D/C	28	150%	42	Pandiabilli-Mendasal D/C	28	22	N	0.35	14	Ν	0.35
29	Mendasal	Meramandali	S/C	98	120%	118	Meramandali-GMR S/C	8	6	Ŷ	0.5 to 0.6	4	Y	0.5 to 0.6
		Mendasal	S/C	98	120%	118	Mendasal Pandiabilli D/C	28	22	Ň	0.35	14	Ŷ	0.5 to 0.6
		Angul	S/C	25	120%	30	Angul-Mermandali S/C	19	15	N	0.35	9	Ň	0.35
		Angul	S/C	19	120%	22	Angul-Mermandali S/C	19	15	N	0.35	9	N	0.35
30	Meramandali	TSTPS	5/C	51	120%	61	TSTPS-Rengali D/C	24	10	N	0.35	12	N	0.35
	inoranianaan	ISPI	D/C	38	150%	57	ISPL-Meramandali Other ckt	38	30	N	0.35	12	N	0.35
		GMP	5/0	8	120%	10		000	700	N	0.35	500	N	0.35
		SEL	D/C	220	150%	330	SEL-Meramandali Other ckt	220	176	N	0.35	110	N	0.35
		Meramandali	S/C	220	120%	30	Meramandali-GMR S/C	8	6	N	0.35	4	V	0.55 0.5 to 0.6
		Moramandali	S/C	10	120%	20	Moramandali GMR S/C	0	6	N	0.35	4	N	0.3 10 0.0
		Bolangir	5/0	106	120%	22	Bolangir-Angul S/C	106	157	N	0.35	4	N	0.35
31	Angul	TSTDS	5/0	69	120%	233	TSTPS Popgali D/C	24	10	N	0.35	70 12	V	0.55
			5/C	80	150%	120	IITPL Apgul Other Ckt	24	64	N	0.35	12	N	0.3 10 0.0
				00 21	150%	120	CMR Apgul Other Ckt	21	04	IN NI	0.33	40	N	0.35
		Angul	5/0	104	100%	47	Angul Mormondeli S/C	10	25	N N	0.55 0 E to 0.4	10	N N	0.55
32	Bolangir	Angui	5/0	190	120%	233	Angui-Mermanuali 5/C	71	57	I V	0.5 to 0.6	9	T V	0.5 to 0.6
		Polongin	5/0	207	120%	244	Bolongir Angul S/C	104	157	T NI	0.5 10 0.0	30	T N	0.5 10 0.0
22	louporo	bolariyii	5/0	207	120%	0F	Bolariyii -Ariyui 3/C	190	107	IN V	0.50 0 E to 0.4	90	N N	0.55
33	Jeypore	Corumvaka	3/0	71	120%	80	Corumeka lawpara athar akt	4	3	Ť N	0.0 10 0.0	2 110	ř N	0.5 10 0.6
		Gazuwaka	5/0	71	100%	330	Gazuwaka-Jeypore other ckt	71	E7	IN NI	0.33	24	N	0.35
24	Indravati	Dopgoli	5/0	254	120%	60 407		24	57	IN V	0.50 0 E to 0.4	30	N N	0.55
34	muravati	Rengan	5/0	300	120%	427	Religali-TSTPS D/C	24	19	Ť N	0.0 10 0.0	12	ř N	0.5 10 0.6
25	Indravati (a)	Indravati (0)	5/0	4	120%	4	lounoro Indrovati S/C	999	/99	IN N	0.35	500	IN N	0.35
30	inuravati (0)	Indravati	5/0	4	120%	4	Jeypore-Indravati S/C	/1	57	IN V	0.35	30	IN V	0.35
24	Dongoli	Indravati	5/0	350	120%	427	Indravati-Indravti (U) S/C	4	3	Ý	0.5 10 0.6	2	Ý	0.5 10 0.6
30	Religali	Keonjnar	5/0	100	120%	120		100	80	IN N	0.35	50	IN N	0.35
		ISIPS Device de	D/C	24	100%	30	TSTPS-Refigal D/C	24	19	IN N	0.35	12	IN N	0.35
37	Keonjhar	Baripada	5/0	156	120%	187	Baripada-Kharagpur S/C	98	/8	N	0.35	49	N N	0.35
	,	Rengali	5/0	100	120%	120	Rengali-TSTPS D/C	24	19	Ŷ	0.5 to 0.6	12	Ŷ	0.5 to 0.6
1		ivieramandali	5/0	51	120%	61	Ivieramandali-GIVIR S/C	8	6	Y	0.5 to 0.6	4	Y	0.5 to 0.6
38	TSTPS	Angul	5/0	68	120%	82	Angui-Iviermandali S/C	19	15	N	0.35	9	Y	0.5 to 0.6
1		Rengali	D/C	24	150%	36	Rengali-ISTPS D/C	24	19	N	0.35	12	N	0.35
<u> </u>	l	Rourkela	D/C	1/1	150%	257	Rourkeia-Chaibasa D/C	131	105	N	0.35	66	Y	0.5 to 0.6
1		TSTPS	D/C	171	150%	257	ISTPS-Rengali D/C	24	19	Y	0.5 to 0.6	12	Y	0.5 to 0.6
		Jharsuguda	D/C	145	150%	218	Jharsuguda-Rourkela S/C	63	50	Y	0.5 to 0.6	31	Y	0.5 to 0.6

		SEL	S/C	135	120%	162	SEL-Rourkela S/C	135	108	Ν	0.35	68	Ν	0.35
39	Rourkela	Chaibasa	S/C	131	120%	158	Chaibasa-Jamsedpur S/C	46	37	Ν	0.35	23	Y	0.5 to 0.6
		Jamsedpur	S/C	182	120%	218	Jamsedpur - Adhunilk D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
		Ranchi	D/C	144	150%	217	Ranchi-N.Ranchi D/C	79	63	Y	0.5 to 0.6	39	Y	0.5 to 0.6
		Raigarh	S/C	139	120%	167	Raigarh-Raigarg Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
		Rourkela	D/C	145	150%	218	Rourkela-Chaibasa D/C	131	105	Ν	0.35	66	Y	0.5 to 0.6
40	Jharsuguda	Raigarh	S/C	115	120%	137	Raigarh-Raigarh Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
	J	IBEUL	S/C	63	120%	75	IBEUL-Raigrah S/C	63	50	N	0.35	31	N	0.35
		Jharsuguda	S/C	63	120%	75	Jharsuguda-Raigarh S/C	115	92	Ν	0.35	58	N	0.35
41	IBEUL	Raigarh	S/C	91	120%	109	Raigarh-Raigarg Polling D/C	6	5	Y	0.5 to 0.6	3	Y	0.5 to 0.6
		Raigarh	S/C	147	120%	176	Raigarh-Raigarg Polling D/C	6	5	Ŷ	0.5 to 0.6	3	Ŷ	0.5 to 0.6
42	SEL	Rourkela	S/C	135	120%	162	Rourkela-Chaibasa S/C	131	105	N	0.35	66	N	0.35
		Kolaghat TPS	S/C	240	120%	288	Kolaghat-Arambagh S/C	64	51	N	0.35	32	Ŷ	0.5 to 0.6
		Kharagpur	S/C	161	120%	193	Kharagpur-Baripada S/C	98	78	N	0.35	49	N	0.35
43	Chaibasa	Rourkela	S/C	131	120%	158	Rourkela-Chaibasa S/C	131	105	N	0.35	66	N	0.35
		lamsedpur	S/C	46	120%	55	lamsedpur - Adhunilk D/C	1	0	Ŷ	0.5 to 0.6	0	Y	0.5 to 0.6
		Durgapur	S/C	177	120%	212	Durgapur-Bidhannagar D/C	. 11	9	Ŷ	0.5 to 0.6	6	Ŷ	0.5 to 0.6
		Baripada	S/C	108	120%	130	Baripada-Kharagpur S/C	98	78	N	0.35	49	N	0.35
		Rourkela	5/C	182	120%	218	Rourkela-Chaibasa D/C	131	105	N	0.00	66	N	0.35
		Chaihasa	5/C	46	120%	55	Chaibasa-Jamsedpur S/C	46	37	N	0.35	23	N	0.35
44	lamsednur	Meija B	S/C	168	120%	201	Meija B- Maithon D/C	59	47	N	0.35	30	Y	0.5 to 0.6
	Jamscupu	Maithon	5/C	153	120%	18/	Maithon-MPL D/C	37	25	V	0.55 0.5 to 0.6	16	v	0.5 to 0.6
			5/C	157	120%	235		60	55	V	0.5 to 0.6	35	v	0.5 to 0.6
		TISCO	5/0	33	120%	20	TISCO-Barinada S/C	33	26	N	0.3 10 0.0	16	N	0.3 10 0.0
		Adbunik	5/C	1	120%	37	lamsodpur, Adbunilk D/C	1	20	V	0.55 0.5 to 0.6	0	V	0.55
		lamsodpur	5/0	160	120%	201	Jamsedpur Adhunik D/C	1	0	V I	0.5 to 0.6	0	v v	0.5 to 0.6
45	Moiia B	Maithon	3/C S/C	84	120%	100	Maithon-MPL D/C	32	25	N	0.3 10 0.0	16	V V	0.5 to 0.6
45	IVIEJIA D	Maithon	5/0	50 50	120%	00	Maithon MPL D/C	32	25	N V	0.55 0 E to 0 6	10	I V	0.5 to 0.6
	-	Covo		274	150%	09		3Z 117	23	T V	0.5 to 0.6	F0	T V	0.5 to 0.6
		Kabalgaon		172	150%	259	Khalgaon BankaD/C	/10	20	T V	0.5 to 0.6		T V	0.5 to 0.6
		Narraopur	D/C	71	150%	200	Nildiydoll-BalikaD/C	40	30	T V	0.5 to 0.6	24	T V	0.5 to 0.6
		Duiyapui	D/C	152	100%	100	Durgapur-Biuriarinagai D/C	1	9	ř V	0.5 to 0.6	0	ř V	0.5 to 0.6
16	Maithon	Jamseupui Maiia B	5/0	153	120%	184	Jamseupul - Autumik D/C	Г Е0	0	Ť NI	0.5 10 0.6	0	ř Ni	0.5 10 0.6
40	Watthon	Iviejia B	3/0	64 E0	120%	100	Maiia B. Maithan D/C	59	47	IN N	0.35	30	IN N	0.35
			D/C	29	150%	69		29	47	IN N	0.35	30	IN N	0.35
		IVIPL	D/C	32	100%	47	IVIPL-IVIAILIIUII D/C	32	20	IN N	0.35	10	IN N	0.35
		Ragnunatpur	5/0	200	120%	00	Ragnunatinpur-Maithon S/C	55	44	N N	0.35	27	N	0.35
		Rancin	3/0	200	120%	240	Ranchi-N.Ranchi D/C	19	03	IN N	0.35	39	ř N	0.5 10 0.6
47	MPL	Danahi	D/C	32	150%	47		32	20	IN V	0.35	10	N N	0.35
		Ranchi	D/C	168	150%	281	Ranchi-N.Ranchi D/C	19	63	Ý V	0.5 l0 0.6	39	Y Y	0.5 10 0.6
48	DSTPS	Jamsedpur	D/C	157	150%	235	Jamsedpur - Adnunlik D/C		0	Ý	0.5 10 0.6	0	Y Y	0.5 10 0.6
		Raynunatpur	D/C	09	100%	104		22	44	IN N	0.35	2/	Ť NI	0.5 10 0.6
40	Doghupothpur		5/0	55	120%	00		32	25	N N	0.35	10	IN N	0.35
49	каупинаттри	DSIP5	D/C	09	120%	104	DSTPS-Jamsedpur D/C	69 70	55	N N	0.35	35	IN N	0.35
		Ranchi	5/0	100	120%	199	Ranchi-N.Ranchi D/C	19	03	IN N	0.35	39	N N	0.35
		ROUFKEIA	D/C	144	150%	217	KOUFKEIA-UNAIDASA D/C	131	105	N N	U.35	60	Y	0.5 to 0.6
		Iviaithon	5/0	200	120%	240		32	25	Y	0.5 to 0.6	16	Ŷ	0.5 to 0.6
50	Dorahi	IVIPL Dearbuiltettet	D/U	188	100%	281		32	25	Y	0.5 (0 0.6	10	Y	0.0 0.0 0.0
50	Ranchi	Ragnunatpur	5/0	166	120%	199	Ragnunatnpur-Maithon S/C	55	44	IN N	0.35	21	Y	U.5 to U.6
		N. Ranchi	D/C	79	150%	118	N. Ranchi-Chandwa D/C	68	54	N N	0.35	34	Y	0.5 to 0.6
		N. Ranchi	D/C	/9	150%	118	N. Ranchi-Chandwa D/C	68	54	N N	0.35	34	Y	0.5 t0 0.6
	+	Sipat	D/C	405	150%	608	Sipat-Korba S/C	100	80	Y	0.5 to 0.6	50	Y	0.5 to 0.6
1		Ranchi	D/C	/9	150%	118	Ranchi-N.Ranchi D/C	/9	63	N	0.35	39	Ŷ	0.5 to 0.6

51	N. Ranchi	Ranchi	D/C	79	150%	118	Ranchi-N.Ranchi D/C	79	63	Ν	0.35	39	Ν	0.35
	1	Chandwa	D/C	68	150%	102	Chandwa-N.Ranchi D/C	68	54	Ν	0.35	34	Ν	0.35
F.2	Chandwa	Gaya	D/C	117	150%	176	Gaya-Chandwa D/C	117	94	Ν	0.35	59	Ν	0.35
52	Chanuwa	N. Ranchi	D/C	68	150%	102	N. Ranchi-Chandwa D/C	68	54	Ν	0.35	34	Ν	0.35
		Gaya	D/C	125	150%	188	Gaya-Chandwa D/C	117	94	Ν	0.35	59	Y	0.5 to 0.6
53	Koderma	Biharsariff	D/C	111	150%	166	Biharsaiff-Lakhisarai D/C	89	71	Ν	0.35	45	Y	0.5 to 0.6
	1	Bokaro	D/C	100	150%	150	Koderma-Bokaro D/C	100	80	Ν	0.35	50	Ν	0.35
54	Bokaro	Koderma	D/C	100	150%	150	Koderma-Bokaro D/C	100	80	Ν	0.35	50	Ν	0.35
55	Dangno	Binaguri	D/C	110	150%	165	Binaguri-Kishanhanj D/C	98	78	Ν	0.35	49	Y	0.5 to 0.6
55	кануро	Teesta V	D/C	12	150%	18	Rangpo-Teesta D/C	12	10	Ν	0.35	6	Ν	0.35
54	TISCO	Baripada	S/C	140	120%	168	Baripada-Kharagpur S/C	98	78	Ν	0.35	49	Ν	0.35
50	11300	Jamsedpur	S/C	33	120%	39	Jamsedpur - Adhunilk D/C	1	0	Y	0.5 to 0.6	0	Y	0.5 to 0.6
57	Teesta V	Rangpo	D/C	12	150%	18	Rangpo-Teesta D/C	12	10	Ν	0.35	6	Ν	0.35
58	GMR	Angul	D/C	31	150%	47	Angul-Meramandali S/C	19	15	Y	0.5 to 0.6	10	Y	0.5 to 0.6
59	GMR(0)	Meramandali	S/C	8	120%	10	Meramandali-Angul S/C	19	15	Ν	0.35	10	Ν	0.35
60	JITPL	Angul	D/C	80	150%	120	Angul-Meramandali S/C	19	15	Y	0.5 to 0.6	10	Y	0.5 to 0.6

Annexure-D9.3

NAME OF LINE IOUR ACCEPT IOUR ACCEPT <thiour accept<="" th=""> <thiour accept<="" th=""></thiour></thiour>				OVER	/OLTAGE % SETTI				
subability NAME OF LINE Image of equipation	Name of the		L	OCAL END(STAGE-I)	REMOTE E	ND(STAGE-I)			
bits bits <td>substation</td> <td>NAME OF LINE</td> <td>VOLTAGE GARDIENT(% setting)</td> <td>TIME DELAY(sec)</td> <td>Drop Off to Pickup ratio</td> <td>VOLTAGE GARDIENT(% setting)</td> <td>TIME DELAY(sec)</td> <td>Drop Off to Pickup ratio</td> <td>REMARK</td>	substation	NAME OF LINE	VOLTAGE GARDIENT(% setting)	TIME DELAY(sec)	Drop Off to Pickup ratio	VOLTAGE GARDIENT(% setting)	TIME DELAY(sec)	Drop Off to Pickup ratio	REMARK
NumberNumbe		400KV BINAGURI-RANGPO-I	110	5		112	7		
		400KV BINAGURI-RANGPO-II	112	5		112	7		
AddyAd		400KV BINAGURI-TALA-I	110	5		105	5		
Bark Bund Link Aux		400KV BINAGURI-TALA-II	112	5		105	5		
Barry Bing in Gold Wink Quin Function 112 5 110 5 110 5 GOLD WINK QUIN FUNR K-1 110 5 110 5 110 5 GOLD WINK QUIN FUNR K-1 110 5 110 5 110 5 GOLD WINK QUIN FUNR K-1 110 5 110 7 Med to buy dated after UD at Kshangan GOLD WINK QUIN FUNR K-1 110 5 110 7 Med to buy dated after UD at Kshangan GOLD WINK QUIN FUNR K-1 110 5 10 Med to buy dated after UD at Kshangan GOLD WINK QUIN FUNR K-1 110 6 1 1 Med to the standard to the standa		400KV BINAGURI-MALABASE-III	110	5		105	5		
Binguil Cont Visuaduli-Punka-1 Tito S III2 S		400KV BINAGURI-TALA-IV	112	5		105	5		
Conception Conception <thconceptin< th=""> Conceptin Conceptin<</thconceptin<>	Binaguri	400 KV BINAGURI-PURNEA- I	110	5		112	5		
BOX PNAQUE:RISMAQNAI-I 110 12 5 12 5 Networksite GOX PNAQUE:RISMAQNAI-I 110 100 5 0 100 7 GOX PNAQUE:RISMAQNAI-I 1100 66		400 KV BINAGURI-PURNEA- II	112	5		110	5		
BOD VF BINACURSCHINACURAL-II11251107Tene to the optime and cold an sciency of an optime and cold an and cold an and cold an and cold and		400 KV BINAGURI-KISHANGANJ- I	110	5		112	5		Need to be undated after LILO at Kishangani
Image:		400 KV BINAGURI-KISHANGANJ- II	112	5		110	7		Need to be updated after LIEO at Kishanganj
dotyIndexI		400KV BINAGURI-BONGAIGAON-I	110	5					
doty BinAcuR-BONAGACM-III1105OWERLIGONDistributionDistributiondoty BinAcuR-BONAGACM-IV11066666add X KISHANGAN-JENNEA-I-66666doty KISHANGAN-JENNEA-I-66666doty KISHANGAN-JENNEA-I-66666doty KISHANGAN-JENNEAU-66666doty KISHANGAN-JENNEAU-66666doty KISHANGAN-JENNEAU1127610766doty KISHANGAN-JENNEAU11276112566doty KISHANGAN-JENNEAU1127110566 <td></td> <td>400KV BINAGURI-BONGAIGAON-II</td> <td>110</td> <td>6</td> <td></td> <td>ОТНЕР</td> <td>PECION</td> <td></td> <td>May be submitted by EP. II. Dowerarid</td>		400KV BINAGURI-BONGAIGAON-II	110	6		ОТНЕР	PECION		May be submitted by EP. II. Dowerarid
doty:doty:doty:mainmainmainmainmainmainAddy:Moty:<		400KV BINAGURI-BONGAIGAON-III	110	5		UTILI	REGION		May be submitted by EK - II, Powergild
ADD KY MSHANGANLPURNEA-IIImage: Constraint of the sector of t		400KV BINAGURI-BONGAIGAON-IV	110	6					
History Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal Normal 		400 KV KISHANGANJ-PURNEA-I							
Kishangal BOV KISHANGAN-BINAGUR-HImage: book with the second of the sec		400 KV KISHANGANJ-PURNEA-II							
KinkingKinkingKinkingKinkingKinkingKinkingKinkingKinkingKov KishangAni-Pathali <td< td=""><td>Kishangani</td><td>400 KV KISHANGANJ-BINAGURI-I</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Kishangani	400 KV KISHANGANJ-BINAGURI-I							
Bork KISHANGAN-PATNA-IIImage: bork KISHANGAN-PATNA-IIImage: bork KISHANGAN-PATNA-IIImage: bork KISHANGAN-PATNA-II600K KISHANGAN-PATNA-II11271107Image: bork KISHANGAN-PATNA-II600K KISHANGAN-PATNA-II11271105Image: bork KISHANGAN-PATNA-II600K KISHANGAN-PATNA-II11271105Image: bork KISHANGAN-PATNA-II600K KANGPO-BINAGUR-II11271105Image: bork KISHANGAN-PATNA-II400K VTA-ABINAGUR-II10551105Image: bork KISHANGAN-PATNA-II400K VTA-ABINAGUR-II10551105Image: bork KISHANGAN-PATNA-II400K VTA-ABINAGUR-II10551105Image: bork KISHANGAN-PATNA-II400K VTA-ABINAGUR-II10551127Image: bork KISHANGAN-II400K VTA-ABINAGUR-II11071127Image: bork KISHANGAN-II400K VTA-ABINAGUR-II11071105Image: bork KISHANGAN-II400K VPURNEA - MALDA - II11071105Image: bork KISHANGAN-II400K VPURNEA - MALDA - II11071107Image: bork KISHANGAN-II400K VPURNEA - MALDA - II11071107	Kishanyanj	400 KV KISHANGANJ-BINAGURI-II							
Book V KishakGAN-PATNAHImage: Constraint of the second		400 KV KISHANGANJ-PATNA-I							
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Hair Alage Horky TALA-BINAGURI-I 105 5 110 5 Hair Alage Hair Alag		400KV RANGPO-BINAGURI-II	112	7		112	5		
Tala 400KV TALA-BINAGURI-II 105 5 112 5 400KV TALA-BINAGURI-IV 105 5 112 5 112 5 400KV TELSTA-RANGPO-I 110 7 112 7 112 5 400KV TEESTA-RANGPO-I 110 7 112 7 112 5 400KV TEESTA-RANGPO-I 110 7 112 7 112 112 7 112		400KV TALA-BINAGURI-I	105	5		110	5		
India 400KV TALA-MALABASE-III 105 5 110 5 400KV TALA-MINAGURI-IV 105 5 112 5 112 5 Testa 400KV TEESTA-RANOPO-I 110 7 112 7 112 5 112 7 112 7 112 7 112 7 112 7 112 110 5 110 <	Tala	400KV TALA-BINAGURI-II	105	5		112	5		
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Ieesta 400KV TEESTA-RANGPO-II 112 5 112 7 Image: Constraint of the second	. .	400KV TEESTA-RANGPO-I	110	7		112	7		
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PURNA 400 KV PURNEA- BINAGURI - I 112 5 110 5 112 5 400 KV PURNEA- BINAGURI - II 110 5 112 5 110 5 110 5 110 5 110		400 KV PURNEA - MALDA - II	112	5		110	6		
PURNEA 400 KV PURNEA- BINAGURI - II 110 5 112 5 Meed to be updated after LILO at Kishanganj 400 KV PURNEA- KISHANGANJ - II 112 5 110 5 Need to be updated after LILO at Kishanganj 400 KV PURNEA- KISHANGANJ - II 112 5 110 5 Need to be updated after LILO at Kishanganj 400 KV PURNEA- KISHANGANJ - II 110 7 110 7 400 KV PURNEA- MUZAFFARPUR-I 110 7 110 7 400 KV PURNEA-BIHARSHARIFF-II 110 5 110 5 400 KV PURNEA-BIHARSHARIFF-II 110 5 110 5 400 KV PURNEA-BIHARSHARIFF-II 110 5 110 7 400 KV MALDA - PURNEA - I 110 6 112 5 MALDA 400 KV MALDA - FARAKKA - II 110 6 110 5 400 KV STSPP-MALDA-I 110 6 110		400 KV PURNEA- BINAGURI - I	112	5		110	5		
PURNEA 400 KV PURNEA- KISHANGANJ - I 112 5 110 5 Need to be updated after LILO at Kishanganj 400 KV PURNEA- KISHANGANJ - II 112 5 112 5 Need to be updated after LILO at Kishanganj 400 KV PURNEA-MUZAFFARPUR-I 110 7 110 7 400 KV PURNEA-MUZAFFARPUR-II 110 7 110 7 400 KV PURNEA-MUZAFFARPUR-II 110 5 110 7 400 KV PURNEA-BIHARSHARIFF-I 110 5 110 5 400 KV PURNEA-BIHARSHARIFF-II 110 7 110 7		400 KV PURNEA- BINAGURI - II	110	5		112	5		
PURNEA 400 KV PURNEA- KISHANGANI - II 112 5 112 5 Need to be updated after LILO at Kishanganj 400 KV PURNEA-MUZAFFARPUR-I 110 7 110 7 110 7 400 KV PURNEA-MUZAFFARPUR-II 110 7 110 7 110 7 400 KV PURNEA-BIHARSHARIFF-I 110 5 110 5 110 5 400 KV PURNEA-BIHARSHARIFF-II 110 5 110 7 110 7 400 KV PURNEA-BIHARSHARIFF-II 110 5 110 7 110 7 110 10 10 10 10 10 10 10 110		400 KV PURNEA- KISHANGANJ - I	112	5		110	5		
400 KV PURNEA-MUZAFFARPUR-I 110 7 110 7 110 7 400 KV PURNEA-MUZAFFARPUR-II 112 7 112 7 112 7 110 5 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110	PURNEA	400 KV PURNEA- KISHANGANJ - II	112	5		112	5		Need to be updated after LILO at Kishanganj
400 KV PURNEA-MUZAFFARPUR-II 112 7 112 7 112 7 400 KV PURNEA-BIHARSHARIFF-I 110 5 110 5 110 5 400 KV PURNEA-BIHARSHARIFF-II 110 7 110 7 110 7 400 KV PURNEA-BIHARSHARIFF-II 110 7 110 7 110 7 400 KV MALDA - PURNEA - I 110 5 110 7 110 7 400 KV MALDA - PURNEA - II 110 6 112 5 10 7 400 KV MALDA - FARAKKA - I 110 6 110 5 10 5 10 400 KV MALDA - FARAKKA - II 110 6 110 5 10 5 10 400 KV FSTPP-MALDA-I 110 5 110 5 10 5 10		400 KV PURNEA-MUZAFFARPUR-I	110	7		110	7		
400 KV PURNEA-BIHARSHARIFF-I 110 5 110 5 110 400 KV PURNEA-BIHARSHARIFF-II 110 7 110 7 110 7 400 KV PURNEA-BIHARSHARIFF-II 110 7 110 7 110 7 400 KV MALDA - PURNEA - I 110 5 110 7 110 7 400 KV MALDA - PURNEA - II 110 6 112 5 110 7 400 KV MALDA - FARAKKA - I 110 6 110 5 110 5 110 5 400 KV MALDA - FARAKKA - II 110 6 110 5 110 5 110 5 110 110 110 110 5 110 5 110		400 KV PURNEA-MUZAFFARPUR-II	112	7		112	7		
400 KV PURNEA-BIHARSHARIFF-II 110 7 110 7 110 7 MALDA 400 KV MALDA - PURNEA - I 110 5 110 7 110 110 110 110 110 <td></td> <td>400 KV PURNEA-BIHARSHARIFF-I</td> <td>110</td> <td>5</td> <td></td> <td>110</td> <td>5</td> <td></td> <td></td>		400 KV PURNEA-BIHARSHARIFF-I	110	5		110	5		
MALDA 400 KV MALDA - PURNEA - I 110 5 110 7 100 400 KV MALDA - PURNEA - II 110 6 112 5 5 100		400 KV PURNEA-BIHARSHARIFF-II	110	7		110	7		
MALDA 400 KV MALDA - PURNEA - II 110 6 112 5 400 KV MALDA - FARAKKA - I 110 5 110 5		400 KV MALDA - PURNEA - I	110	5		110	7	İ	
MALDA 400 KV MALDA - FARAKKA - I 110 5 110 5 400 KV MALDA - FARAKKA - II 110 6 110 5 <td></td> <td>400 KV MALDA - PURNEA - II</td> <td>110</td> <td>6</td> <td></td> <td>112</td> <td>5</td> <td></td> <td></td>		400 KV MALDA - PURNEA - II	110	6		112	5		
400 KV MALDA - FARAKKA - II 110 6 110 5 400 KV FSTPP-MALDA-I 110 5 110 5 <	MALDA	400 KV MALDA - FARAKKA - I	110	5		110	5		
400 kV FSTPP-MALDA-I 110 5 110 5 400 kV FSTPP-MALDA-II 110 5 110 6 400 kV FSTPP-MALDA-II 110 5 110 6		400 KV MALDA - FARAKKA - II	110	6		110	5		
400 KV FSTPP-MALDA-II 110 5 110 6 400 KV FSTPP-DUIRGABUR-I 112 7 110 5		400 KV FSTPP-MAI DA-I	110	5	1	110	5		
			110	5	ł	110	6		
			112	7		110	5		

	400 KV FSTPP-DURGAPUR-II	110	5		112	5	
	400 KV FSTPP-KhSTPP-I	110	5		110	5	
FARAKKA	400 KV ESTPP-KhSTPP-II	112	5		112	5	
		110	7		110	7	
		110	7		110	7	
		112	10		112	6	
		110	12		110	0	
	400 KV FSTPP-SAGARDIGHI	112	/		140	0.1	
	400 KV BEHRAMPUR-BHERAMARA -I	110	5		110	4	
	400 KV BEHRAMPUR-BHERAMARA -II	110	10		110	5	
Behrampur	400 KV BEHRAMPUR - FARAKKA	110	6		110	12	
	400KV BERHAMPORE-SAGARDIGHI-I	110	5		110	5	
	400KV BERHAMPORE-SAGARDIGHI-II	110	6		110	7	
	400 KV BEHRAMPUR - JEERAT	110	7		110	7	
	400KV JEERAT-SUBHASHGRAM	112	5		112	5	
laanat	400 KV JERAT - BERHAMPUR	110	7		110	7	
Jeerat	400 KV Jeerat-Bakreswar	110	5		110	5	
	400 KV Jeerat-Kolaghat		NOT INST	ALLED AT BOTH	ENDS		Present status may be updated
	400 KV SUBHASHSHGRAM-SAGARDIGHI	112	5		112	5	
	400KV SUBHASHGRAM-HALDIA-I	110	5		110	3	
Subhashgram	400KV SUBHASHGRAM-HALDIA-II	110	6		110	5	
	400 KV SUBHASHGRAM-JEERAT	112	5		112	5	
	400KV HALDIA-SUBHASHGARM-I	110	3		110	5	
HALDIA	400KV HALDIA-SUBHASHGRAM-II	110	5		110	6	
	400 KV SAGARDIGHI - FARAKKA	140	0.1		112	7	
	400 KV SAGARDIGHI - DURGAPUR-I	110	5		110	5	
	400 KV SAGARDIGHI - DURGAPUR-II	110	6		110	6	
SAGARDIGHI		110	5		110	5	
		110	7		110	6	
		110	5		110	5	
		112	5		112	5	
		110	5		110	5	
		110	6		110	0	
	400 KV DURGAPUR-FSTPP-I	110	5		112	/	
	400 KV DURGAPUR-FSTPP-II	112	5		110	5	
Durgapur	400 KV DURGAPUR-MAITHON-I	110	5		110	5	
	400 KV DURGAPUR-MAITHON-II	110	6		110	6	
	400 KV DURGAPUR-JAMSHEDPUR	110	5		112	5	
	400 KV DURGAPUR - BIDHANNAGAR-I	110	5		110	5	
	400 KV DURGAPUR - BIDHANNAGAR-II	110	5		110	5	
	400 KV BIDHANNAGAR-PPSP-I	110	5		110	5	
	400 KV BIDHANNAGAR-PPSP-II	110	5		110	5	
BIDHANNAGAR	400 KV BIDHANNAGAR - DURGAPUR-I	110	5		110	5	
	400 KV BIDHANNAGAR - DURGAPUR-II	110	5		110	5	
	400 KV BIDHANNAGAR-ARAMBAG	110	5		110	5	
	400 KV PPSP-BIDHAN NAGAR-I	110	5		110	5	
DD2D	400 KV PPSP-BIDHAN NAGAR-II	110	5		110	5	
11.51	400 KV PPSP-ARAMBAG-I	110	5		110	5	
	400 KV PPSP-ARAMBAG-II	110	5		110	5	
	400 KVARAMBAG-PPSP-I	110	5		110	5	
	400 KV ARAMBAG-PPSP-II	110	5		110	5	
Arambag	400 KV ARAMBAG -KOLAGHAT	110	5		NOT INSTALLED A	AT KOLAGHAT END	Present status may be updated
	400 KV ARAMBAG-BAKRESWAR	110	5		110	5	
	400 KV ARAMBAG-BIDHANNAGAR	110	5		110	5	
BAKRESWAR	400 KV BAKRESWAR-JEERAT	110	5		110	5	
	400 KV BAKRESWAR-ARAMBAG	110	5		110	5	

	400 KV KOLAGHAT-JEERAT		NOT INST	FALLED AT BOTH I	Present status may be updated		
	400 KV KOLAGHAT-ARAMBAG	NOT INSTALLED T	A KOLAGHAT END		110	5	Present status may be updated
KULAGHAT	400 KV KOLAGHAT-KHARAGPUR-I	110	5		110	5	
	401 KV KOLAGHAT-CHAIBASA-I	110	5		110	5	Need to be updated after Chaibasa connectivity
	400 KV KHARAGPUR-KOLAGHAT-I	110	5		110	5	
KHARAGPUR	400 KV KHARAGPUR-CHAIBASA-I	110	5		110	5	Need to be updated after Chaibasa connectivity
	400KV KHARAGPUR-BARIPADA	110	5		112	7	······
		110	3		112	5	
		110	5		110	J 4	
		112	5		110	4	Needs to be upgated after LILO at N. Duburi
BARIPADA		112	6	-	110	5	Needs to be updated after LILO at N. Dubuli
		112	0		110	5	
		112	7		110	3	
	400 KV BARIPADA-JAMSHEDPUR	1112	5		110	4	
	400 KV JAMSHEDPUR-CHAIBASA - I	112	3		112	5	
	400 KV JAMSHEDPUR-CHAIBASA- II	110	7		110	6	
	400 KV JAMSHEDPUR - MEJIA	112	5		117	2.5	
	400 KV JAMSHEDPUR - DSTPS(ANDAL)-I	110	5		117	2.5	
lone che celui un	400 KV JAMSHEDPUR - DSTPS(ANDAL)-II	112	5		117	2.5	
Jamsneupur	400K V JAMSHEDPUK - APNKL-I	110	5		115	5	
	400KV JAMSHEDPUR - AFINKL-II	110	5		110	5 F	
	400 KV JAMSHEDDUR TISCO	112	7		110	3	
	400 KV JAMSHEDPUR - LISCO	112	1		112	/	
	400 KV JAMSHEDPUR-MATHON	110	3		110	5	
	400 KV JAMSHEDPUR-BARIPADA	110	4		111	5	
	400KV CHAIBASA-JAMSHEDPUR-I	112	5		112	5	
	400KV CHAIBASA-JAMSHEDPUR-II	110	6		110	7	
CHAIRASA	400KV CHAIBASA-KHARAGPUR-II						Need to be updated after Chaibasa connectivity
CIADASA	400KV CHAIBASA-KOLAGHAT-II						Need to be updated after Chaibasa connectivity
	400KV CHAIBASA-ROURKELA-I	112	7		110	5	
	400KV CHAIBASA-ROURKELA-II				110	6	
ADNIDI	400 KV APNRL-JAMSHEDPUR-I	115	5		110	5	
APNRL	400 KV APNRL-JAMSHEDPUR -II	115	5		110	5	
TINGO	400 KV TISCO-JAMSHEDPUR	112	7		112	7	
lisco	400 KV TISCO-BIRPADA	110	4		111	5	
	400 KV MAITHON-RANCHI	112	5		112	5	
	400 KV MAITHON-KAHALGAON-I	110	5		112	5	
	400 KV MAITHON-KAHALGAON-II	110	6		110	5	
	400 KV MAITHON -MAITHON RB-I	110	5		110	7	
	400 KV MAITHON -MAITHON RB-II	112	5		112	7	
	400 KV MAITHON -GAYA - I	110	5		110	5	
N de lale e u	400 KV MAITHON -GAYA-II	110	6		110	5	
Iviaithon	400 KV MAITHON-JAMSHEDPUR	110	5		110	5	
	400 KV MAITHON -MEJIA- I	110	5		117	2.5	
	400 KV MAITHON -MEJIA- II	112	5		117	2.5	
	401 KV MAITHON -MEJIA- III	110	5		117	2.5	
	400 KV MAITHON - DURGAPURR - I	110	5		110	5	
	400 KV MAITHON - DURGAPURR - II	110	6		110	6	
	400 KV MAITHON -RAGHUNATHPUR	112	6		113	5	
	400 KV RANCHI-MAITHON	112	5		112	5	
	400 KV RANCHI-NEW RANCHI-I	110	5		110	5	
	400 KV RANCHI-NEW RANCHI-II	110	5		110	5	
	400 KV RANCHI-NEW RANCHI-III	110	5		110	5	
	400 KV RANCHI-NEW RANCHI-IV	110	5		110	5	
Danahi	400 KV RANCHI-RAGHUNATHPUR	110	5		113	5	
Ranchi	400 KV RANCHI-MAITHON RB-I	112	7		112	7	
	400 KV RANCHI-MAITHON RB-II	110	7		110	7	

	400 KV RANCHI - SIPAT - I	110	7		OTUED	DECION		Markey hadded by FD, J, Darward J
	400 KV RANCHI - SIPAT - II	112	5		OTHER	REGION		iviay be submitted by ER - I, Powergrid
	400 KV RANCHI-ROURKELA- I	110	5		110	5		
	400 KV RANCHI-ROURKELA - II	112	7		110	6		1
-	400 KV NEW RANCHL RANCHLI	110	5		110	5		
	400 KV NEW PANCHI PANCHI II	110	5		110	5		
	400 KV NEW RANCHI-RANCHI-II	110	5		110	5		
	400 K V NEW RANCHI- RANCHI-III	110	5		110	5		
765/400 KV NEVV	400 KV NEW RANCHI- RANCHI-IV	110	5		110	5		
KANUTI 3/3	400 KV NEW RANCHI- CHANDWA-I							
	400 KV NEW RANCHI- CHANDWA-II							
	765 KV KV NEW RANCHI-DHARMJAYGARH-I	107	5		OTHER	REGION		May be submitted by ER - I. Powergrid
	765 KV KV NEW RANCHI-DHARMJAYGARH-II							
	400 KV CHANDWA-N.RANCHI-I							
CHANDWA	400 KV CHANDWA-N.RANCHI-II							
01.0.101111	400 KV CHANDWA-GAYA-I							
	400 KV CHANDWA-GAYA-II							
	400 KV MAITHON RB-RANCHI-I	112	7		112	7		
MAITHON RIGHT	400 KV MAITHON RB-RANCHI-II	110	7		110	7		
BANK	400 KV MAITHON RB-MAITHON-I	110	7		110	5		
	400 KV MAITHON RB-MAITHON-II	112	7		112	5		
	400 KV DSTPS-JAMSHEDPUR-I	117	2.5		110	5		
DCTDC	400 KV DSTPS-JAMSHEDPUR-II	117	2.5		112	5		
DSIPS	400 KV DSTPS-RAGHUNATHPUR-I	117	2.5		113	5		
	400 KV DSTPS-RAGHUNATHPUR-II	117	2.5		113	5		
	400 KV KODERMA-GAYA-I	113	5		110	5		
	400 KV KODERMA-GAYA-II	113	5		110	5		
	400 KV KODERMA-BIHARSHARIFE-I	113	5		110	7		
KODERMA	400 KV KODERMA-BIHARSHARIFE-II	113	5		112	5		
	400 KV KODERMA BOKADO A I	113	5		110	5		
	400KV KODERMA BOKARO-A-I	113	5		110	6		
	400KV RODERMA-BOKARO-A-II	110			110	0	-	
BOKARO-A	400KV BOKARO-A-KODERMA-I	110	6		113	5		
	400 KV MEHA MAITHON J	110	0		113	5		
	400 KV MEJIA-MAITHON J	117	2.0		110	5 F		
Mejia	400 KV MEHA MAITHON III	117	2.0		112	5 F		
	400 KV MEJIA-MATHON -III	117	2.0		110	5 F		
		117	Z.0 E		112	5		
		113	5 F		112	0 F	-	
RAGHUNATHPUR		113	э Г		110			
		113	5		117	2.0		
		110	5		117	2.5		Needs to be undeted after LILO at Dendiabilli
MENIDUAGAI		110	5		112	0		Needs to be updated after LILO at Particiabili
IVIEINDHASAL	400 KV MENDHASAL-PANDIABILLI-II	110	5		112	6		Needs to be updated after LILO at Pandiabili
		110	5		110	5		
	400 KV PANDIABILLI-MENDASAL-I							
PANDIABILLI	400 KV PANDIABILLI-MENDASAL-II							
	400 KV PANDIABILLI-N.DUBURI							
	400 KV PANDIABILLI - BARIPADA							
	400 KV N.DUBURI-PANDIABILLI							
	400 KV N.DUBURI-BARIPADA							
N. DODONI	400 KV N.DUBURI-MERAMANDALI-I							
	400 KV N.DUBURI-MERAMANDALI-II							
	400 KV MEERAMUNDALI-TALCHER	110	5		110	5		
	400 KV MEERAMUNDALI-ANGUL-II	112	5		110	5		
	400 KV MEERAMUNDALI-JINDAL-I	110	5	1	110	5		
	400 KV MEERAMUNDALI-JINDAL-II	110	5		110	5		
	400 KV MEERAMUNDALI-ANGUL-I	112	5		110	5		

MEERAMUNDALI	400 KV MEERAMUNDALI-MENDHASAL	110	5		110	5	
	400KV MERAMUNDALI-GMR	110	5		110	5	
	400 KV MERAMUNDALI-STERLITE -I						
	400 KV MERAMUNDALI-STERLITE -II						
	400 KV MERAMUNDALI-N DUBURI-I						
		110	F		110	E	
JINDAL		110	5		110	5	
	400 KV JINDAL-MEERAMONDALI-II	110	5		110	5	
	400 KV GMR-ANGUL-I	110	2		110	5	
GMR	400 KV GMR-ANGUL-II	110	2		110	6	
	400KV GMR-MERAMUNDALI	110	5		110	5	
	400 KV ANGUL-MEERAMUNDALI-I	110	5		112	5	
	400KV ANGUL-BOLANGIR	110	5		110	5	
	400KV ANGUL-TSTPP	110	5		110	5	
	400 KV ANGUL-MERAMUNDALI-II	110	5		112	5	
ANGUL	400 KV ANGUL-JITPL-II	110	5		110	5	
	400 KV ANGUL-JITPL-I	110	5		110	5	
	400KV ANGUL-GMR-I	110	5		110	2	
	400KV ANGUL-GMR-II	110	6		110	2	
	765KV Angul Jharsuguda II	110	4		110	4	
		110	5		110	4	
JITPL		110	5		110	5	
		110	5		110	J	
BOLANGIR		110	5		110	5	
		112	5		112	5	
		112	5		112	5	
Jeypore	400 KV JEYPORE-GAZUWAKA-I	110	5		110	9	
	400 KV JEYPORE-GAZUWAKA-II	110	10		110	10	
	400KV JEYPORE-INDRAVATI	112	5		110	5	
	400 KV INDRAVATI-JEYPORE	110	5		112	5	
INDRAVATI(PG)	400 KV INDRAVATI-INDRAVATI	115	5		115	5	
	400 KV INDRAVATI-RENGALI	113	5		110	5	
INDRAVATI(GR)	400 KV INDRAVTI(GR)-INDRAVATI(PG)	115	5		115	5	
	400 KV RENGALI-INDRAVATI(PG)	110	5		113	5	
Popgali	400 KV RENGALI-KEONJHAR	110	5		110	5	
Rengan	400 KV RENGALI-TALCHER-I	110	5		110	5	
	400 KV RENGALI-TALCHER-II	110	6		112	5	
KEONULIOD	400 KV KEONJHAR-RENGALI	110	5		110	5	
KEONJHOR	400 KV KEONJHAR-BIRPADA	110	3	1	110	5	
	400 KV Talcher-Rourkela-I	110	5	1	110	5	
	400 KV Talcher-Rourkela-II	112	5		110	6	
Talchor	400 KV Talcher-Rengali-I	110	5		110	5	
Taichei	400 KV Talcher-Rengali-II	112	5		110	6	
	400 KV Talcher-MERAMUNDALI	110	5		110	5	
	400 KV Talcher-ANGUL	110	5		110	5	
	400 KV ROURKELLA-JHARSHUGUDA-I	110	5		110	10	
	400 KV ROURKELLA-JHARSHUGUDA-II	110	6		110	6	
	400 KV ROURKELLA-RAIGARH	112	5		OTHER	REGION	May be submitted by Odisha Project, Powergrid
Rourkela	400 KV ROURKELLA-STERLITE-II	110	6		115	5	
	400 KV ROURKELA-TALCHER-I	110	5		110	5	
	400 KV ROURKELA-TALCHER-II	110	6		112	5	
	400 KV ROURKELA-CHAIBASA-I	110	5		112	7	
	400 KV ROURKELA-CHAIBASA-II	110	6				
	400 KV ROURKELA-RANCHI-I	110	5		110	5	
	400 KV ROURKELA-RANCHI-II	110	6		112	7	1
	400 KV STERLITE - ROURKELA - II	115	5		110	6	
CTEDUTE	400 KV STERLITE - RAIGARH - II	115	5	OTHER REGION			May be submitted by Odisha Project, Powergrid
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STERLITE	400 KV STERLITE-MERAMANDALI-I						
	400 KV STERLITE-MERAMANDALI-II						
Jharshuguda		110	10	110	5		
		110	6	110	6		
		110	10	110	5	1	
	765kV (barsuguda ANGUL L	110	10	110	3		
		110	4	110	4		
		110	4	110			
Jharsguda 765KV S/s	400 KV JHARSHUGUDA-RAIGARH -II	100	6 F				May be submitted by Odishe Project Dowergrid
	765kv Jharsuguda-Dharnjaygan-i	100	7	OTHER			May be submitted by Odisha Project, Powergrid
	s Toshiv Jharsuguda-Dharmjaygarn-II	108	/	UTHER	REGION		iviay be submitted by Odisha Project, Powerghd
	765kV Jharsuguda-Angul-I	110	4	110	4		
	765kV Jharsuguda-Angul-II	110	4	110	4		
IBEUL	400kV IBEUL-Raigarh	110	5	OTHER	REGION		May be submitted by Odisha Project, Powergrid
	400kV IBEUL-Jharsuguda	110	5	110	10		
	400 KV APNRL-JAMSHEDPUR-I	115	5	110	5		_
APNRL	400 KV APNRL-JAMSHEDPUR -II	115	5	110	5		
	400 KV BIHARSHARIFF-BANKA-I	112	7	112	7		
	400 KV BIHARSHARIFF-BANKA-II	110	6	110	6		
	400 KV BIHARSHARIFF - PUSAULI - I	110	5	110	5		
	400 KV BIHARSHARIFF - PUSAULI- II	112	5	112	5		
	400 KV BIHARSHARIFF - VARANASI- I	112	7	112	7		
	400 KV BIHARSHARIFF - VARANASI- II	110	7	110	7		
BIHARSHARIFF	400 KV BIHARSHARIFF - BALIA - I	110	5	OTHER REGION			May be submitted by ER-L Powergrid
	400 KV BIHARSHARIFF - BALIA - II	112	5				····_j=-····
	400 KV BIHARSHARIFF-KODERMA-I	112	7	113	5		
	400 KV BIHARSHARIFF-KODERMA-II	110	5	113	5		
	400 KV BIHARSHARIFF-PURNEA-I	110	5	110	5		
	400 KV BIHARSHARIFF-PURNEA-II	110	7	110	/		
	400 KV BIHARSHARIFF-LAKHISARAI-I	110	7	110	5		
	400 KV BIHARSHARIFF-LAKHISARAI-II	112	5	110	5		
	400 KV BIHARSHARIFF-MUZAFFARPUR-I	110	5	110	5	-	
	400 K V BIHARSHARIFF-MUZAFFARPUR-II	112	5	112	5		
	400 KV KhSTPP-BANKA -I	110	6	110	6		
	400 KV KhSTPP-BANKA - II	112	1	112	/		
Kahalgaon	400 KV KhSTPP - LAKHISARAI- I	110	7	110	7		
	400 KV KhSTPP - LAKHISARAI- II	112	5	112	5		
	400 KV KhSTPP-MAITHON -I	112	5	110	5		
	400 KV KhSTPP-MAITHON -II	110	5	110	6		
	400 KV KhSTPP-BARH - I	112	6	112	6		
	400 KV KhSTPP-BARH- II	112	6	112	6		
	400 KV KHSTPP-FSTPP-I	110	5	110	5		
	400 KV KHSTPP-FSTPP-II	112	5	112	5		
	400 KV KHSTPP-FSTPP-III	110	7	110	7		
	400 KV KHSTPP-FSTPP-IV	112	7	112	7		
Barh	400 KV BARH-KAHALGAON-I	112	6	112	6		
	400 KV BARH-KAHALGAON-II	112	6	112	6		
	400 KV BARH - PATNA-I	112	6	112	6		
	400 KV BARH - PATNA-II	112	7	112	7		
	400 KV BARH - PATNA-IIII	110	4	110	4		
	400 KV BARH - PATNA-IV	110	5	110	5	1	
	400 KV BARH - GORAKHPUR-I						
	400 KV BARH - GORAKHPUR-II						
	400 KV PATNA-BARH-I	112	6	112	6		
	400 KV PATNA-BARH-II	112	7	112	7	1	
	400 KV PATNA-BARH-III	110	4	110	4		

PATNA	400 KV PATNA-BARH-IV	110	5		110	5		
	400 KV PATNA-KISHANGANJ-I							
	400 KV PATNA-KISHANGANJ-II							
	400 KV PATNA - BALIA - I	110	4			·		
	400 KV PATNA - BALIA - II	110	5		OTHER REGION			May be submitted by ED L Dowergrid
	400 KV PATNA - BALIA - III	112	6					May be submitted by Ek-i, Powerghu
	400 KV PATNA- BALIA - IV	112	7					
Sasaram	765KV SASARAM-FATEHPUR	108	5		108	5		
	400 KV PUSAULI - VARANASI	112	5		OTHER REGION			May be submitted by ER-I, Powergrid
	400 KV PUSAULI - ALLAHABAD	112	7					
	400 KV PASAULI-BIHARSHARIFF-I	110	5		110	5		
	400 KV PASAULI-BIHARSHARIFF-II	112	5		112	5		
	400KV PUSAULI-NABINAGAR-I	110	5					
	400KV PUSAULI-NABINAGAR-II	110	6					
Gaya	400 KV GAYA-KODERMA-I	110	5		113	5		
	400KV GAYA-KODERMA-II	110	5		113	5		
	400KV GAYA-MAITHON-I	110	5		110	5		
	400KV GAYA-MAITHON-II	110	5		110	6		
	765 KV GAYA-VARANASI-I							
	765 KV GAYA-VARANASI-II							
	765 KV GAYA-BALIA	110	5		OTHER REGION			May be submitted by ER-I, Powergrid
BANKA	400 KV BANKA-BIHARSHARIFF-I	112	7		112	7		
	400 KV BANKA-BIHARSHARIFF-II	110	6		110	6		
	400 KV BANKA-KAHALGAON-I	110	6		110	6		
	400 KV BANKA-KAHALGAON-II	112	7		112	7		
Muzaffarpur	400 KV MUZAFFARPUR - NEW PURNEA - I	110	7		110	7		
	400 KV MUZAFFARPUR - NEW PURNEA - II	112	7		112	7		
	400 KV MUZAFFARPUR - GORAKHPUR - I	110	7		OTHER REGION			May be submitted by ER-I, Powergrid
	400 KV MUZAFFARPUR - GORAKHPUR - II	112	5					
	400 KV MUZAFFARPUR - BIHARSHARIFF - I	110	5		110	5		
	400 KV MUZAFFARPUR - BIHARSHARIFF - II	112	5		112	5		
LAKHISARAI	400 KV LAKHISARI-BIHARSHARIFF-I	110	5		110	7		
	400 KV LAKHISARI-BIHARSHARIFF-II	110	5		112	5		
	400 KV LAKHISARAI-KAHALGAON-I	110	5		110	7		
	400 KV LAKHISARI-KAHALGAON-II	110	5		112	5		