Minutes
of
68th PCC meeting

Date: 05.07.2018
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 68TH PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 18.06.2018 (MONDAY) AT 10:30 HOURS

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

PART – A

ITEM NO. A.1: Confirmation of minutes of 67th Protection sub-Committee Meeting held on 22nd May, 2018 at ERPC, Kolkata.

The minutes of 67th Protection Sub-Committee meeting held on 22.05.18 circulated vide letter dated 04.06.18.

Members may confirm the minutes of 67th PCC meeting.

Deliberation in the meeting

Members confirmed the minutes of 67th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN MAY, 2018

ITEM NO. B.1: Disturbance at 400kV DSTPS S/s at 06:11hrs on 10-05-2018

At 06.09 hrs on 10.05.2018 all lines, both GTs and both ST tripped together causing total power failure of DSTPS 400KV Switchyard. The weather was very stormy with rain and thunder during that time.

Sequence of events are placed below:

1. A C-N fault occurred in RTPS #2 at about 06:09:08.736 hrs. The said line trips through Distance Zone 1 from both ends and recloses successfully after dead time.
2. Within 5sec i.e. at 06.09.13.221, there is another CN fault within RTPS # 2 line section. The said line again trips through Distance Zone 1 from both ends but this time AR goes to lockout as the fault is within the reclaim time thus forcing a 3 pole trip.
3. Thereafter a C-N fault occurs in RTPS # 1 Line at about 20km from DSTPS end at 06.09.17.164 hrs. Both M1 & M2 relays issued single pole trip in C Phase but the C pole of the Main CB did not open. This was a Main CB LBB condition but LBB protection did not operate in both M1 and M2 LBB Relays. Hence the fault was not cleared by operation of LBB protection.
4. There was no tripping during this fault from RTPS end as the line was already OPEN from there. The Main CB was OPEN due unsuccessful AR of Main CB during a previous fault in this line(at about 05:38:39 hrs) and the Tie CB had opened form AR Lockout condition due to the fault in RTPS # 2 line mentioned in point no. 2.
5. As the fault continued in RTPS #1, Distance zone 2 appeared in the Distance relays causing 86A & 86B to operate. This had caused the other poles of the CB to open. But the C pole remained stuck as evident from the continuation of the fault current in the C Phase.
6. However the CB status as read by both the Busbar PUs of RTPS # 1 bay showed Main CB as OPENED because as per scheme CB Closed BI is HIGH when all the CB poles are closed together. As soon as the CB closed signal goes LOW, Dead Zone protection picks up in both

RTPS # 1 PUs as the PU is sensing current yet the Main CB is OPEN which is a correct Dead Zone fault condition.

7. As the fault in C Phase of RTPS # 1 continues the fault is cleared by operation GT#1 and GT # 2 Standby E/F Protection and from Jamshedpur end through Distance Zone-3 of both lines.
8. After all the sources trip the voltage at DSTPS 400 KV bus remain for about another 637ms approx. due to the back feeding of LV boards via ST. Evidence of existence of this voltage is confirmed from the DR of Jamshedpur Line.This voltage waveform during this period is seen to be rich in 2nd and 3rd harmonics.
9. It is seen from DR of STs that over-fluxing (V/f) and differential 2ndharmonic block had picked up in both ST # 1 & ST # 2 differential relays which had blocked the operation of differential function of both STs throughout this period. But just as one LV board current had died down, the 2nd harmonic content in differential current had marginally decreased below the blocking threshold causing the harmonic blocking to be withdrawn thereby resulting in differential trip of both transformers.

SOE, INDICATIONS AND DR INFORMATION OF TRIPPED ELEMENTS:

Sl. No	Element	Time of trip as per DR at DSTPS	Description of Event	R/I at DSTPS End	R/I at other End
1.	RTPS # 2	06:09:08.736	Distance Z1 trip, C Phase	Zone 1, C Ph.	Zone 1, C Ph.
2.	RTPS # 2	06:09:08.767	CB C Pole opens		
3.	RTPS # 2	06:09:10.034	AR successful. CB C pole recloses.		
4.	RTPS # 2	06:09:13.221	Distance Z1 trip, C Phase.	Zone 1, C Ph.	Zone 1, C Ph.
5.	RTPS # 2	06:09:13.253	CB C Pole opens.		
6.	RTPS # 2	06:09:13.268	AR Lockout.		
7.	RTPS # 2	06:09:13.288	CB all poles open.		
8.	RTPS # 1	06:09:17.164	Distance Z1 trip, C Phase	Zone 1, C Ph.	No Trip
9.	RTPS # 1	06:09:17.193	CB C Pole opens but actually it remains stuck		
10.	RTPS # 1	06:09:17.534	86 A, 86B operate.		
11.	RTPS # 1	06:09:17.547	CB all pole open signal is received in SAS but C pole does not open.		
12.	Jmd # 1	06:09:18.236		No Trip	Zone 3, C Ph.
13.	Jmd # 2	06:09:18.236		No Trip	Zone 3, C Ph.
14.	GT # 1	06.09.18.209	GT # 1 CB opens all pole	GT Standby E/F	
15.	GT # 2	06.09.18.215	GT # 2 CB opens all pole	GT Standby E/F	
16.	ST # 1	06.09.18.860	ST # 1 CB opens all pole	Differential Trip A,B,C	
17.	ST # 2	06.09.18.862	ST # 2 CB opens all pole	Differential Trip A,B,C	

Generation loss: 900 MW

DVC may explain.

Deliberation in the meeting

DVC explained with a detailed presentation. Presentation is enclosed at Annexure-B1. DVC explained the disturbance as follows:

- *DVC informed that the RTPS line#1 & #2 were in same dia at RTPS end.*
- *Main CB of RTPS#1 line was already open due to unsuccessful A/R during the fault at 05:38:39 hrs.*
- *The Successive faults within reclaim time in RTPS#2 caused the A/R lockout and resulted in 3-phase tripping of the line.*
- *This tripping has caused opening of tie breaker at RTPS end which in turn results opening of the RTPS#1 from RTPS end as both lines are in same dia.*
- *At 06.09.17 hrs, during the C-N fault in RTPS#1 which was charged from DSTPS end only, both Main-I & II relays issued single pole trip in C-phase. But the breaker did not open.*
- *As the fault persisted, other two poles tripped in zone-II and RTPS-Jamshedpur line tripped on zone-III from Jamshedpur end. Finally the fault was cleared by tripping of GT#1 and GT#2 on standby E/F protection.*

DVC informed that even after all the sources feeding the fault tripped, the voltage of 400kV DSTPS bus remained for about 600msec. After 600 msec, the ST#1 and ST#2 tripped on differential protection and bus became dead.

Upon analysis of DR of STs it was found that differential 2nd harmonic block had picked up in both the STs and that blocked the operation of differential during the intervening time.

It was also found that voltage waveform during that 600 msec period was rich in 2nd and 3rd harmonics which justified the above blocking of STs.

PCC opined that the voltage existed during the period of 600msec could be due to back feeding of Induction motors through STs. The high harmonic content could be due to resonance phenomena between ST inductance and Jamshedpur line capacitance. DR of Jamshedpur line also showed the same voltage phenomena.

PCC advised DVC to test the CB of 400kV DSTPS-RTPS line 1 at DSTPS end and to verify the reason for non-operation of LBB protection at 400kV DSTPS.

DVC informed that during inspection it was found +ve wire for initiation of LBB in both PU1A & PU2A was found open in relay panel which caused non operation of LBB in the above situation. They have rectified the wiring issue after the incident.

DVC added that CB of 400kV DSTPS-RTPS line 1 at DSTPS end has been tested and found working satisfactory.

ITEM NO. B.2: Disturbance at 220kV Jaynagar S/s at 16:30 hrs on 25-05-2018

220 kV Jaynagar – Laxmipur – I tripped from both ends due to R phase LA burst at Jaynagar. But R phase pole at Jaynagar end did not open. As a result, all the connected transmission lines except 220 kV Jaynagar – Balimela II tripped from remote end to clear the fault. 220 kV Jaynagar – Balimela II tripped from Jaynagar end in reverse zone. Finally 800 ms after the fault inception point, R phase pole opened at Jaynagar end and fault got cleared.

220 KV Jaynagar substation became dead and due to loss in evacuation paths, 160 MW in Upper Kolab(unit 1 and 3) and 268 MW in Balimela(Unit 3,4,5,6,7,8) tripped.

As per PMU data, fault was seen in R phase at 16:30 hrs which got cleared in almost 800 ms which is same as R phase pole opening time of 220 kV Jaynagar – Laxmipur – I at Jaynagar end.

Relay indications are as follows:

Name of the elements	Relay Indication at End 1	Relay Indication at End 2
220 kV Jaynagar – Laxmipur D/C	Z-I, R-N, R pole of circuit I opened after 800 ms (approx) from fault inception point	Yet to be received
220 KV Jaynagar – Jeypore D/C	Did not trip	Z-II
220 kV Jaynagar - Balimela I & III	Did not trip	Yet to be received
220 kV Jaynagar - Balimela II	Yet to be received	Did not trip
220/132 kV ICT at Jeypore	Yet to be received	Yet to be received
220 kV Jaynagar - U. Kolab D/C	Did not trip	Yet to be received
220 kV U. Kolab - Theruvali S/C	Yet to be received	Did not trip

Load loss: 98 MW (including 18 MW traction load)

Generation loss: 428 MW

OPTCL may explain.

Deliberation in the meeting

OPTCL explained the disturbance with a presentation. Presentation is enclosed at Annexure-B2.

OPTCL explained the disturbance as follows:

- *There was a R-N fault in 220 kV Jaynagar – Laxmipur – I due to flashover in grading ring of R-Phase LA at 220kV Jaynagar. The breaker of R-phase did not open from Jaynagar end.*
- *LBB protection at 220kV Jaynagar failed to operate due to the faulty bay unit relay of upper kolab line enabled the blocking mode of Busbar/LBB by central unit.*
- *The fault was cleared from remote end feeders except 220kV Jaynagar-balimela#2 which was tripped from Jaynagar end in reverse zone.*

OPTCL updated the relay indications as follows:

Time	**220KV Feeder/Bay Name**	**JAYANAGAR GSS END**	**REMOTE END PH/GRID**	**Remarks**
		Trip Details	Trip Details	
16:30:38:	Laxmipur-1	**R-N, Zone-1 & Back-up. I=12.8KAmps**	**R Ph-N,Zone-1**	**All 8 Nos. feeders tripped at Remote End.**
16:30:38	Laxmipur-2	CB in ON Condition	**R Ph-N,Zone-1**	
16:30:38:	PGCIL-1	CB in ON Condition	**R Ph-N, Zone-2**	
16:30:38	PGCIL-2	CB in ON Condition	**R-Ph-N,Zone-2**	
16:30:38:	Balimela-1	CB in ON Condition	**Over Voltage**	
16:30:38	Balimela-2	R-N,Z-4(Reverse)	**Zone-2**	
16:30:38:	Balimela-3	CB in ON Condition	**Over Voltage**	

16:30:38	Upper Kolab-1	CB in ON Condition	**R Ph-N,Zone-3 (T Set-600 ms)**	
16:30:38	Upper Kolab-2	CB in ON Condition	**R Ph-N,Zone-3 (T set-600 ms)**	

OPTCL added that they have taken the following corrective actions after the disturbance:

- *Upon inspection they found that the trip coil of R-phase breaker in Laxmipur line#1 was faulty which they changed with a new one.*
- *It was observed that the trip coil#2 was connected with only manual trip command. The connection has been revised to protection trip.*
- *Regarding non-operation of busbar/LBB protection they informed that they have intimated the issue to Siemens for corrective action.*

ITEM NO. B.3: Disturbance at Hatia at 18:22 hrs on 30-05-2018

220 kV Ranchi - Hatia D/C tripped in R-B fault at 18:22 hrs. At same time 220 kV Hatia - Patratu D/C tripped on overreaching the fault resulting interruption of power at 220/132 kV Hatia S/S and its surrounding areas.

Name of the elements	Relay Indication at End 1	Relay Indication at End 2
220 kV Ranchi Hatia – D/C	R-B, IB 4.1 kA, IR 4 kA, 16 km from Ranchi	R-B, IB 2.1 kA, IR 1.3 kA, 22 km from Hatia
220 kV Hatia Patratu D/C	Yet to be received	Yet to be received

Load loss: 60 MW

Powergrid and JUSNL may explain.

Deliberation in the meeting

Powergrid informed that fault was in both the circuits of 220kV Ranchi-Hatia line. Ranchi end cleared the fault in zone-I for both the circuits.

JUSNL informed that 220kV Hatia-Ranchi Circuit-I tripped on zone-I whereas circuit-II tripped on Overcurrent E/F.

Regarding tripping of 220kV Hatia-Patratu lines, JUSNL informed that from Patratu end there was no relay indication as well as no tripping.

From DR analysis of 220kV Hatia-Patratu lines at Hatia end, it was known that both circuits of Hatia-Patratu line were tripped on overvoltage. It was also come to notice that the VT fuse failure alarm was ON condition prior to the fault.

As there was no overvoltage indication at Patratu end, PCC felt that such high voltage was unlikely possible in the given scenario of the fault. PCC opined that It should be a measurement error and advised JUSNL to check double grounding/earthing in CVT circuits as double grounding leads to high voltage during fault.

From one of the DR of Hatia-Patratu line it also came to known that one of the polarity of CVT was in reverse. It was concluded that this reverse connection was the cause of enabling VT fuse failure alarm in the relay.

PCC advised JUSNL to rectify the CVT polarity connection as well as to test the CVT in normal condition and submit a report on this tripping within seven days.

ITEM NO. B.4: Disturbance at 220kV Lalmatia S/s at 03:25 hrs on 14-05-2018

220 kV Farakka - Lalmatia line tripped at 03:25 hrs from Farakka end on overcurrent relay operation. At the same time 132 KV Kahalgaon (NTPC) - Lalmatia line tripped zone 1, E/F, fault location 28.35 mt. ,IA=2.844 Kamp , Ib= 699.5 A , Ic= 927.8 A.

132 Kv Kahalgaon (BSPTCL)- Lalmatia (Sahebgunj) line also tripped at 03:17 hrs. Bursting of R-Phase bushing of 20 MVA Transformer H.V side. occurred during the on-going adverse weather at Lalmatia complex.

Load loss: 83 MW

JUSNL, NTPC and BSPTCL may explain.

Deliberation in the meeting

JUSNL informed that the fault was due to bursting of R-phase busing on 132 kV side of 132/33 kV transformer.

PCC opined the fault was not cleared from 132kV Lalmatia S/s as a result the lines which were connected to sources got tripped:

- *220kV Farakka-Lalmatia line tripped from Farakka end on O/C protection*
- *132 KV Kahalgaon (NTPC) - Lalmatia line tripped zone 1, E/F from Kahalgaon end*

PCC advised JUSNL to check the protection system at 132kV Lalmtia S/s including 220/132kV ATRs.

ITEM NO. B.5: Blackout at Malda, Dalkhola and Purnea at 19:04 hrs on 28-05-2018

At 19:04 hrs R-N fault took place in 400 KV Malda-Purnea-2 line and during A/R attempt Bus bar protection operated at 400 KV Malda and all the element tripped. Then Dalkhola B/C tripped in O/C and 220 kV Purnea-Purnea D/C and 220 kV Kishangunj-Dalkhola D/C tripped on DEF leading to wide spread blackout at Malda, Dalkhola and Purnea.

Load loss: 410 MW

Powergrid and BSPTCL may explain.

Deliberation in the meeting

Powergrid explained the disturbance with detailed presentation. The presentation is enclosed at Annexure-B5.

Powergrid informed that that 400 KV Malda-Purnea-2 tripped on R-N fault due to persisting fault after auto reclosing. Simultaneously the busbar protection operated at 400kV Malda due to forcing the bus coupler current to zero. After investigation it was found that the specific cable was cut which forcing the bus coupler status as open.

After tripping of 400kV Bus at Malda, Malda load has been shifted to Dalkhola and 220 kV Kishangunj-Dalkhola D/C line tripped from Kishanganj on Transient Earth Fault protection due to huge unbalance current. 220 kV Purnea-Purnea D/C and Dalkhola B/C tripped on overcurrent due to overload. As a result total power failed at Dalkhola.

Powergrid informed that they have taken the following remedial actions:

- *Contact Multiplier of the Bus Coupler Auxiliary Contact installed at Bus Coupler Panel at 400kV Malda to rectify the maloperation of Busbar protection.*

- *Annunciation for Bus Coupler CB input Status Monitoring system has been established to avoid such type incident in future.*

ITEM NO. B.6: Disturbance at 220kV Muzaffarpur (PG) at 18:38hrs on 11-05-2018

220 kV Muzaffarpur - Hazipur - II was under shutdown.

At 18:38 hrs 220 kV bus I at Muzaffarpur tripped resulting outage of 220 kV Muzaffarpur - Hazipur - I, 400/220 kV ICT - I & II at Muzaffarpur, 220/132 kV ICT at Muzaffarpur and 220 kV Muzaffarpur - MTPS - I. This resulted in total power failure at Hazipur, Chapra, Jandaha. Interruption of supply of power occurred at Dhalkebar due to tripping of 220/132 kV ICT at Muzaffarpur.

The following elements tripped during the disturbance:

- 220 kV Muzaffarpur - Hazipur - I
- 400/220 kV ICT - I & II at Muzaffarpur
- 220/132 kV ICT at Muzaffarpur
- 220 kV Muzaffarpur - MTPS - I
- 220 kV bus I at Muzaffarpur

As per PMU data, fault was seen in Y and B phase at 18:38 hrs which got cleared within 100 ms.

Load loss: 240 MW (including 40 MW traction load and 120 MW exported to Nepal)

Powergrid and BSPTCL may explain.

Deliberation in the meeting

Powergrid informed that there was a fault in 220kV Muzaffarpur-Hazipur-I line. During fault clearance, breaker got stuck in one of the phase at Muzaffarpur which caused the operation of LBB protection resulting tripping of all feeders connected to Bus-I.

Kanti TPS representative informed that the stage –I over voltage setting 220kV lines may be increased to 115% to avoid line tripping before the tripping of their units.

PCC agreed and advised BSPTCL and Powergrid to revise stage-I over voltage setting to 115 %.

ITEM NO. B.7: Disturbance at Bodhgaya at 20:38hrs on 08-05-2018

At 20:38 hrs, HV side CT in B phase connected to 150 MVA ICT-II blasted, leading to a suspected bus bar protection operation at 220 KV Main bus and subsequent voltage loss at Bodhgaya.

Load loss: 310 MW

BSPTCL may explain.

Deliberation in the meeting

BSPTCL explained that there was a B-N fault at 220kV Bus at Bodhgaya due to failure of 220kV side CT of 150 MVA ICT II. The transformer differential protection operated and tripped the ICT.

Powergrid informed that 220kV Gaya-Bodhgaya tripped from Gaya end on zone II and cleared the fault.

BSPTCL further informed that 220kV Bodhgaya S/s has one main and transfer bus scheme and busbar protection is not available at 220kV Bodhgaya S/s.

ITEM NO. B.8: Tripping of 220 KV Gaya-Bodhgaya D/C line at 12:06 hrs on 26-05-2018

At BODHGAYA GSS, Total power failed after tripping of both 220 KV Gaya(PG)-Bodhgaya ckt-1 and 2 at 12:06 Hrs from Gaya (PG) end. There was no any tripping at GSS Bodhgaya end.

BSPTCL and Powergrid may explain.

Deliberation in the meeting

BSPTCL informed that 220kV Bodhgaya-Khizarsarai line was idle charge condition and the relay of 220kV Bodhgaya-Khizarsarai line did not have any fault indication on that day.

PCC opined that there might be a fault in 220kV Bodhgaya-Khizarsarai line and Bodhgaya end did not clear the fault. As a result fault was cleared from Gaya (PG) end.

On enquiry, BSPTCL informed that only main-I relay is present in 220kV Bodhgaya- Khizarsarai line.

PCC advised BSPTCL to install main-II relay and to make time setting of all zone protection including O/C as instantaneous for 220kV Bodhgaya-Khizirsarai Lines.

ITEM NO. B.9: Tripping of 220 KV Gaya-Bodhgaya D/C line at 21:41 hrs on 28-05-2018

220 KV Gaya Bodhgaya d/c tripped from Gaya(PG) end only on 3-Ph Fault, zone III . Actually fault was in 220 KV Bodhgaya-Khizersarai-I line. During anti-theft charging of the said line 220 KV Gaya Bodhgaya D/C line tripped from Gaya(PG) end. Fault was not cleared by Boghgaya.

BSPTCL and Powergrid may explain.

Deliberation in the meeting

BSPTCL informed that the weather was stormy and the initial fault was on 18:34 due to tower failure in 220kV Bodhgaya-Khizarsarai line. Bodhgaya end cleared the fault.

After three hours while BSPTCL attempted to charge the line, the fault was persisting due to tower failure. At that time the protection at Bodhgaya end did not operate which caused tripping of Gaya-Bodhgaya lines from Gaya end on zone-III.

PCC advised BSPTCL to test Bodhgaya end relay of 220kV Bodhgaya-Khizarsarai line and to revise the zone settings and O/C timing to instantaneous.

BSPTCL informed that they have revised the zone setting and O/C timing to instantaneous after this incident.

ITEM NO. B.10: Disturbance at 400kV Daltongunj S/s at 18:43 hrs on 31-05-2018

Total power failure occurred at 400kV Daltongunj after tripping of 400 kV Sasaram Daltongunj – D/C on R-N and B-N fault respectively.

As per PMU data, fault was seen in R & B phase at 18:43 hrs which got cleared within 100 ms.

Load loss: 30 MW

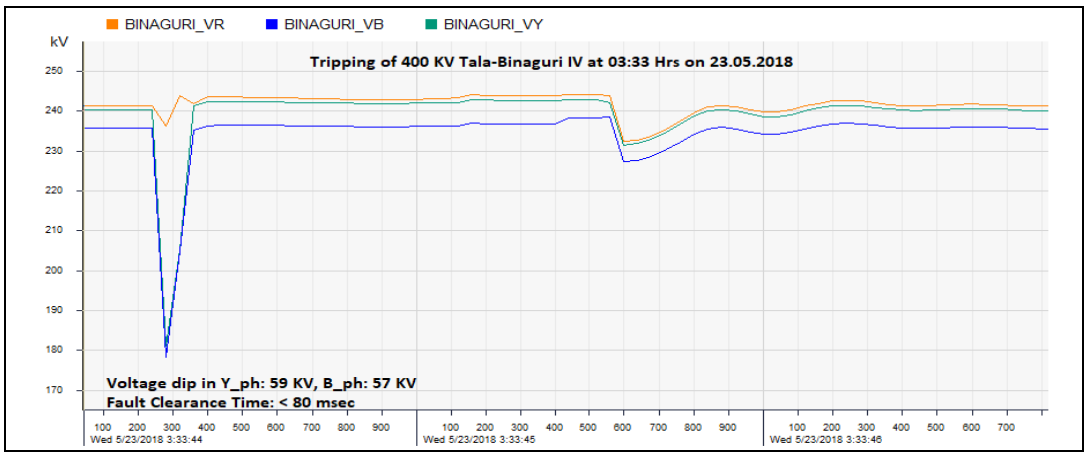
Powergrid may explain.

Deliberation in the meeting

Powergrid informed that the fault was due to tower collapse in 400 kV Sasaram-Daltonganj Line.

ITEM NO. B.11: Issue of Protection Coordination Observed during Blackout of Tala on 23rd May 2018

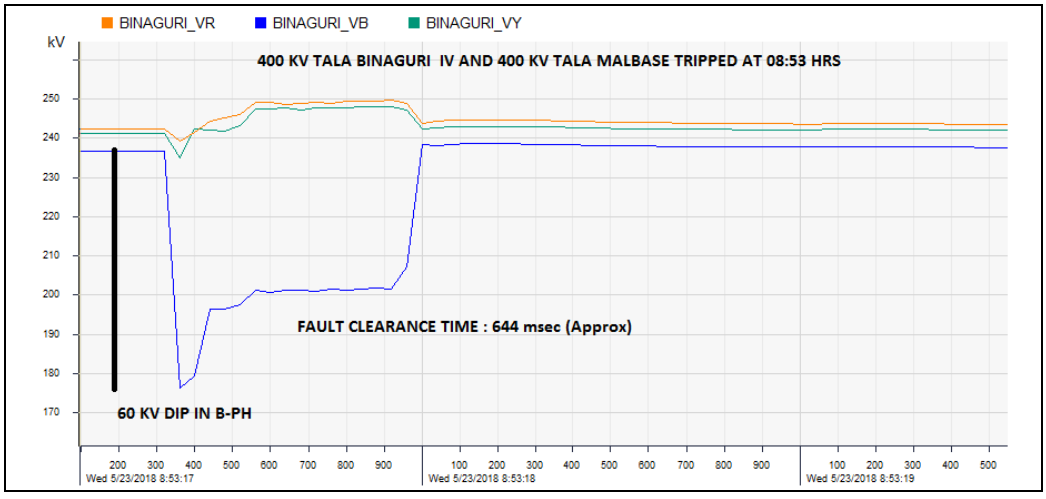
On 23rd May At 03:33 Hrs: 400 kV Binaguri-Talackt 4 tripped on Y-B phase to earth fault (Fault distance was 147.10 km from Binaguri end). At the same time 400 kV, Binaguri-Malbase ckt also tripped on B phase to earth fault however, it got successfully reclosed from Binaguri end. The circuit seems to have tripped from Malbase end. It can be seen that fault were located in the Bhutan side however details are not shared with ERLDC. The associated PMU plot is given.



At 04:57 Hrs, 400 kV Binaguri-Tala 2 tripped on B phase to E/F (fault distance was 105.3 km from Binaguri). The circuit was kept idle charge from 0607 Hrs from Binaguri till the line isolator at Tala. In the meantime, 400 kV Binaguri-Tala circuit 1 was made out for planned shutdown by Bhutan.

At 08:53 Hrs:

- 400 kV Binaguri-Talackt 4 tripped from Binaguri end on B phase to E/F in zone 2 (location of fault was 124.5 km from Binaguri end). Initially carrier signal was received due to which only B phase opened and A/R function and timer has started. However, within the next 133 ms direct trip was received at Binaguri from Tala causing three-phase tripping at Binaguri end.
- It was observed that the 400 kV Binaguri-tala 4 circuit did not trip from Tala end resulting in fault feeding on this circuit from 400 kV Binaguri-Malbase circuit. 400 kV Binaguri-Malbase circuit has first fed the fault in zone 3 from Binaguri end however, with tripping of 400 kV Binaguri-Tala 4 from Binaguri end, sensed the same in zone 2 and tripped in next 500 ms. The fault location observed for this circuit from Binaguri end was 145 km indicating the fault of 400 kV Binaguri-Tala 4 ckt.



This led to blackout of 400 kV Tala substation causing loss of 447 MW generation. The tripping of 400 kV Malbase-Tala circuit is not shared with ERLDC as this circuit might also have tripped during the blackout of Tala generation.

The tripping at 0333 Hrs and 0853 Hrs, indicate several issues observed during the event in Bhutan side of the transmission line:

1. What was the nature of the fault on these transmission lines?
2. Whether 400 kV Binaguri-Malbase A/R operated at Malbase end at 03:33 Hrs?
3. Why the A/R has not occurred on 400 kV Binaguri-Talackt 2?
4. Why the 400 kV Tala did not clear the fault on 400 kV Binaguri-Tala circuit 4 ?
5. Why the Tala end has send the direct trip command for 400 kV Binaguri-Tala circuit 4 ?
6. On what protection the 400 kV Malbase-Tala circuit ha stripped at 0853 Hrs.

PGCIL and Bhutan May kindly explain the above tripping along with relavent details to ERLDC/ERPC.

Deliberation in the meeting

The disturbance could not be discussed in detail as Bhutan representative was not present in the meeting.

ITEM NO. B.12: Issues related with Generation Backing down during Talcher-Kolar SPS operation on 16th May 2018

On 16th May 2018 at 15:34 Hrs, HVDC Talcher Kolar Pole 1 was carrying 2000 MW and in the next 45 seconds due to transient fault it came down to RVO mode to 1350 MW followed by one pole tripping and other pole in Ground return mode. With this, the SPS operation was as per the 1350 MW instead of 2000 MW Power order of HVDC. This has caused effective fast generation reduction of 165 MW in Talcher Stage 2 and 1000 MW load shedding in SR. The above inadequate generation reduction in ER has led to:

1. Severe loading on 400 kV Talcher-Meramundali and Talcher-Angul circuit (Refer Figure)
2. High loading on the 765/400 kV Vemagiri ICTs (Refer Figure).
3. Due to inadequate generation reduction at Talcher in eastern region the loading on 400 kV Talcher Stage 1 and 2 Interconnector were more than 1400 MW for 6 minutes (Refer Figure).

Apart from these, the generation reduction observed at GMR and JITPL were having certain issues, which is given below:

1. The generation reduction was also observed at GMRhowever, it took more than 10 minutes for the reduction. (Refer Figure).
2. The JITPL has done the reduction however, it was observed after few minutes of the event and the same was restored immediately. Further, the reduction was not adequate.

PCC may like to discuss the issue of inadequate backing down at Talcher causing overloading of network in Eastern region under such contingencies along with the issue of slow generation backing down at GMR and other issues at JITPL as quoted above.

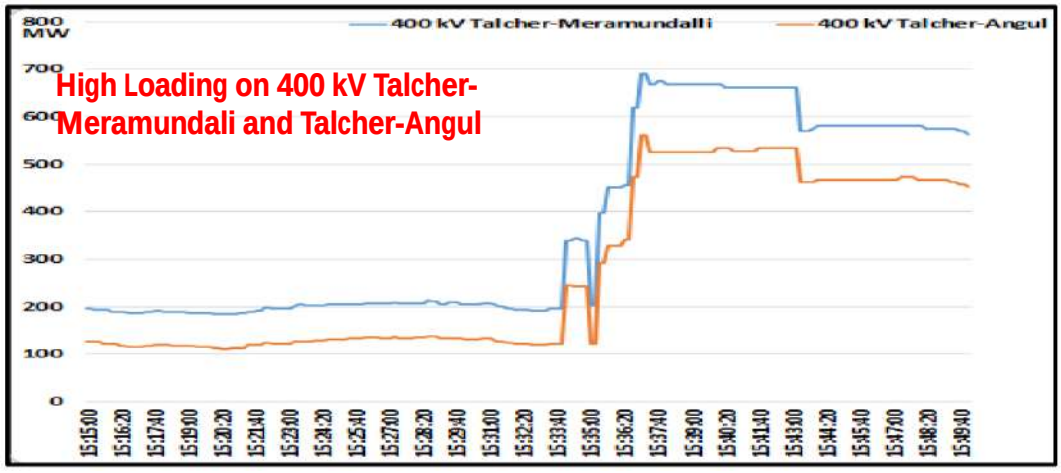


Figure: Loading of 400kV Talcher-Meramundali and Talcher-Angul on 16th may 2018

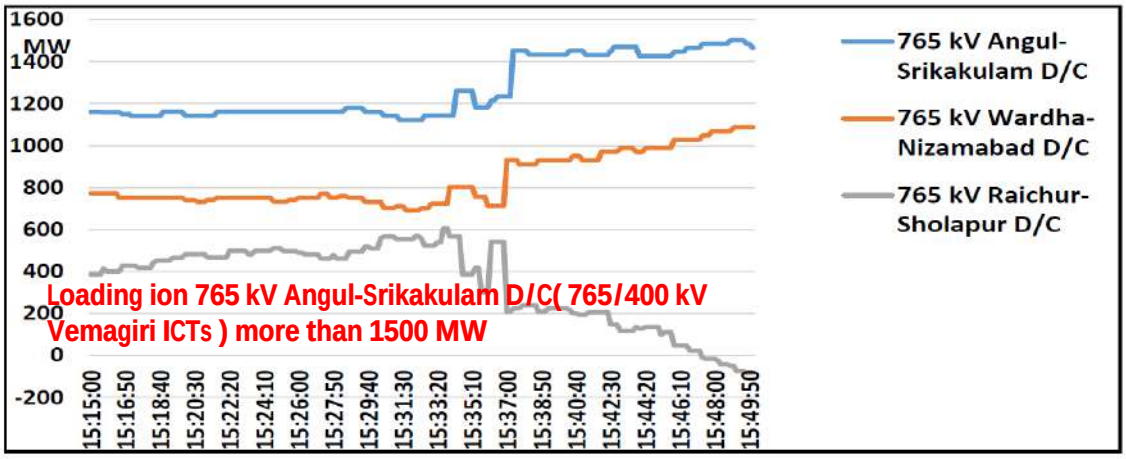


Figure: 2 X 1500 MVA VemagiriICTs loading (Same as 765 kV Angul-Srikakulam D/C power flows as no anchoring of 400 kV at Srikakulam) on 16th May 2018

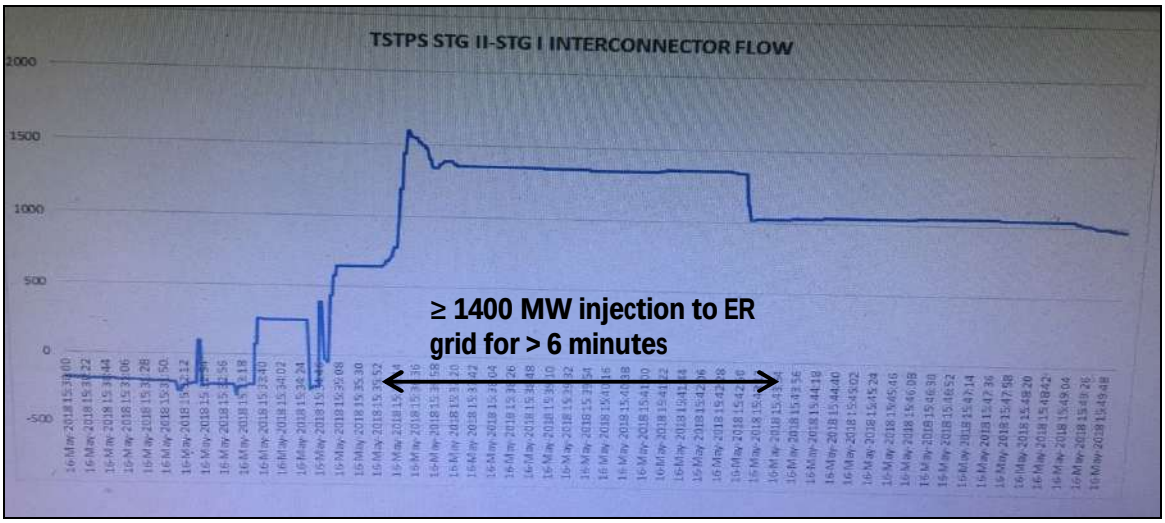


Figure: Loading of 400 kV Talcher stage 2- Stage 1 interconnectors on 16th May 2018

Members may discuss.

Deliberation in the meeting

NTPC gave a detailed presentation on the disturbance. Presentation is enclosed at Annexure-B12.

NTPC explained that Talcher units were given the generation relief as per the SPS logic. Since Pole block with ground return mode is not configured in the SPS logic, sufficient generation reduction is being provided in this case.

PCC advised Powergrid to explore for inclusion of pole block with ground return mode signal in the SPS logic.

PCC advised NTPC, GMR and JITPL to ensure the generation reduction as per the SPS logic.

PCC opined that frequent pole trippings were observed during this year.

Powergrid informed that OEM is visiting the site in this month for detail investigation on frequent pole trippings.

ITEM NO. B.13: Repeated station black out at Raxaul S/S.

Repeated station black out at 132/33 kV Raxaul S/S resulted interruption power supply to nearby area and Nepal. Summary of major events are given in Table I. BSPTCL may check the relay co-ordination and share corrective actions taken after these events.

Date	Time	Antecedent condition	Summary	Load loss amount
18-05-18	8:59	132 kV Raxaul - Betiah D/C were kept out of service	132 kV Motihari - Raxaul D/C tripped on distance protection. 132 kV Raxaul Parwanipur S/C tripped at same time. It is suspected fault was at 132 kV Raxaul Parwanipur S/C.	84 MW (Nepal 60 MW)
19-05-18	21:10	132 kV Raxaul - Betiah D/C were kept out of service	132 kV Motihari - Raxaul D/C tripped on Y-B fault and 132 kV Motihari - Motihari S/C tripped on R-N fault. It is suspected fault was at downstream.	140 MW (Nepal load 60 MW)
23-05-18	6:02	132 kV Raxaul - Betiah D/C were kept out of service	132 kV Motihari - Raxaul D/C tripped on distance protection. 132 kV Raxaul Parwanipur S/C tripped at same time. It is suspected fault was at 132 kV Raxaul Parwanipur S/C.	84 MW (Nepal 60 MW)

Table I: Summary of the major grid events occurred at Raxaul S/S in the month of May 2018

BSPTCL may explain.

Deliberation in the meeting

BSPTCL informed that based on last PCC advice they have rectified the star point reverse problem of CT at Raxaul end. Also they have revised their O/C settings to avoid tripping of upstream lines in case of any fault in Nepal area.

ITEM NO. B.14: Multiple tripping incidents at Sultanganj at 17:29 hrs on 28-05-18

132 kV Banka – Sultanganj D/C tripped on R-N fault at 17:29 hrs resulting load loss of 40 MW at Sultanganj, Tarapur area of Bihar system.

BSPTCL may share corrective actions taken after this event.

BSPTCL may explain.

Deliberation in the meeting

BSPTCL informed that the fault was in 132kV sultanganj-sabore line which is idle charged.

PCC advised to make time settings of zone protection as well as O/C protection to instantaneous for the ideally charged line.

BSPTCL informed that sometimes there was power flow in the line.

PCC advised to set two different group settings in relay for the lines which are not always idle charged so that one group can be used during idle charged condition and another during power flow condition in order to protect the line in all conditions.

ITEM NO. B.15: Repeated station black out in Sikkim

Repeated power failure at Gangtok and Melli in the month of May 2018 resulted interruption of power supply in the nearby region.Summary of major events are given in Table II. Sikkim may share corrective actions taken after these events.

Date	Time	Affected area	Antecedent condition	Summary	Load loss	Fault clearing time
10-05-18	17:05	Gangtok	132 kV Rangpo - Gangtok was under shutdown	132 kV Chujachen Gangtok S/C tripped in R-Y-N fault. Inclement weather was reported at the time of the incident	19	<100 ms
11-05-18	17:14	Gangtok	132 kV Rangpo - Gangtok was under shutdown	132 kV Chujachen Gangtok S/C tripped in Y-N fault due to Y phase LA failure at Gangtok end. Inclement weather was reported at the time of the incident	33	<100 ms
10-05-18	16:58	Melli, Kalimpong	132 kV Melli - Sagbari S/C is out since long due t problem at Sagbari end.	132 kV Melli Siliguri S/C and 132 kV Melli - Rangpo S/C tripped in R-Y-N fault. Inclement weather was reported at the time of the incident	32	700 ms
28-05-18	16:08	Melli, Kalimpong	132 kV Melli - Sagbari S/C is out since long due t problem at Sagbari end.	132 kV Melli Siliguri S/C and 132 kV Melli - Rangpo S/C tripped in R-Y-N fault. Inclement weather was reported at the time of the incident	25	600 ms

Table II: Summary of the major grid events occurred in Sikkim in the month of May 2018

Sikkim may explain.

Deliberation in the meeting

The agenda could not be discussed in detail as Sikkim representative was not present in the meeting.

ITEM NO. B.16: Tripping incidences in the month of May, 2018

Other tripping incidences occurred in the month of May 2018 which needs explanation from constituents of either of the end is circulated with agenda.

In 58th PCC, ERLDC informed that most of the constituents are not submitting the DR and EL data for single line trippings.

PCC advised all the constituents to upload the details along with DR and EL in PDMS on-line portal and referred the issue to TCC for further guidance.

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

Members may discuss.

Deliberation in the meeting

Members explained the tripping incidences. Updated status is enclosed at Annexure-B16.

PCC advised all the concern constituents to take necessary corrective action to resolve the issues.

PART- C:: OTHER ITEMS

ITEM NO. C.1: Implementation of new islanding schemes in ER

1. Islanding scheme at IbTPS- OPGC

OPTCL has submitted the detail plan of IbTPS islanding scheme. Details are enclosed at **Annexure-C1.1**.

Members may discuss.

Deliberation in the meeting

PCC opined that the draft scheme submitted by Odisha was three years old and the draft scheme is needed to be reviewed with existing network configuration.

PCC decided to discuss the islanding scheme in next PCC Meeting and advised OPTCL to submit all the relevant details to ERPC and ERLDC.

2. Islanding scheme at Kanti TPS - KBUNL

ERLDC prepared thedraft islanding scheme.Details are enclosed at **Annexure-C1.2**.

Members may discuss.

Deliberation in the meeting

After detailed deliberation, PCC in principle agreed with the following islanding scheme at Kanti TPS:

- *Stage II units (2x195 MW) of Kanti TPS will be islanded with station load of 40 MW and radial load of 150 MW (approx.) of 220kV Kanti TPS-Gopalganj D/C line.*
- *Once the grid frequency falls to 48.2 Hz, the PLC at Kanti TPS would initiate the islanding process with 500 ms time delay.*

ITEM NO. C.2: Implementation of differential protection for short distance lines

Powergrid informed that for short distance line (<20KM) they are planning to replace existing Distance protection relay with fibre base differential protection relay. Feeder details are as follows:

1. 220KV Subhasgram (POWERGRID)-Subhasgram (WBSETCL) D/C: Line length = 0.8 KM,
2. 132KV Malda (POWERGRID)-Malda (WBSETCL) D/C: Line length = 5.94 KM,
3. 220KV Alipurduar (POWERGRID)-Alipurduar (WBSETCL) D/C: Line length = 6.377 KM,
4. 220KV Durgapur (POWERGRID)-Durgapur (DVC) D/C: Line length = 1 KM,
5. 400KV Durgapur (POWERGRID)-Bidhan Nagar (WBSETCL) D/C: Line length = 11 KM,
6. 132KV Birpara (POWERGRID)-Birpara (WBSETCL) D/C: Line length = 0.3 KM,
7. 132KV Siliguri (POWERGRID)-NJP (WBSETCL) S/C: Line length = 10 KM,
8. 132KV Siliguri (POWERGRID)-NBU (WBSETCL) S/C: Line length = 10 KM

Members may discuss.

Deliberation in the meeting

PCC opined that differential protection should be implemented for all short lines (<20KM) to overcome relay coordination issues with respect to distance and over current protection.

PCC in principle agreed to the proposal.

PCC opined that differential protection at both the ends could be implemented by one entity to maintain the relay and communication compatibility.

WBSETCL informed that they are implementing differential protection in 220KV Subhasgram (POWERGRID)-Subhasgram (WBSETCL) D/C for both the ends using fibre optic cables.

PCC advised Powergrid to implement differential protection at both ends for rest of the above lines.

Powergrid requested DVC and WBSETCL to share the availability of fibre optic terminal equipment details and protection scheme installed at their end.

ITEM NO. C.3: Third Party Protection audit observations of DVC system and UFR testing report

Third Party Protection Audit of 400kV Bokaro TPS, 220kV MTPS, DTPS, CTPS and BTPS S/s was carried out during 29th May 2018 to 1st June 2018. The observations are enclosed at **Annexure-C3.1.**

UFR testing of 220/33kV Durgapur (DVC) S/s was also done on 30-05-2018. Report is enclosed at **Annexure-C3.2**.

Members may note.

Deliberation in the meeting

Members noted.

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

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

ITEM NO. C.4: Total power failure at 400/132 kV Motihari substation on 07-04-2018 at 09:56 hrs

In 67th PCC, it was decided to form a Committee with members from NTPC, Powergrid, ERLDC and ERPC. The Committee would visit 400kV Motihari S/s during 11th June 2018 to 13th June 2018 and will do on-site inspection along with Third Party Protection Audit and place the report in next PCC Meeting.

Accordingly, Third Party Protection Audit was done on 11th June 2018.

Audit Committee may place the report. DMTCL may respond.

Deliberation in the meeting

*Detailed report is placed in the meeting which is enclosed at **Annexure-C4**.*

PCC advised DMTCL to comply the observations at the earliest.

ITEM NO. C.5: Disturbance in DVC system on 11-04-2018 at 20:10 hrs

In 67th PCC, it was opined that one more 400/220kV ICT at BTPS A is urgently required to overcome the present loading DVC system. DVC should plan automatic load shedding schemes to avoid overloading of existing ICT/ATRs and transmission lines, instead of keeping the important 220kV lines open condition.

In reply, DVC informed that the commissioning of second (2nd) 400/220kV ICT at BTPS 'A', 400kV side bays are ready and work at 220kV side bays is in progress and would take some more times.

DVC may update.

Deliberation in the meeting

DVC informed that the work will be completed by February, 2019.

ITEM NO. C.6: Disturbance at 220kV Tashiding HEP substation on 15-04-2018 at 06:43 hrs

In 67th PCC, Dansenrgy was advised to take the following corrective actions & report:

- Review the zone 1 reach settings of distance protection at Tashiding and JLHEP as per the protection philosophy of ER.
- Review the overcurrent settings of lines at Tashiding and JLHEP and coordinate with the distance protection.
- Autoreclose feature should be same at both ends of the line. Hence Dansenergy should decide to keep the Autorecloser in service or not and implement the same at both ends of the line immediately in coordination with Powergrid.

Dansenergy may update.

Deliberation in the meeting

Dansenergy representative was not present in the meeting.

ITEM NO. C.7: Tripping of 220 kV EMSS – Subhasgram D/C on 17-04-2018 at 10:37 hrs

In 67th PCC, it was opined that delay in receiving carrier and delay (160 ms approx.) in resetting of carrier at Subhasgram end may cause mal-tripping of 220 KV Subhasgram -EMSS line during dead time for a fault in the adjacent line of EMSS like 220 KV EMSS-New Casipur.

PCC advised CESC and POWERGRID to ensure minimum time delay for receiving carrier and carrier reset at Subhasgram end.

CESC and Powergrid may update.

Deliberation in the meeting

It was informed that they are in process of implementing the PCC recommendation.

ITEM NO. C.8: Tripping of 132 kV KhSTPP - Lalmatia S/C and 132 kV Kahalgaon (BSPTCL) - Lalmatia S/C tripped from Lalmatia on 20-04-2018 at 10:35 hrs

At 10:35 hrs 132 kV KhSTPP - Lalmatia S/C and 132 kV Kahalgaon (BSPTCL) - Lalmatia S/C tripped from Lalmatia resulting load loss at Sahebgunj

In 67th PCC, JUSNL informed that there was a B-N fault in 132 kV Kahalgaon (BSPTCL) - Lalmatia S/C line and the fault was successfully cleared from both ends on over current protection. But 132 kV KhSTPP - Lalmatia S/C was also tripped from Lalmatia end on overcurrent protection.

NTPC informed no tripping signal was initiated from their end and the line was manually tripped from their end.

PCC opined that similar incidents were occurred in March 2018 and in 66thPCC JUSNL was advised to check the relay settings and resolve the issue.

PCC once again advised JUSNL to check the reasons for maloperation of the relay of 132 kV KhSTPP (NTPC) - Lalmatia S/C at Lalmatia end within 10 days and submit a report to ERPC and ERLDC.

JUSNL may update.

Deliberation in the meeting

It was informed that no report was received from JUSNL. PCC once again advised JUSNL to comply the observations.

ITEM NO. C.9: Zone 3 settings of ISTS lines

Based on the data available in PDMS, the zone 3 settings of all ISTS lines in Eastern Region were verified and compared with the corresponding resistive reach of the line thermal loading. Zone 3 settings were also checked with the agreed protection philosophy of ER. The discrepancies observed in the settings will be presented in the meeting.

In 67th PCC, PRDC presented the list of ISTS lines where they observed the discrepancy in zone-3 setting.

PCC advised all the concern utilities to verify the zone 3 settings and review the settings with an intimation to ERPC Secretariat.

Members may update.

Deliberation in the meeting

PCC advised all the concern utilities to verify the zone 3 settings and review the settings with an intimation to ERPC Secretariat.

ITEM NO. C.10: Schedule of training program to be conducted by PRDC

As per AMC, PRDC will conduct training on PDMS and PSCT in state utility premises of Eastern Region. Tentative schedule is given below:

Training in Month	State	Date
June'2018	Bihar	11/06/18 To 15/06/18
July'2018	West Bengal	09/07/18 To 13/07/18
August'2018	Odisha	20/08/18 To 24/08/18
September'2028	Jharkhand	17/09/18 To 21/09/18
October'2018	Sikkim	08/10/18 To 12/10/18

Accordingly, training was conducted at Patna from 11th June 2018 to 15th June 2018.

Members may update.

Deliberation in the meeting

PCC advised WBSETCL, WBPDCL, WBSEDCL, DPL, HEL and CESC to attend the training program in West Bengal scheduled to be held from 9th July 2018.

PCC advised WBSETCL to do the needful for arranging the training program.

ITEM NO. C.11: Non-Operation of 400 kV Binaguri-Rangpo D/C SPS on 9th May 2018

In 67th PCC, it was opined that as per the designed logic, SPS should operate in this case. PCC observed that the CB status of Binaguri end of 400kV Rangpo-Binagruri D/C line was not included to the SPS logic.

PCC advised Powergrid to incorporate the status of CBs of Binaguri along with the Rangpo status in SPS logic at the earliest.

PCC advised Powergrid to check the healthiness of the SPS scheme immediately.

PCC advised ERLDC to fix a date for SPS testing and coordinate with all the concern utilities for SPS testing.

Regarding implementation of SPS through SAS, Powergrid informed that the implementation would complete by July 2018.

PCC advised Powergrid to ensure the relevant data availability of SPS operation to ERLDC through SCADA.

Powergrid may update.

Deliberation in the meeting

Powergrid informed that the work is in progress.

ITEM NO. C.12: Multiple Tripping of 400 kV Ranchi-Raghunathpur circuits in the month of March and April 2018.

In 67th PCC, DVC informed that repeated faults were occurred at same location due to touching of Earth wire of 220kV STPS-New Bishnupur line to 400kV Ranchi-Raghunathpur line conductors.

This was due to insufficient clearance between 400kV Ranchi-Raghunathpur and 220kV STPS-New Bishnupur lines.

DVC added that they are planning to resolve the clearance problem during next opportunity shutdown.

Regarding non-operation of Autorecloser at Raghunathpur, DVC informed that they will check the scheme by end of May 2018 and revert back.

DVC may update.

Deliberation in the meeting

DVC informed that the issue of autorecloser at Raghunathpur end has been rectified.

DVC added that request for shutdown has been placed to resolve the clearance problem.

ITEM NO. C.13: Disturbance at 400/220 kV Biharshariff S/s on 28-03-2018 at 18:43 hrs and 19-03-2018 at 02:02 hrs.

In 66th PCC, BSPTCL was advised to compute the fault level at Biharshariff (BSPTCL) substation and review the over current settings accordingly.

PCC advised BSPTCL and Powergrid to coordinate back up IDMT the over current settings at 220/132 kV ICTs with 440/220kV ICTs so that 220/132 kV ICTs would trip first for any downstream faults.

In 67th PCC, BSPTCL informed that they have computed the revised relay settings for Biharshariff S/s as per the fault level of the substation. They would incorporate the new settings by 24th May 2018.

PCC advised BSPTCL and Powergrid to ensure proper relay coordination between 400kV and 220 kV system including ICTs at Biharshariff S/s.

BSPTCL and Powergrid may update.

Deliberation in the meeting

BSPTCL informed that they have finalized the relay settings in coordination with Powergrid.

ITEM NO. C.14: Disturbance at 220/132 kV Old Purnea S/S on 16-03-2018 at 11:15 hrs

In 66th PCC, members advised BSPTCL to take the following actions:

The relay settings of VT failure at Purnea (B) of 132 KV Purnea (BSPTCL) -Triveniganj s/c should be reviewed

PCC advised Powergrid to take the following actions:

The relay settings of 132kV Old Purnea - Purnea (B) line III and 220/132 kV ICT – III at Old Purnea should be reviewed

Powergrid informed that the relay settings of 132kV Old Purnea - Purnea (B) line III and 220/132 kV ICT – III at Old Purnea have been corrected in coordination with adjacent relay settings.

On enquiry, Powergrid informed that line differential protection is not yet commissioned for all three lines of 132kV Old Purnea - Purnea (B). Some work is yet to be done at Purnea(B).

In 67th PCC, BSPTCL informed that they are ready at their end to implement the differential protection for 132kV Old Purnea-Purnea(BSPTCL) lines.

PCC advised BSPTCL and Powergrid to coordinate each other and commission the differential protection at the earliest.

BSPTCL and Powergrid may update.

Deliberation in the meeting

BSPTCL and Powergrid informed that the differential protection has been commissioned and it is in service.

ITEM NO. C.15: Disturbance at 220/132 kV Patratu S/S on 09-02-2018 at 15:00 hrs

In 65th PCC, JUSNL was advised to take the following measures:

- Check the healthiness of the DC system including end to end cables at 220/132kV Patratu S/s
- Check the healthiness of all Circuit Breakers at 220/132kV Patratu S/s
- Check the healthiness of all the relays installed at 220/132kV Patratu S/s including 220/132kV ATRs
- Check Kanke end relay and CB of 132kV Patratu-Kanke line
- Check the Directional feature of 132 kV Hatia I – Sikidri and 132 kV Namkum - Hatia I line relays at Hatia-I

PCC advised TVNL to verify the zone 1 reach of 220kV Patratu-TVNL line as TVNL end should trip on zone 2 in this case.

In 66th PCC, JUSNL informed that they had visited 220/132kV Patratu S/s on 23rd April 2018 for physical inspection of protection system.

JUSNL added that the primary injection kit was defective hence they could not test the healthiness of the relays. They are planning to engage an agency for checking healthiness of the relays.

JUSNL and TVNL may update.

Deliberation in the meeting

PCC advised JUSNL to comply the observations at the earliest.

ITEM NO. C.16: Disturbance at 220 kV Budhipadar S/s on 01-10-17 at 09:25 hrs

In 62nd PCC, OPTCL informed that Busbar protection maloperated and tripped all the elements connected 220kV bus 1 at Budhipadar.

OPTCL added that the issue has been referred to OEM (Siemens) for rectification.

In 63rd PCC, OPTCL informed that OEM (SIEMENS) visited the Substation on 29th December'2017 and taken the data (i.e. Trip Log, Even Log & DR) for analysis.

In 64th PCC, OPTCL informed that OEM, Siemens has recommended for updating of 7SS52_MCU device firmware version to V4.73 or higher to resolve the restart automatic problems. Accordingly, Siemens will upgrade the firmware.

OPTCL may update.

Deliberation in the meeting

OPTCL informed that the rectification work is going on.

ITEM NO. C.17: Interim Arrangement for substations that are not having bus bar protection In Eastern region

There may be 400 kV or 220 kV substations where either the bus bar is kept out of service for planned shutdown or bus bar protection is not available due to various reasons. Further, the older substations having static busbar scheme would also undergo replacement activity witha numerical scheme for which the bus bar protection will again be required to be withdrawn for a considerable time. Under such scenario, there is need of a mechanism to reduce the bus fault clearance time as the non-availability of bus bar protection can result in delayed fault clearance.In case of any issue of the protection system at remote substations,there may bea widespread outage.

In view of this, it is proposed to adhere to the following philosophy whenever the bus bar protection is kept out or is not available for a considerable amount of time at any 765/400/220 kV substation:

1. Zone 4 (Reverse Zone) timing of all the Lines to be reduced to 300 ms. The LBB should have a high priority or the reverse zone time should be set at least equal to LBB time setting.
2. Healthiness of the carrier protection of all lines is to be ensured.
3. Zone 4 timer reset should be checked in all the relays, as its function needs to be flawless.
4. DMT high set available in the numerical backup Overcurrent (O/C) relays of all the ICTs be properly set to clear the bus fault immediately. The backup O/C protection is coordinated with the upstream and downstream elements;therefore, it would not be possible to make it sensitive as suggested.
5. Bus Coupler overcurrent protection setting to be made lower. Whenever the Bus Bar protection is out the Buses should be operated in split bus mode, to have isolation of the elements on other Buses from feeding the Bus fault.
6. Re-trip feature if available in LBB should also be enabled to take one more attempt of breaker opening.
7. Healthiness of all Protection i.e. both Main and Backup shall be ensured.
8. All the Other Utilities at the remote ends be informed about the Bus Bar protection outage through ERLDC/respective SLDCs

In the case where two separate bus bar protections schemes are available at the substation as Main 1 and Main 2, then the above will not be applicable in the case of the outage of any one of the bus bar protection scheme.

In 65th PCC, all the constituents were advised to send their comments to ERPC and ERLDC.

PCC may discuss.

Deliberation in the meeting

All the constituents were advised to send their comments to ERPC and ERLDC.

ITEM NO. C.18: Earthing Audit report of 400/220 kV Bihar Sharif (PGCIL) substation

In 67th PCC, ERLDC informed that they observed high voltage in healthy phases of Biharshariff S/s during single line to ground fault on 18th April 2018.

Powergrid informed that they have not yet implemented the recommendations of Earthing Audit observations. The recommendations would be implemented by August 2018. Powergrid added that the issue of high voltage in healthy phases during single phase to ground fault would be resolved after implementation of Earthing Audit observations.

PCC advised Powergrid to submit the Earthing Audit report to ERPC and ERLDC.

Powergrid agreed to submit the report within a week.

Powergrid may submit the report.

Deliberation in the meeting

Powergrid submitted the earthing audit report.

ITEM NO. C.19: 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	46	85.19
NTPC	16	14	87.50
NHPC	1	1	100.00
DVC	40	26	65.00
WB	68	49	72.06
Odisha	59	42	71.19
JUSNL	34	25	73.53
BSPTCL	16	5	31.25
IPP (GMR, Sterlite and MPL)	5	5	100.00

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

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

Members may note.

Deliberation in the meeting

Members noted for compliance.

ITEM NO. C.20: Repeated pole blocking at HVDC Sasaram

In 63rd PCC, Powergrid submitted the report which is enclosed at **Annexure-C20**.

In 64th PCC, Powergrid informed that they are implementing the observations. PCC advised Powergrid update the status in monthly PCC Meetings.

Powergrid informed that as per OEM recommendation they have to install air condition system to minimize the temperature of the control panels.

PCC advised Powergrid to submit the details to ERPC and ERLDC.

In 66th PCC, Powergrid informed that as per OEM recommendation they have to install air condition system to minimize the temperature of the control panels which is under procurement.

Powergrid may update.

Deliberation in the meeting

Members noted.

ITEM NO. C.21: Non-commissioning of PLCC / OPGW and non-implementation of carrier aided tripping in 220kV and above lines.

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

List of line where auto reclose facility is not available(Information based on PMU data analysis)							
S. No	**Transmission Lines name**	**Date of Tripping**	**Reason of Tripping**	**Owner Detail**		**Present Status**	
				End-1	**End-2**	**OPGW/PLCC Link available**	**AR facility functional**
13	220KV BUDIPADAR-KORBA-II	23.06.16	Y-N FAULT	OPTCL	CSEB	PLCC available	will be activated in consultation with Korba
17	220 KV TSTPP-RENGALI	17.07.16	EARTH FAULT	NTPC	OPTCL		by March 2018
18	220KV BUDIPADAR-RAIGARH	21.07.16	EARTH FAULT	OPTCL	PGCIL	PLCC defective	
19	400 KV KOLAGHAT-KHARAGPUR-II	03.08.16	Y-N FAULT	WBPDCL	WBSETCL		
20	220 KV FARAKKA-LALMATIA	03.08.16	B-N FAULT .	NTPC	JUNSL	Yes	Old Relay and not functional. 7-8 months required for auto re-close relay procurement.
23	220 KV MUZAFFARPUR - HAZIPUR - II	10.08.16	B-N FAULT	PGCIL	BSPTCL		Voice established. For carrier required shutdown

24	220 KV ROURKELA - TARKERA-II	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	Expected to install protection coupler by Jan 17
27	220 KV BIHARSARIF-TENUGHAT	07.09.16	B-N FAULT	BSPTCL	TVNL		
32	220KV Bidhannagar-Waria-II			WBSETCL	DVC		
33	220KV Jamshedpur-Jindal-SC						

34th TCC advised all the respective members to update the above list along with the last tripping status in next PCC meeting.

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

OPTCL:

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

BSPTCL:

1. 220kV Purnea (PG)-Madhepura line
2. 220 kV Biharshariff- Begusarai line
3. 220 kV Biharshariff- Bodhgaya line
4. 220kV MTPS-Motiari line

Work is in progress expected to be commissioned by December 2017.

5. 220KV Madhepura-New Purnea D/C — Auto recloser is out of service at Madhepura
6. 220KV Muzaffarpur-Hajipur D/C line — Auto recloser is out of service at Hazipur
7. 220KV FSTPP-Lalmatia-1 — Auto recloser is out of service at Lalmatia
8. 220KV Patna-Khagaul-SC — Auto recloser is out of service at Khagual

In 65th PCC, Powergrid informed that they will replace the Autorecloser relay of 400 kV Rourkela-Chaibasa 1 and 400 kV Meramundali-Sterlite 1 & 2 by April 2018.

In 67th PCC, BSPTCL informed that they are planning to hire an agency for implementing PLCC system in all the lines in their network.

Members may update the status.

Deliberation in the meeting

Members noted for compliance.

ITEM NO. C.22: Coordination of Auto-Reclsoure on the Transmission lines emanating from generating substation

Many of the Generating stations adopt delayed Auto-reclosure scheme by sensing of the successful Auto-reclosure at the remote end through voltage buildup. In this way if the fault is persisting then it will not be attempting auto-reclosure as line will be in trip condition from the remote end thus there will be no voltage buildup. The intent of this scheme is to avoid generator to feed the fault current on more than one occasion in case of permanent nature of the fault. However, certain issues have been observed in the real-time cases, which are described below:

1. **A/R Time coordination:** In many instances, it has been observed that even in case of unsuccessful A/R from other end, the generating end is attempting Auto-reclosure and thus once again feeding the fault causing double voltage dip. This defies the whole purpose of this scheme. In such cases, either there should be a direct trip sent from the remote end after unsuccessful auto –reclosure or Tripping of the circuit at generating end after the delay introduced for sensing of voltage buildup after A/R timing.
2. **Activation of TOR protection:** Delayed feeding of Fault during A/R has been observed in case of Zone 2 fault from one of the ends. This has happened when the fault is not in the Overlapped Zone 1area from both ends of the transmission line. Under this condition, it has been observed that if the end from where the fault is in zone 2 takes the first attempt for A/R then will see the fault in zone 2 and clear in zone 2 timing (350 ms). This has resulted in delayed fault feeding to the system, which is highly undesirable. Under such condition, if TOR (trip on reclose) protection would have been enabled/activated, then it will trip immediately irrespective of the zone for such scheme.

In 66th PCC, Members opined that TOR (trip on reclose) protection should be activated to minimize the fault feeding period. PCC advised WBSETCL to take appropriate action.

WBSETCL may update.

Deliberation in the meeting

WBSETCL informed that they have activated the TOR protection as per PCC recommendation.

ITEM NO. C.23: Sequence of operation of HVDC Talcher-Kolar D/C line - ERLDC

ERLDC requested Powergrid and NTPC to submit the details of sequence operation of HVDC Talcher-Kolar D/C for a fault in the line along with the sequence of SPS operation.

In 67th PCC, Powergrid and NTPC agreed to submit the details.

ERLDC, Powergrid and NTPC may update.

Deliberation in the meeting

PCC advised Powergrid and NTPC to submit the relevant details to ERLDC.

ITEM NO. C.24: Checklist for submission of updated data for Protection Database

The network data in Protection Database needs to be updated on regular basis on account of commissioning of new elements in the CTU as well as STU networks. Accordingly a checklist has been prepared which is enclosed in **Annexure-C24**.

All the constituents requested to submit the checklist on monthly bases in every OCC/PCC meetings.

Constituents may note.

Deliberation in the meeting

Members noted.

ITEM NO. C.25: Additional Agenda

Meeting ended with vote of thanks to the chair.

****

Annexure-A

Participants in 68th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata Time: 10:30 hrs Date: 18.06.2018 (Monday)

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

Participants in 68th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata | Time: 10:30 hrs | Date: 18.06.2018 (Monday)

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36	BHOUVIK BAGCHI	AM (PS), WBPDCL	8293800723	s.bagchi01@wbpdcl.co.in	[signature]
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Participants in 68th PCC Meeting of ERPC

Venue: ERPC Conference Room, Kolkata Time: 10:30 hrs Date: 18.06.2018 (Monday)

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

TOTAL POWER FAILURE AT DSTPS 400KV BUS ON 10.05.2018

SEQUENCE AND ANALYSIS OF EVENTS

- At about 06.09 hrs of 10.05.2018 all lines, both GTs and both ST tripped together causing total power failure of DSTPS 400KV Switchyard. The weather was very stormy with rain, thunder and high wind velocity during that time.
- A C-N fault occurred in RTPS # 2 at about 06:09:08.736 hrs. The said line trips through Distance Zone 1 from both ends and recloses successfully after dead time.
- Within 5sec i.e. at 06.09.13.221, there is another CN fault within RTPS # 2 line section. The said line again trips through Distance Zone 1 from both ends but this time AR goes to lockout as the fault is within the reclaim time thus forcing a 3 pole trip.

SEQUENCE AND ANALYSIS OF EVENTS

- Both M1 & M2 relays issued single pole trip in C Phase but the C pole of the Main CB did not open. This was a Main CB LBB condition but LBB protection did not get initiated in both M1 and M2 LBB Relays. Hence the fault was not cleared by operation of LBB protection.
- There was no tripping during this fault from RTPS end as the line was already OPEN from there. The Main CB was OPEN due unsuccessful AR of Main CB during a previous fault in this line(at about 05:38:39 hrs) and the Tie CB had opened form AR Lockout condition due to the fault in RTPS # 2 line 06:09:08.736.
- As the fault continued in RTPS #1, Distance zone 2 appeared in the Distance relays causing 86A & 86B to operate. This had caused the other poles of the CB to open. But the C pole remained stuck as evident from the continuation of the fault current in the C Phase.

SEQUENCE AND ANALYSIS OF EVENTS

- However the CB status as read by both the Busbar PUs of RTPS # 1 bay showed Main CB as OPENED because as per scheme CB Closed BI is HIGH when all the CB poles are closed together. As soon as the CB closed signal goes LOW, Dead Zone protection picks up in both RTPS # 1 PUs as the PU is sensing current yet the Main CB is OPEN which is a correct Dead Zone fault condition.
- As the fault in C Phase of RTPS # 1 continues the fault is cleared by operation GT#1 and GT # 2 Standby E/F Protection and from Jamshedpur end through Distance Zone-3 of both lines.
- After all the sources trip the voltage at DSTPS 400 KV bus remain for about another 637 ms approx. due to the back feeding from LV board motors via ST. This voltage creates a resonance between ST inductance and Jamshedpur line capacitance. Evidence of existence of this voltage is confirmed from the DR of Jamshedpur Line and ST. This voltage waveform during this period is seen to be rich in 2^{nd} and 3^{rd} harmonics.

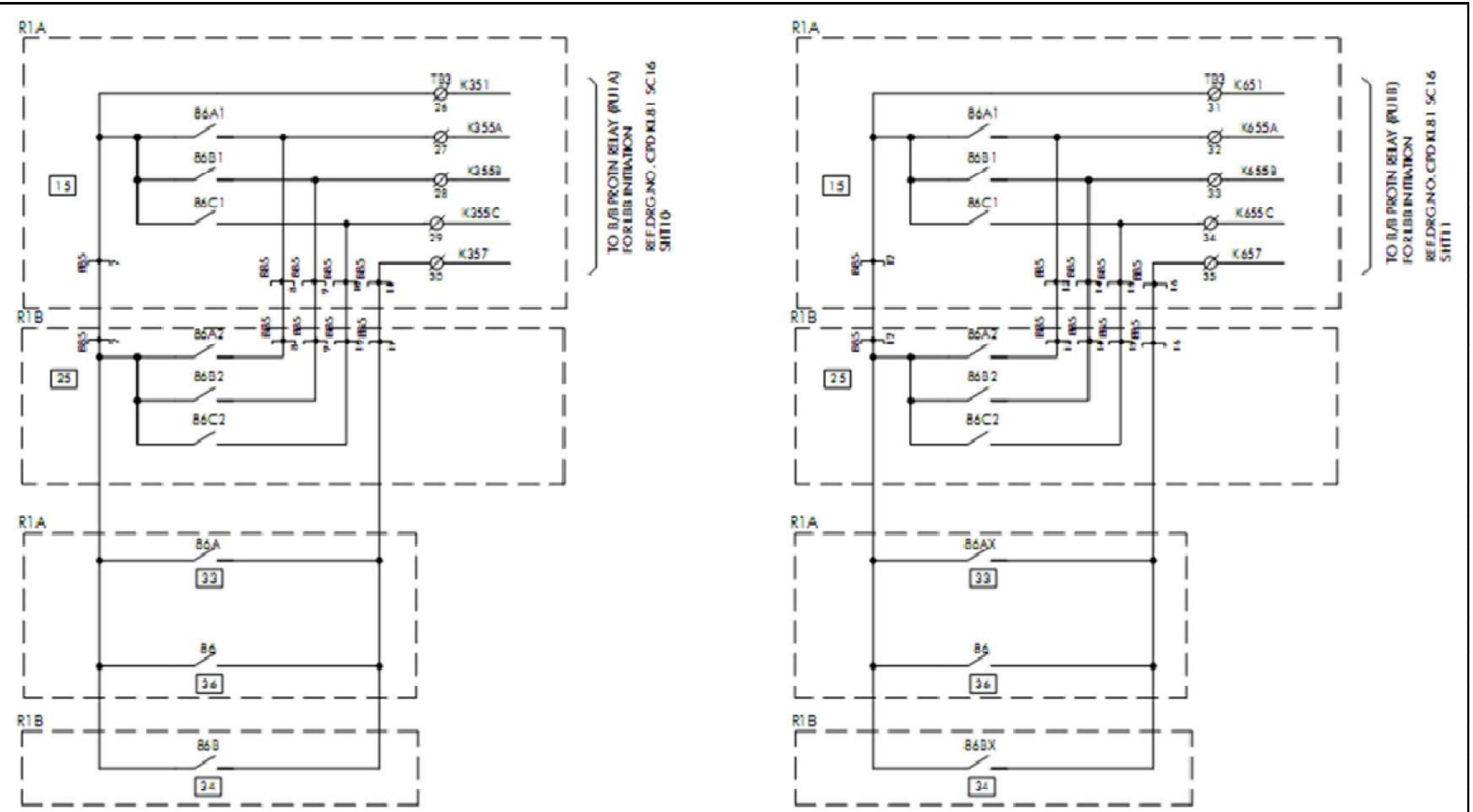
SEQUENCE AND ANALYSIS OF EVENTS

- The frequency of this voltage is seen to be decreasing with time showing the slowing down of Induction Motors feeding the ST.
- It is seen from DR of STs that over-fluxing (V/f) and differential 2nd harmonic block had picked up in both ST # 1 & ST # 2 differential relays which had blocked the operation of differential function of both STs throughout this period.
- Both STs trip through Differential after 2nd harmonic content had marginally decreased below the blocking threshold causing the harmonic blocking to be withdrawn.
- After ST trips the 400KV DSTPS bus becomes dead.

FINDINGS AND CORRECTIVE MEASURES

- During checking of protection circuit of RTPS Line # 1, +ve wire for initiation of LBB in both PU1A & PU2A was found open in the TB3 26 & 31 respectively in R1A. This had resulted in non-appearance of LBB protection in RTPS # 1 leading to TPF at DSTPS 400KV.
- The opened LBB initiation DC +ve wire was reconnected as per drawing.

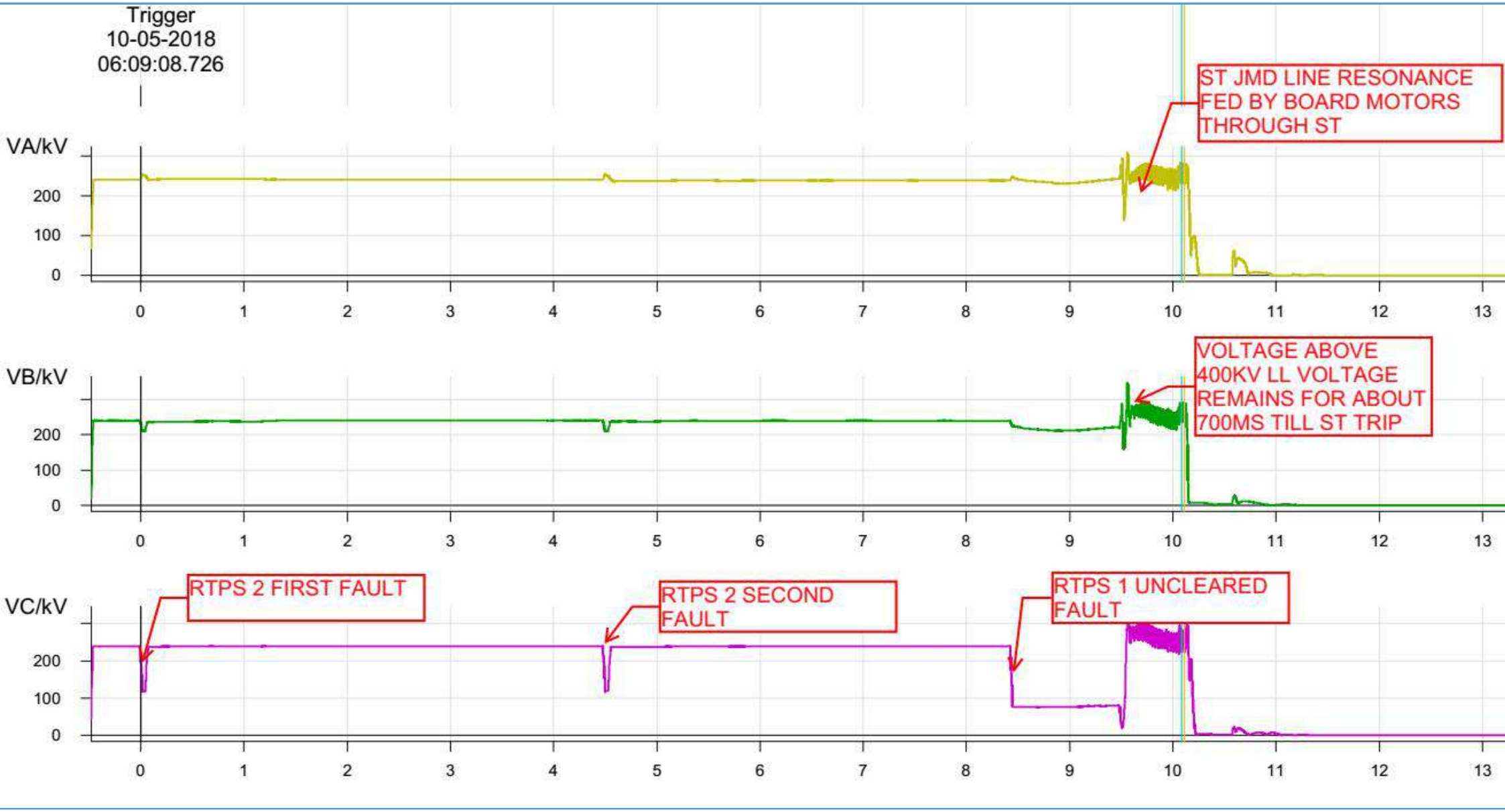
86 contacts going to LBB INI



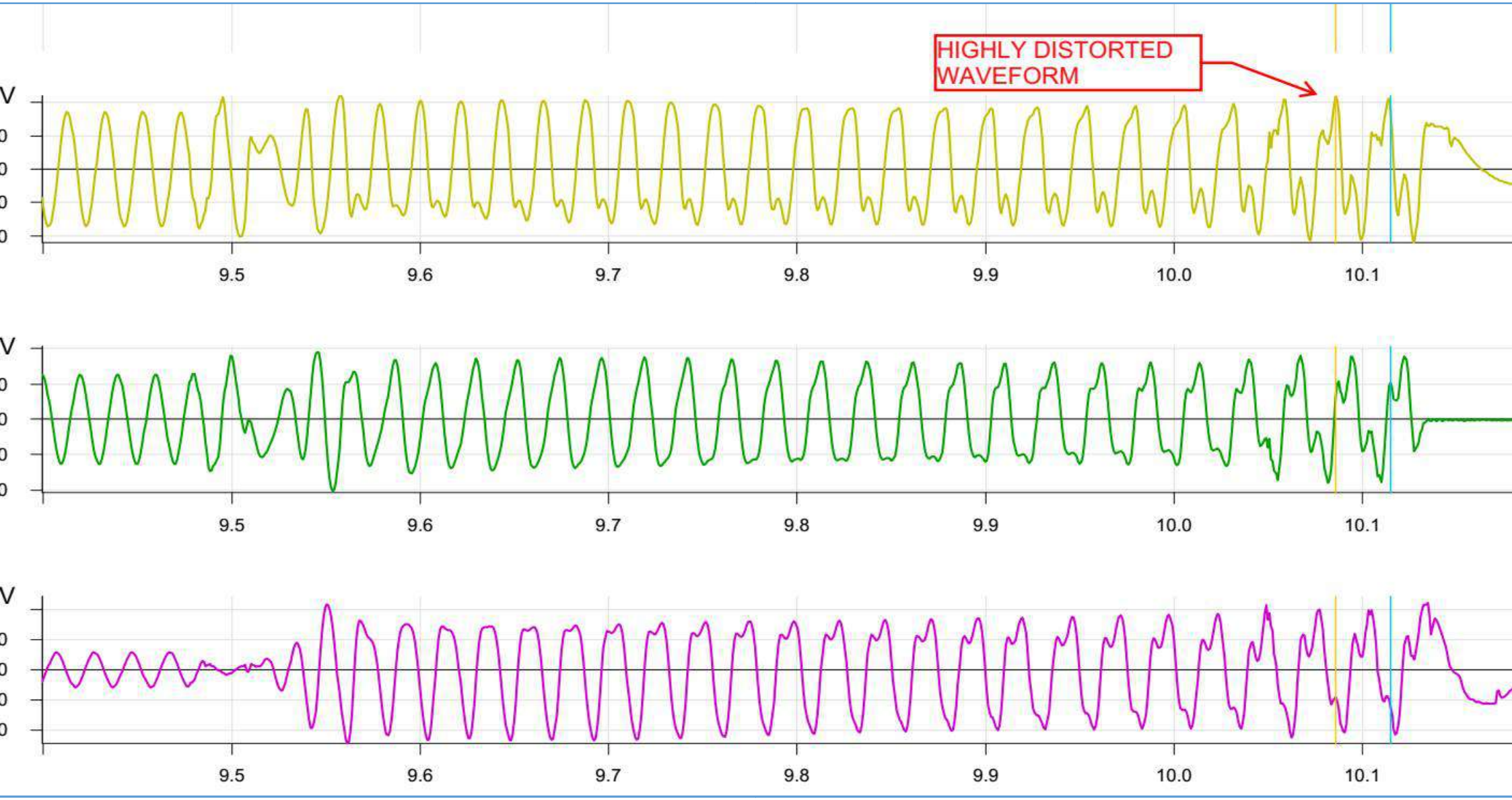
REMEDIAL MEASURES

- The LED for LBB initiation present in Busbar Peripheral Units of each bays appears whenever there is any lockout operation in any bay.
- Shift personnel have been advised to note the appearance of this LED following any tripping before resetting the lockout relays. In case there is no appearance of LBB initiation LED in any bay after appearance lockout relays leading to three pole trip during any tripping the same must be noted and reported.
- Maintenance and testing of all HV Circuit Breakers needs to be carried out at least once in a year which is currently the normal practice.

BUS VOLTAGES – DSTPS END



BUS VOLTAGES AFTER SOURCE TRIP



Annexure-B2

22OKV SYSTEM DISTURBANCE REPORT

220/132/33 KV GRID SUBSTATION - JAYANAGAR

DATE: 25.05.2018

16 : 30 : : 37 Hrs

- Name Of The Station: 220/132/33 KV GRID S/S-JAYANAGAR
- Weather Condition : Cloudy With Heavy Wind Flow
- 220KV Bus Scheme : One & Half
- Disturbance Duration : 30 minutes
- Protection Scheme of Line : DP relay(Main-1 only) & Directional Backup
- DC Source for Control & Protection : Single Source Provision Available (DC-1 Only)

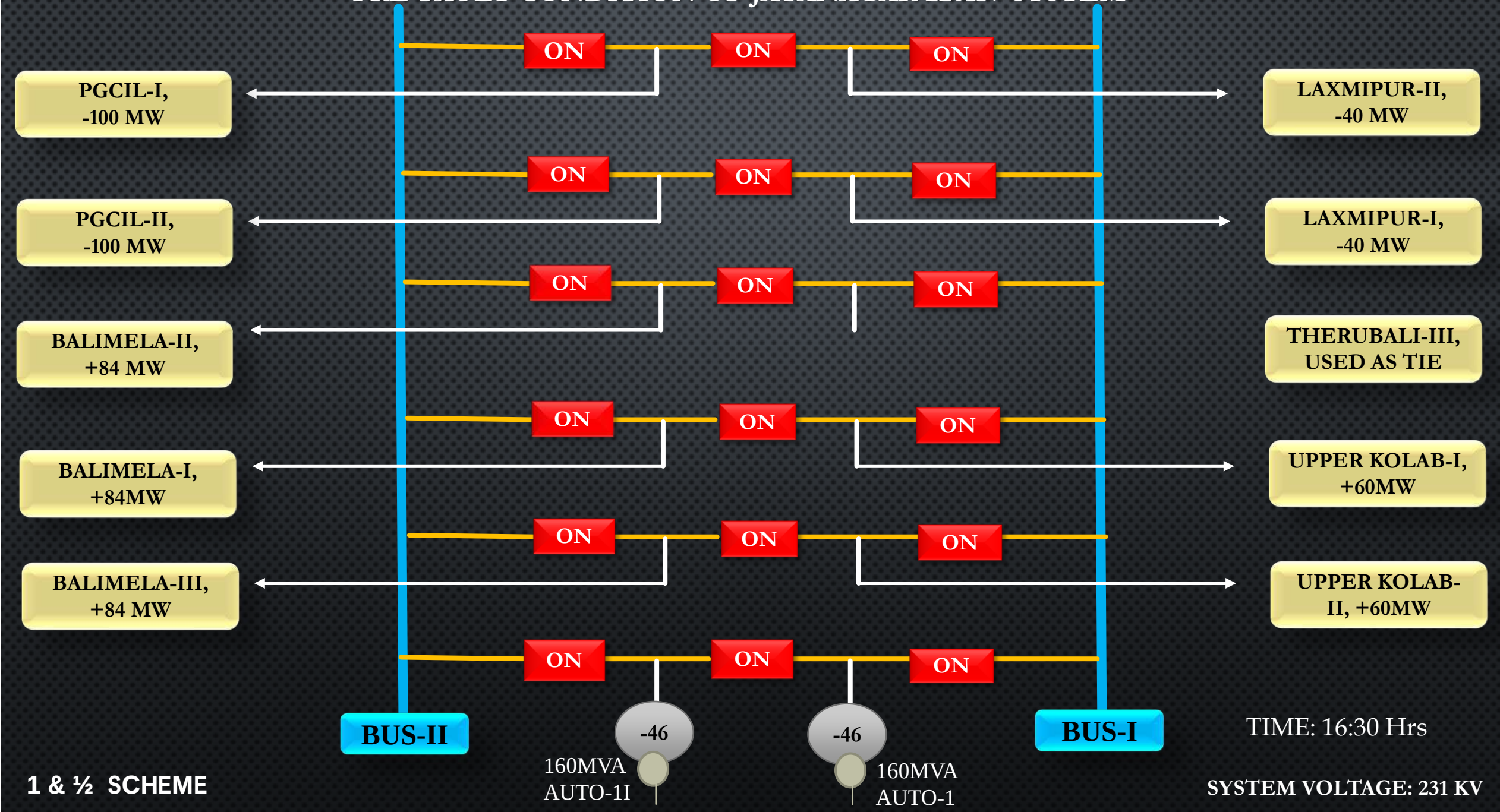
BUS-I →	Lxmpr-2	Lxmpr-1	Thv-3	U.Kolab-1	U.Kolab-2	Auto-1
TIE :-	1	2	3	4	5	6
BUS-II →	PGCIL-1	PGCIL-2	Balimela-2	Balimela-1	Balimela-3	Auto-2

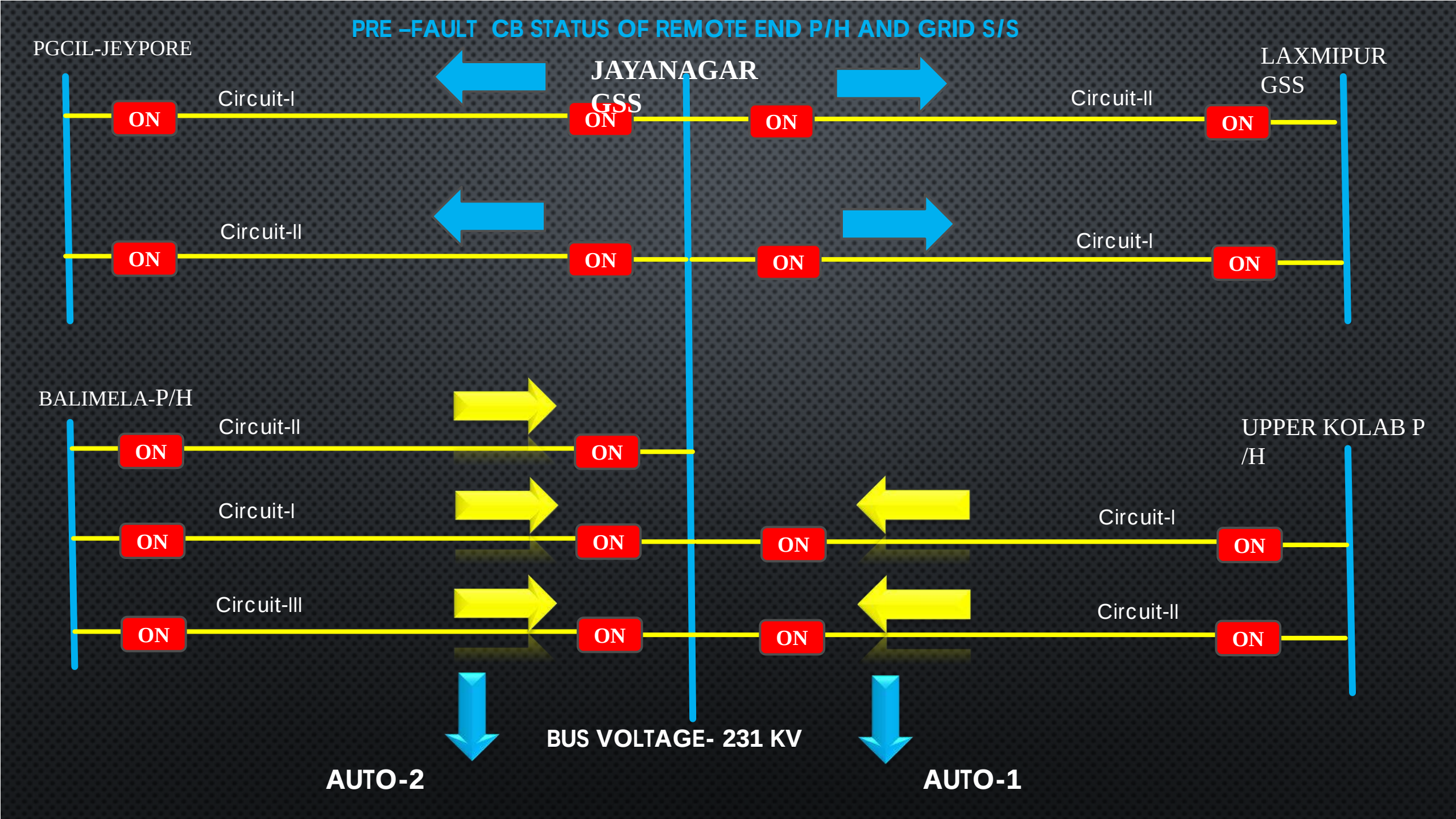
INCIDENT DETAILS:

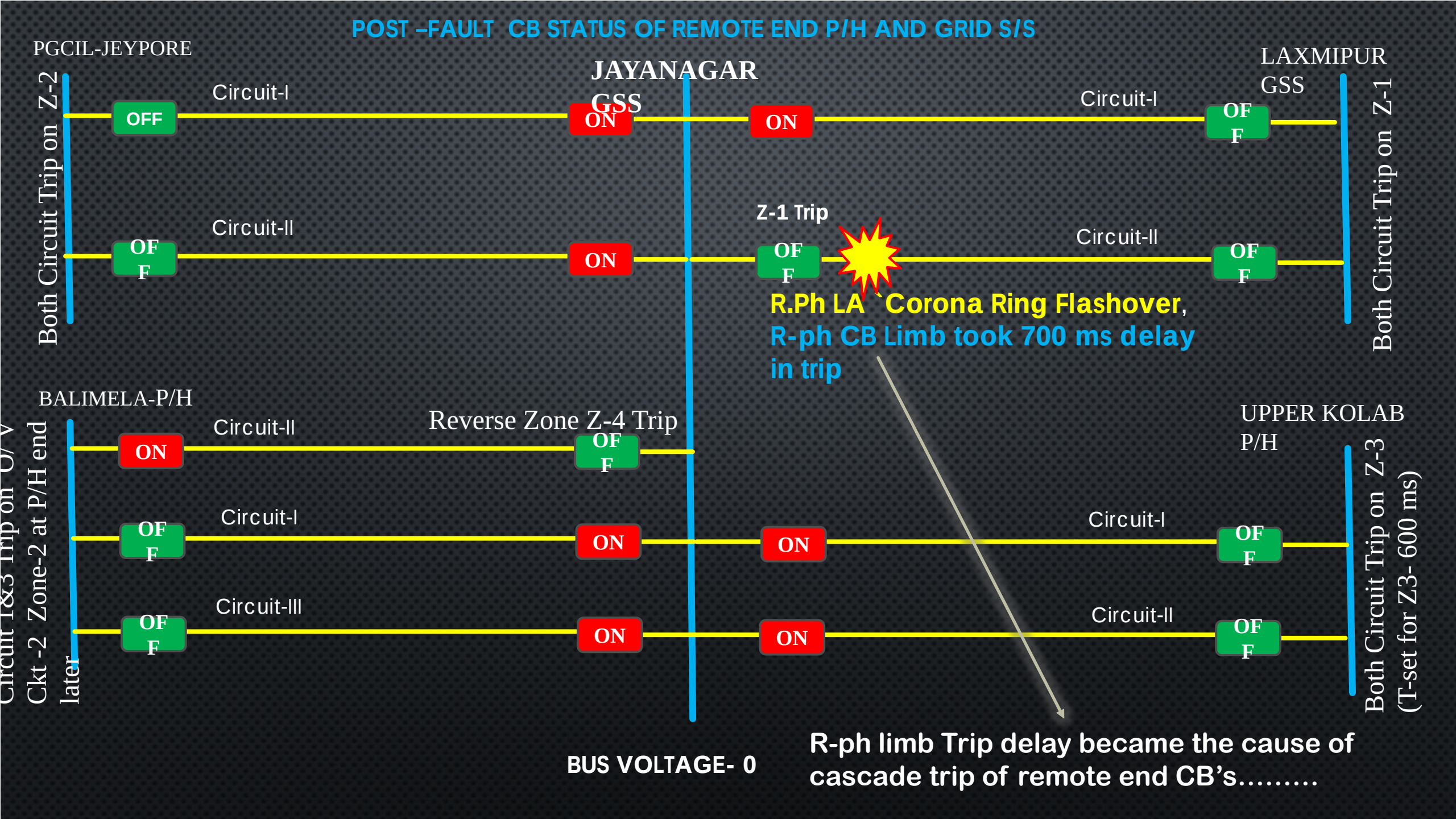
At 16:30:37 Hrs. a heavy flashover occurred in R-phase LA top corona grading ring of 220KV Laxmipur-1 feeder with fault current 12.8 KA. From the field visit it was observed that, the fault current had discharged from the corona ring of the L.A to the ground through a small nearby tree which might have swung to the induction zone of the corona ring of the R phase L.A due to heavy wind flow. Then, the healthiness of the LA was tested and found to be satisfactory. Then the feeder was taken in to service with same LA by replacing grading ring only.

Time	220KV Feeder/Bay Name	JAYANAGAR GSS END	REMOTE END PH/GRID	Remarks
		Trip Details	Trip Details	
16:30:38:	Laxmipur-1	R-N, Zone-1 & Back-up. I=12.8KAmps	R Ph-N,Zone-1	All 8 Nos. feeders tripped at Remote End.
16:30:38	Laxmipur-2	CB in ON Condition	R Ph-N,Zone-1	
16:30:38:	PGCIL-1	CB in ON Condition	R Ph-N, Zone-2	
16:30:38	PGCIL-2	CB in ON Condition	R-Ph-N,Zone-2	
16:30:38:	Balimela-1	CB in ON Condition	Over Voltage	
16:30:38	Balimela-2	R-N,Z-4(Reverse)	Zone-2	
16:30:38:	Balimela-3	CB in ON Condition	Over Voltage	
16:30:38	Upper Kolab-1	CB in ON Condition	R Ph-N,Zone-3 (T Set-600 ms)	
16:30:38	Upper Kolab-2	CB in ON Condition	R Ph-N,Zone-3 (T set-600 ms)	

PRE-FAULT CONDITION OF JAYANAGAR 220KV SYSTEM




PRE –FAULT CB STATUS OF REMOTE END P/H AND GRID S/S
PGCIL-JEYPORE
JAYANAGAR GSS
LAXMIPUR GSS
Circuit-I
Circuit-II
ON
BALIMELA-P/H
UPPER KOLAB P /H
Circuit-III
BUS VOLTAGE- 231 KV
AUTO-2
AUTO-1

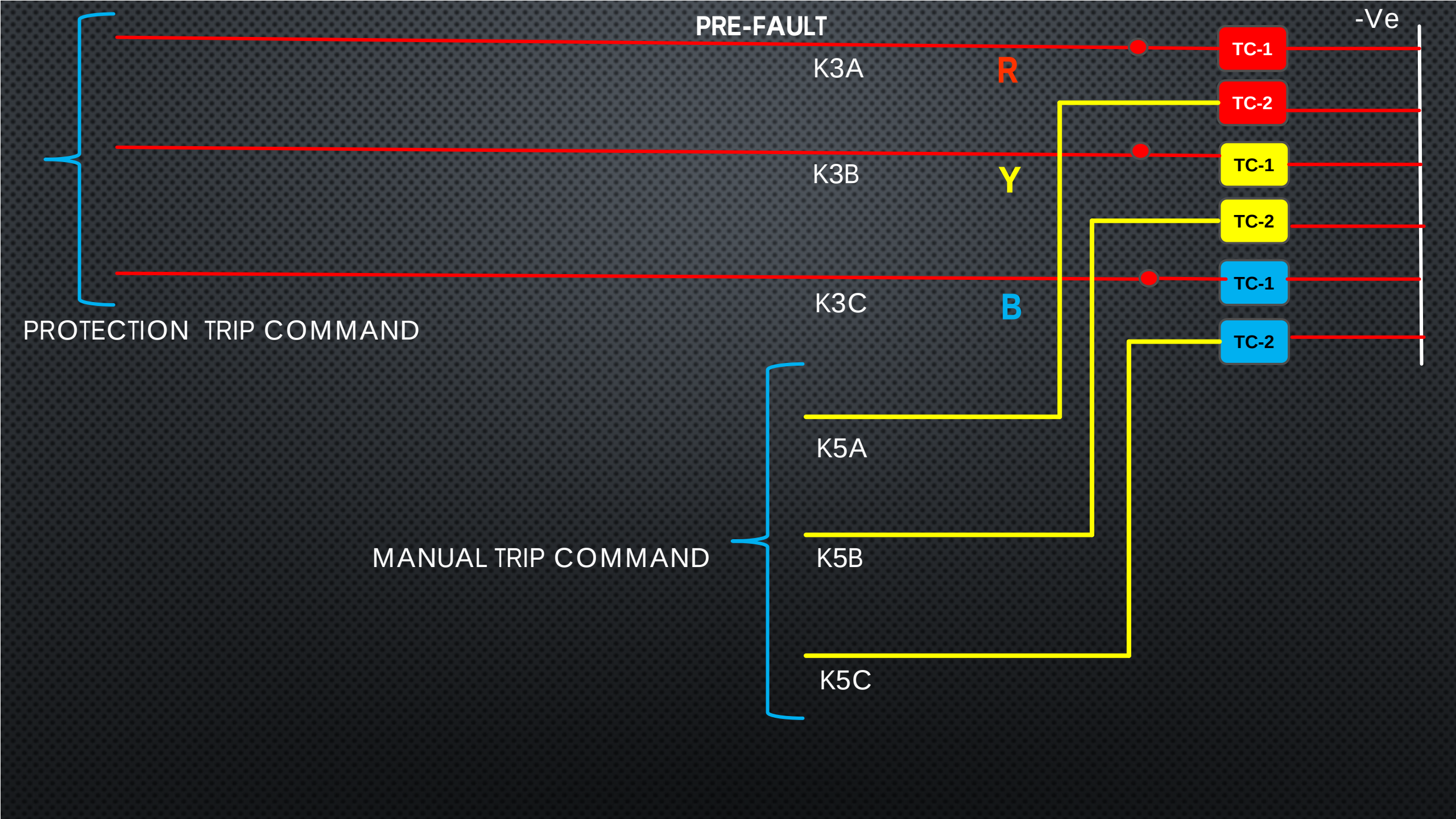

POST –FAULT CB STATUS OF REMOTE END P/H AND GRID S/S
PGCIL-JEYPORE
JAYANAGAR GSS
LAXMIPUR GSS
Both Circuit Trip on Z-2
Both Circuit Trip on Z-1
Circuit-I
Circuit-II
OFF
ON
OFF
Z-1 Trip
R.Ph LA `Corona Ring Flashover,
R-ph CB Limb took 700 ms delay in trip
BALIMELA-P/H
UPPER KOLAB P/H
Reverse Zone Z-4 Trip
Circuit-III
Circuit I&3 Trip on O/V Ckt -2 Zone-2 at P/H end later
Both Circuit Trip on Z-3 (T-set for Z3- 600 ms)
BUS VOLTAGE- 0
R-ph limb Trip delay became the cause of cascade trip of remote end CB's……

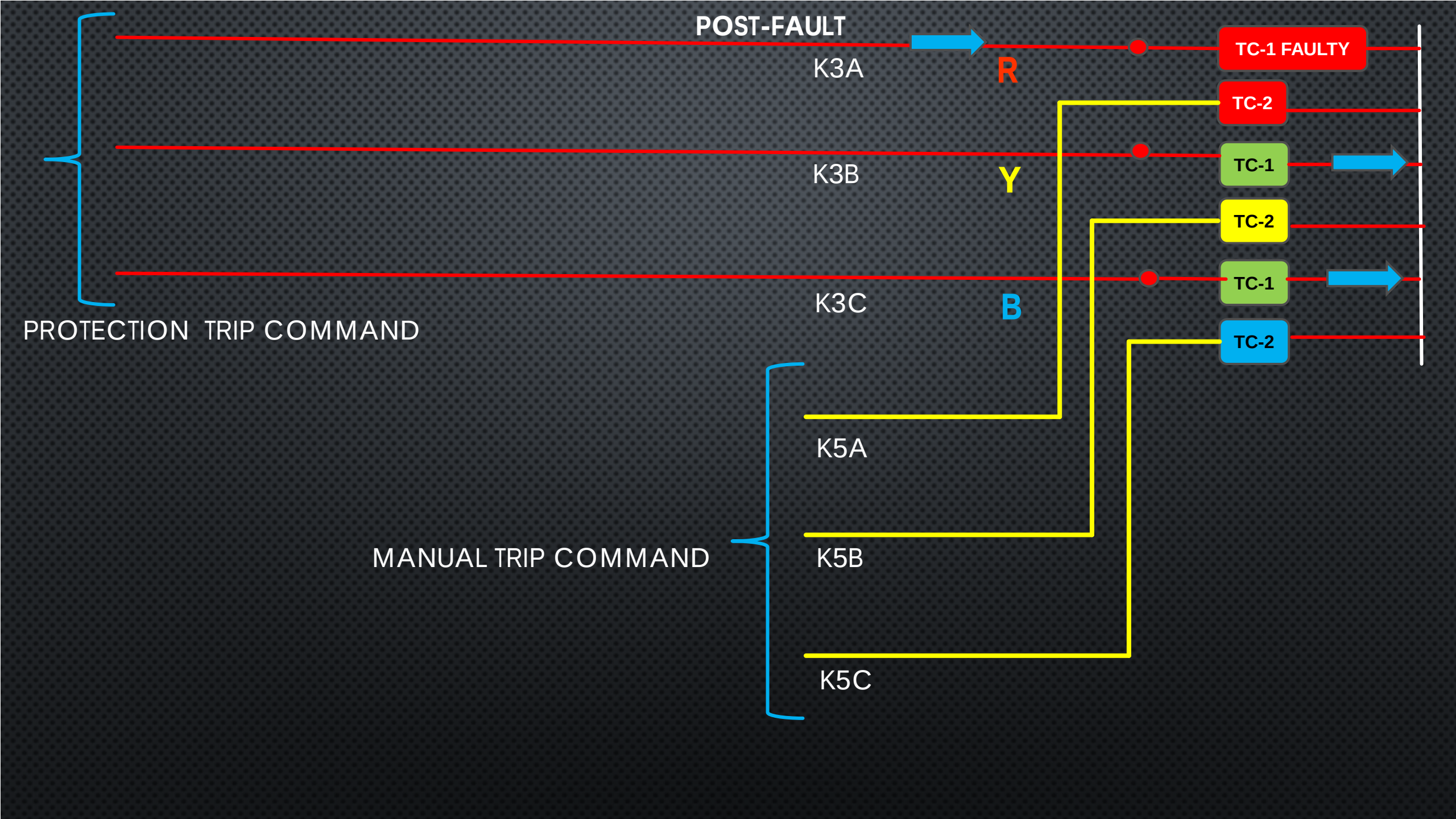
DISTURBANCE ANALYSIS:

At 16:30:37 Hrs 220KV Laxmipur-1 relays (i.e DP, Zone-1 & Back-up) initiated tripping command for bus side CB & its Tie CB. Instantaneously tie CB and Bus side CB (Y&B-Phase) tripped at Jayanagar GSS, But R-phase limb of bus side CB didn't trip up to 700ms. PDR also operated but R-phase limb didn't trip up to 700ms. During this time SIEMENS make bus-bar Prot./LBB also did not operate & found that the Bus zone-1 of Bus bar Protection scheme is in blocking mode by the Central Unit. Later it was found that Upper Kolab-1 Bay Unit (BU-7) relay not sensing the R-phase current even though balanced current was flowing in the BU, due to which the Central Unit(CU) blocked the Bus-1 diff. protection/LBB.

Cascade situation arised due to 700ms delay in tripping of R-ph limb (i.e Laxmipur-1), so line feeders which were connected to the Jayanagar GSS tripped at remote end.

- 220KV PGCIL-1&2 = Tripped at PGCIL end on Distance(Main-1&2) , Zone-2, R ph-N
- 220KV Laxmipur-1&2= Tripped at Laxmipur end on Distance with Zone-1, R-ph-N
- 220KV Balimela -1& 3 tripped at P/H end on O/V. But Ckt -2 didn't trip at P/H so same was tripped on Z-4(Reverse Zone) at Jayanagar GSS.
- 220KV Upper Kolab-1 &2 tripped at P/H end on Distance fault with Z-3(Time set for Z-3=500ms)


PRE-FAULT
-Ve
K3A
R
TC-1
TC-2
K3B
Y
TC-1
TC-2
K3C
B
TC-1
TC-2
PROTECTION TRIP COMMAND
K5A
K5B
K5C
MANUAL TRIP COMMAND


POST-FAULT
K3A
R
TC-1 FAULTY
TC-2
K3B
Y
TC-1
TC-2
K3C
B
TC-1
TC-2
PROTECTION TRIP COMMAND
K5A
K5B
K5C
MANUAL TRIP COMMAND

ACTION TAKEN:

1. Faulty trip Coil was changed with new a one. Both the Trip coils were used for protection trip. Also requested to provide Main-2 Dist. Prot Relay for line feeders.

2. At present the faulty bay unit (BU-7) of SIEMENS Bus-bar scheme has been kept out of service to keep active Bus Zone-1 for operation. The problem has been informed to M/s SIEMENS for taking necessary steps to rectify the issue.

3. At present PDR setting of Siemens make CB has been kept minimum with adjustment (i.e 360 ms). But the same will be replaced with a new one very soon.

System Normalisation

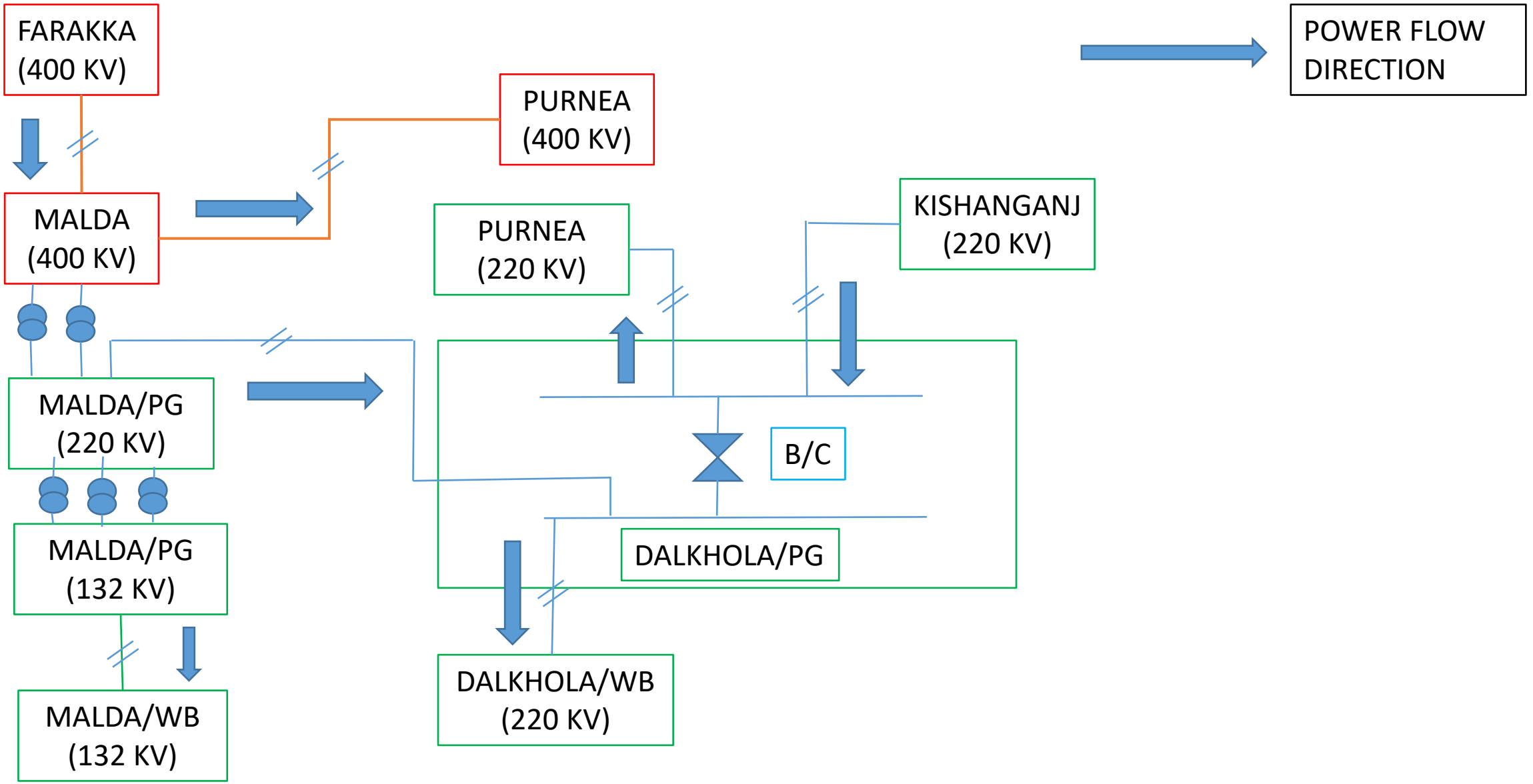
1. 17:01 hrs – PGCIL-1 circuit Charged and then its Tie CB charged.
By charging Laxmipur-2 circuit both 220KV Bus-1 & Bus-II charged and load extended through Auto Transformer –I & 2 subsequently.

2. 17:08 to 17:19 hrs- During this period Balimela & Upper Kolab circuits were charged and system was fully normalised.

The 220KV system of Jayanagar Grid Substation was disturbed after 2 Years. Hope such incidents will not happen in future and also OPTCL will extend service to provide more stable system in efficient manner.

REPORT ON 400KV BUS-I&II AT 400/220/132KV MALDA SUBSTATION ON DATED 29.05.2018

MALDA/DALKHOLA NETWORK DIAGRAM



Brief details:-

- 400 KV Bus-I&II tripped at 19:04:21 Hrs. on dated 28.05.2018 at 400 KV Malda substation due to operation of 400KV bus-bar relay.
- Before that, there was a tripping in 400KV Malda-Purnea Ckt.-II at 19:04:19 Hrs. on dated: 28.05.2018. The relay details: R-N, Ir=4KA, D=65KM, Zone-I, A/R optd. in first fault but again tripped in persistence fault.

- 400KV Feeders distribution in 400KV Bus before the incident:

Bus-I: 400 KV MLD-PRN Ckt.-I,

400 KV MLD-FRK Ckt.-I,

315 MVA ICT-V

Bus-II: 400 KV MLD-PRN Ckt.-II,

400 KV MLD-FRK Ckt.-II,

315 MVA ICT-III

TRIP SEQUENCE:

Sl. No.	Time (hrs.)	Incident	Remarks
1	19:04:19	400KV Malda-Purnea Ckt-II Tripped	R-N fault, Ir=3.7.62 KA, D=64 KM, A/R attempt initiated.
2	19:04:20	Again tripped after A/R operation due to persistence fault	R-N fault, Ir=4.62 KA, D=65.8 KM, A/R Lockout and 3-phase tripped.
3	19:04:20.138	400 KV MLD-FAR D/C, MLD-PRN-I, ICT-III & V tripped	Due to 400 KV Bus-bar relay-I&II operation
4	19:04:30:314	220KV KSHN-DLK D/C Tripped	TEF protection operated at Kishanganj end. After DR checking it observed TEF operated due to un-balanced current and measured value is very low i.e. Ir=512A, Iy=715A and Ib=233A.

Overview:

- 400KV Malda-Purnea Ckt.-II tripped in R-N fault. at 19:04:19 Hrs. on dated: 28.05.2018.
- 400 KV Bus-I & II tripped at 19:04:21 Hrs. on dated 28.05.2018 at 400 KV Malda substation. This caused complete 400KV Bus-I & II dead of Malda. However, 400 KV Bus Coupler CB did not open at Malda SS and afterwards opened manually.
- 220 KV Kishanganj-DLK-D/C tripped from Kishanganj end causing power flow Zero at Dalkhola station. Expect B/C CB, no other CB opened at Dalkhola station. This causes 220 KV Bus-I & II became no-voltage-no-power condition at Malda & Dalkhola.
- 220KV KSNJ-DLK D/C tripped in TEF (Transient Earth Fault) protection from Kishanganj SS end only.

Critical points…….

- WHY Both 400 KV Bus protection operated at Malda SS ?
- Why Bus Coupler CB at Malda end did not opened although Bus Bar protection operated?
- Why 220 KV Dalkhola SS become dead?

Causes of operation of Bus Bar protection (Both Bus) & non-opening of Bus Coupler CB at Malda.

- 400kV Malda-Purnea Line-2 tripped on Reclose due to permanent earth fault with fault Current 4.8 KA in R-phase.
- The said feeder was connected in Bus-2. As the 400KV two Bus was in service, the said fault current shared by both Bus. During detail checking it was found that sharing of fault current by Bus-1 is around 2.8kA and remaining from Bus-2. The above said fault current shared by all feeders connected in Bus-1&Bus-2.
- From the above, it is observed that No Bus fault present in that time. It may be current summation issue in the relay.
- Normally, In each Bus, 3 feeders were connected and sharing of power from Bus-1 to Bus-2 is almost zero and spill current also almost zero due to balance distribution of feeders in Bus-1 and Bus-2.
- During investigation it was found that when 400kV Purnea-2 line is in De-energized condition, the spill current found in Main-1&2 Busbar relay is in the range of 160 A which is exactly matching with spill current.
- From the above it is very clear that summation of Bus Coupler current is the main issue in the Bus Bar Relays. During prefault condition the spill current is almost zero .During Line fault Bus coupler current was 2.8 kA and same was reflected in spill. As the relay setting is 2.6 kA, the both Main-1 & Main-2 Busbar Relay operated.
- During detail checking of Busbar Relays parameter, setting it was found that Binary Input of Bus Coupler CB Open status 1 (High) , In the relay Binary input of CB open status 1 (High) means Bus Coupler current will force to zero i.e. it is not considered for summation also not for tripping of Bus Coupler CB during BB relay operated.

Causes of operation of Bus Bar protection (Both Bus) & non-opening of Bus Coupler CB at Malda…Contd…

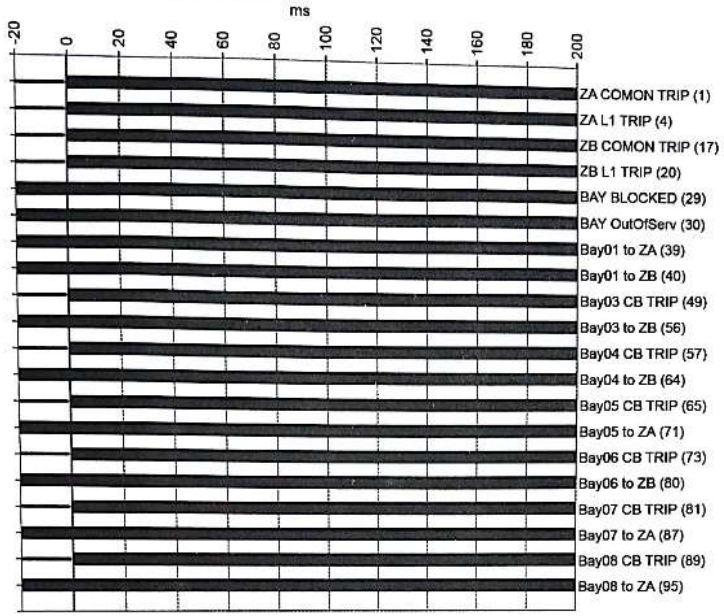
- During detail checking of the same, it was found that Bus Coupler Open Status given from Contact Multiplier (Using NC Contact) to both the relays as per scheme. However, on detail investigation, the specific cable is found in cut condition forcing the status as open.

- As in normal condition due to balance sharing of feeder in Bus-1 &2 it is not possible to identify the spill current as Bus Coupler Current is almost zero and there is no mechanism to monitor the CB status input is proper or not. For monitoring the same one supervision indication lamp/Annunciation is already installed for unhealthy status of CB input as per relay requirement.

ABB

Binary Time Diagram

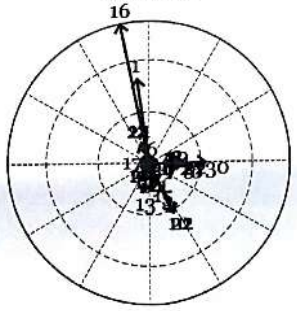
Trig Date Time: 28-May-18 7:06:21:474 PM



Vector Diagrams

Calculation Interval : -17 ms to 1 ms

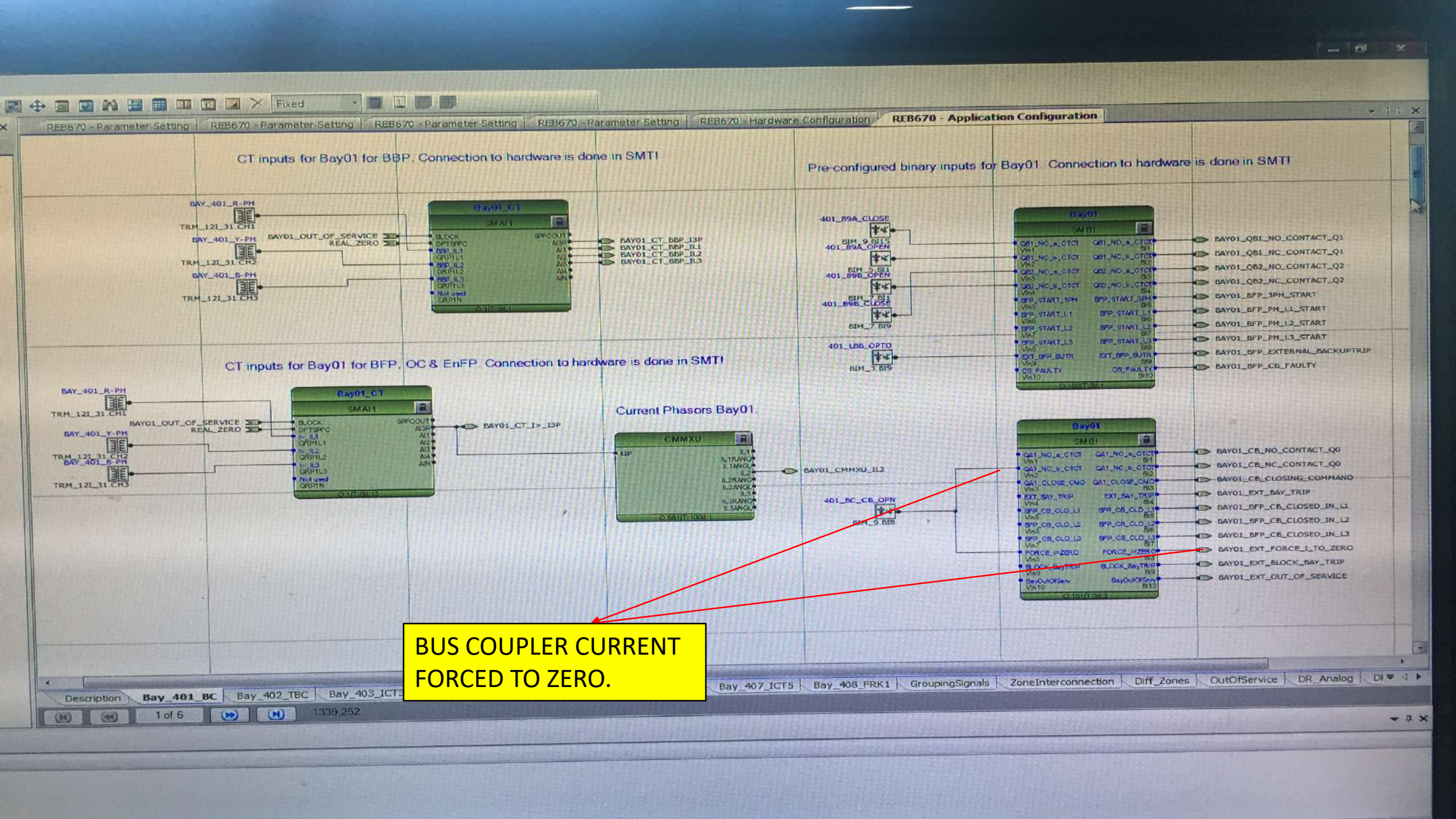
Currents

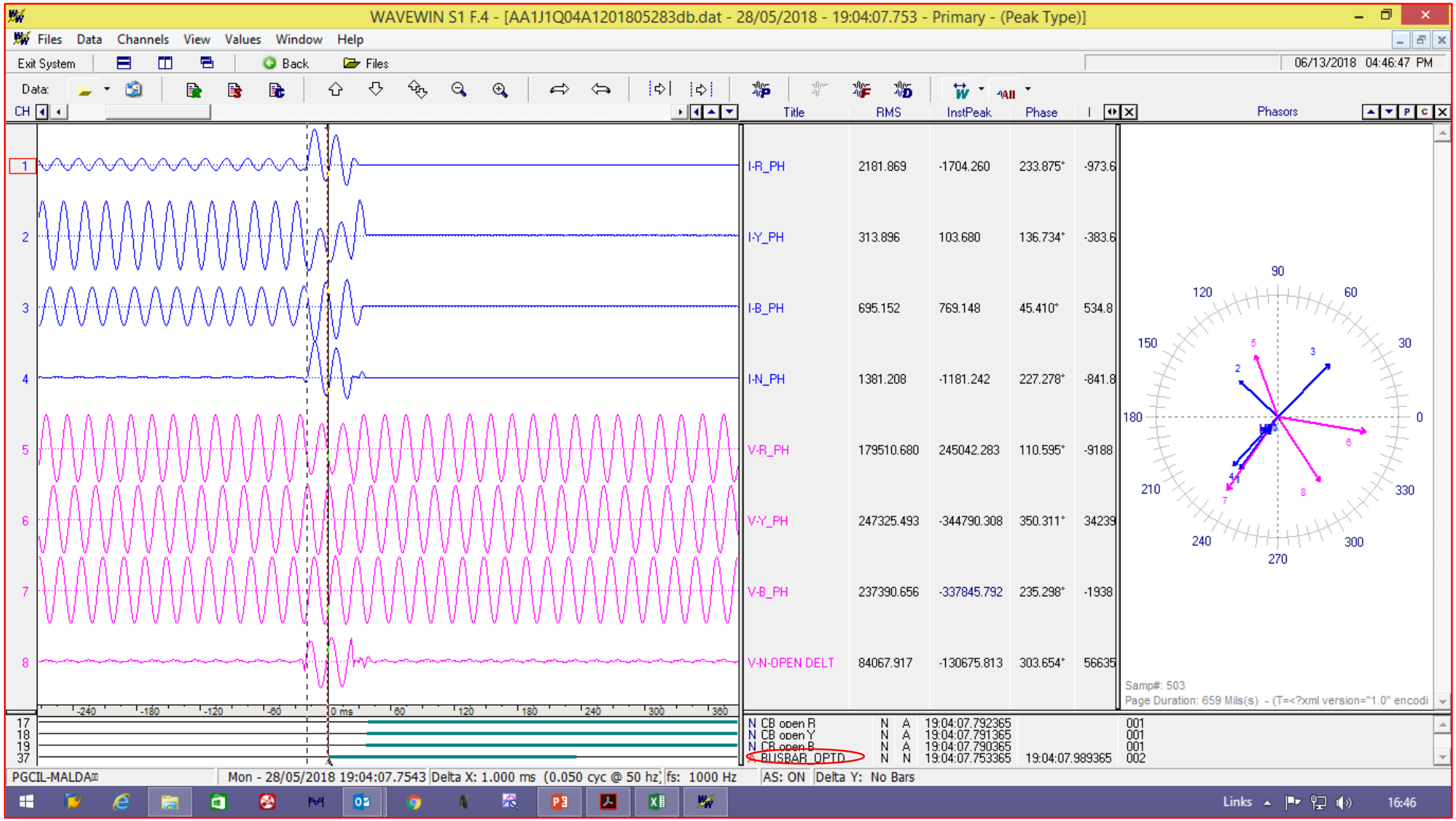


No.	Name	RMS	Angle
1	Bay01_IL1	2886.984(A)	98.1°
2	Bay01_IL2	122.592(A)	185.0°
3	Bay01_IL3	326.394(A)	105.7°
4	Bay02_IL1	0.652(A)	34.3°
5	Bay02_IL2	0.753(A)	15.7°
6	Bay02_IL3	0.959(A)	89.3°

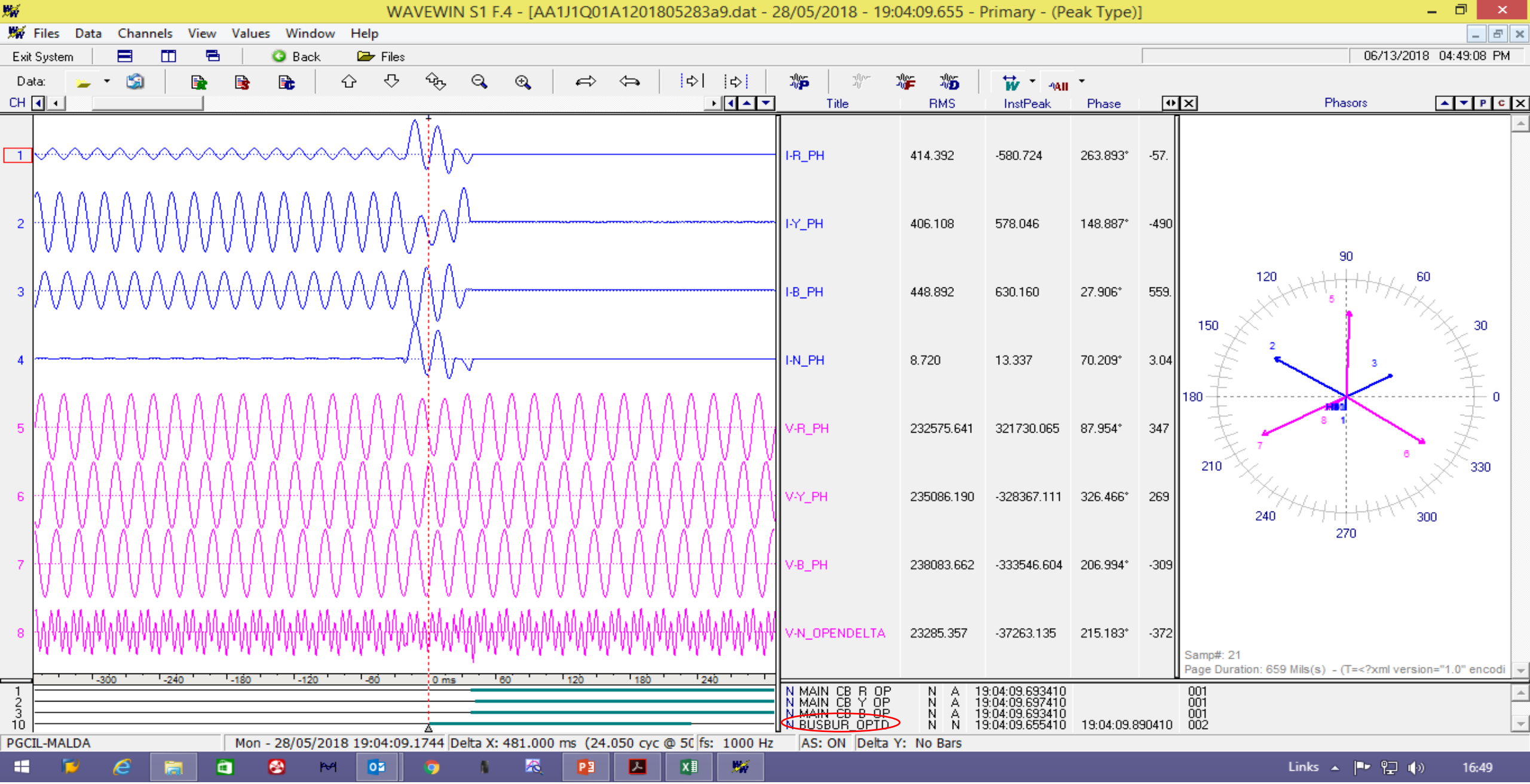
Recording File Name:C:\PCMDataBases\DisturbanceRecordings\29.05.2018\Substation\400KV_J1\BUS BAR_Q01\REB670_AA1J1Q01A1\AA1J1Q01A120180528260

Fault Current Sharing through Bus Coupler During Fault.

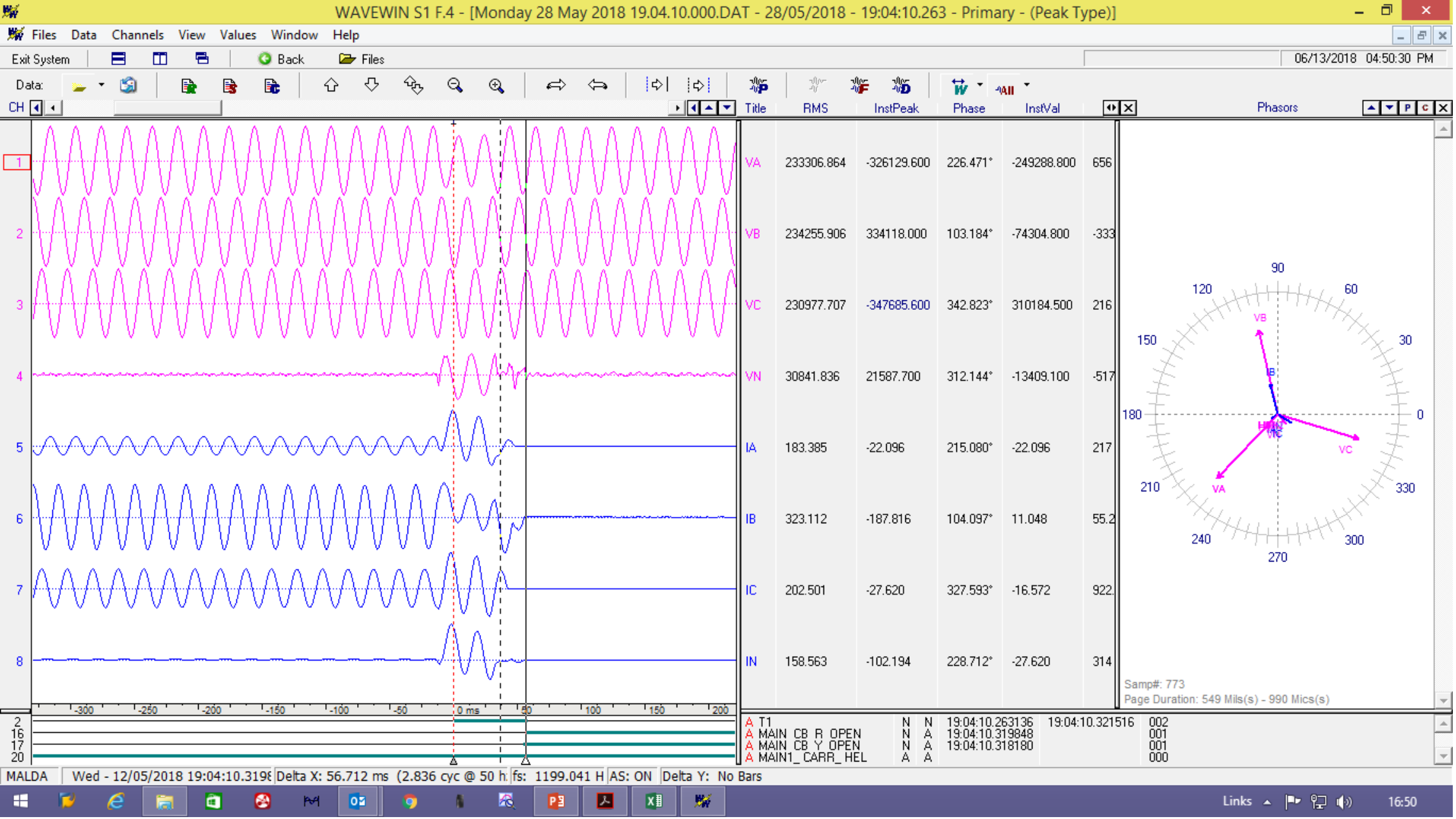

REB670 - Parameter Setting
REB670 - Parameter Setting
REB670 - Parameter Setting
REB670 - Parameter Setting
REB670 - Hardware Configuration
REB670 - Application Configuration
CT inputs for Bay01 for BBP. Connection to hardware is done in SMT!
Pre-configured binary inputs for Bay01. Connection to hardware is done in SMT!
CT inputs for Bay01 for BFP, OC & EnFP. Connection to hardware is done in SMT!
Current Phasors Bay01.
BUS COUPLER CURRENT FORCED TO ZERO.
Description
Bay_401_BC
Bay_402_TBC
Bay_403_ICT5
Bay_407_ICT5
Bay_408_FRK1
GroupingSignals
ZoneInterconnection
Diff_Zones
OutOfService
DR_Analog
1 of 6
1339.252



400 KV FARAKKA-I AT MALDA



400 KV FARAKKA-II AT MALDA



400 KV PURNEA-I AT MALDA

Restoration Schedule :

- At 19:46 Hrs.: 220 KV KSNJ-DLK Ckt.-I&II restored first to power up Dalkhola station.
- At 19:49 Hrs.: 220 KV Bus coupler closed at Dalkhola station.
- At 19:52 Hrs.: Then, 220 KV DLK-MLD Ckt.-I restored to power up Malda station at 220KV Bus-I.
- At 19:54 Hrs.: 132KV bus-I charged from 160 MVA ICT-II at Malda station to feed 132KV Malda (WBSETCL) feeder.
- At 21.01 Hrs.: 400KV Bus-I charged by extending 400KV NPRN-MLD Ckt.-I charged from New Purnea end.
- At 21.06 Hrs.: 400KV & 220KV synchronize by charging 315 MVA ICT-V.
- At 21.06 Hrs.: 400KV FARK-MLD Ckr.-I taken into service.
- At 21.48 Hrs.: Then 400KV Bus-II charge through Bus-coupler with min. O/C setting (Later it change to original setting).
- At 21.54 Hrs.: 400KV FARK-MLD Ckt.-II taken into service.
- At 21.59 Hrs.: Then 160 MVA, 220/132KV ICT-III charged.
- At 22:02 Hrs.: Then 50 MVA, 220/132KV ICT-IV charged.

PRE-FAULT CONFIGURATION:-

- IN GENERAL POWER IN WB NETWORK DRAWN THROUGH 132 KV MALDA-MALDA-D/C & 220 KV DLK-DLK-D/C LINE. ON 28.05.18, BEFORE FAULT, THE ACTUAL DRAWAL FROM MALDA IS IN THE TUNE OF 200 MW (100 MW X 2) WHERE AS DRAWAL FROM DALKHOLA IS 120 MW (60 MW X 2).
- AT DALKHOLA S/S, BUS CONFIGURATION DURING PRE FAULT ARE AS FOLLOWS:-

  BUS-I: 220 KV DLK-KNE-D/C & 220 KV DLK-PRN-D/C.

  BUS-II: 220 KV MLD-MLD-D/C & 220 KV DLK-DLK-D/C.

  BUS COUPLER IS IN CLOSED CONDITION.

POWER FLOW AT EACH FEEDER AT DALKHOLA:-

220 KV DLK-MLD-D/C: (40 MW Each/Import).

220 KV DLK-DLK-D/C: (62 MW Each/Export).

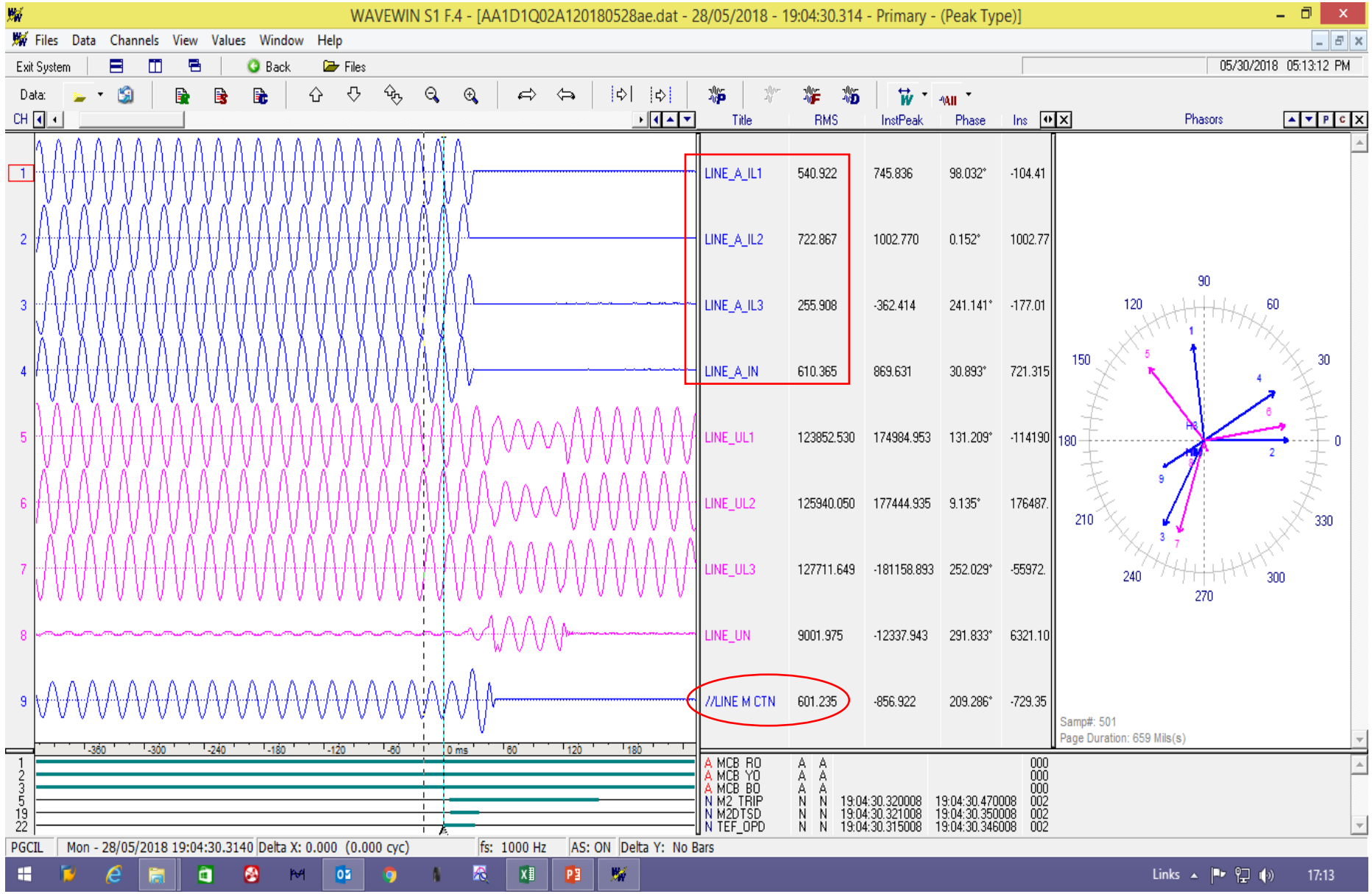
220 KV DLK-KNE-D/C: (49 MW Each/Import).

220 KV DLK-PRN-D/C: (26 MW Each/Export).

Tripping details:-

- After tripping of 400 KV Malda Bus-1 & 2, entire, load demand in 220 KV & 132 KV radial system started to draw from available resources at Dalkhola SS.
- In absence of power support from 220 KV MLD-MLD-D/C, & also as B/C at Dalkhola is in closed condition, Dalkhola S/S started to draw power from Kisanganj & Purnea SS.
- 220 KV Purnea-New Purnea-D/C Line having Panther conductor and might have tripped on operation of O/C protection at New Purnea end, after shifting of load resulting loss of power support from both DLK-PRN-D/C from Purnea end.
- After loss of power support through 220 KV DLK-PRN-D/C, from Purnea end, entire load shifted to Kishanganj S/S vide 220 KV DLK-KNE-D/C. At this point entire load of Malda & Dalkhola is dependant upon Kishanganj source. However as Malda & Dalkhola (WB End) are radial in nature, when they started to draw current from Kishnaganj source, on operation of TEF at Kishanganj both the feeders got tripped from Kishanganj only. The same has been observed in Kishnaganj end DR.
- From the Kishanganj end DR, it is observed that there is no fault in 220 KV system, as the phase currents are almost equal to load currents. Except B/C at Dalkhola SS, no other element got tripped.
- This results in total power failure in Dalkhola as well as in Malda SS also (220 KV & 132 KV).

DR of Kishanganj Sub-station for Dalkhola-I Feeder



1. From Kishanganj end DR it is very much clear that no fault in 220 KV system as phase current is almost normal load current.
2. Rise in neutral current is due to unbalance in radial system / Load imbalance for sudden load shifting.

Remedial Measure to avoid black out of Dalkhola SS & 220/132 KV System at Malda SS:-

1. Preferably Bus Coupler at Dalkhola end , to be kept in open position, to avoid overloading of all connected links. In this case security will be compromised for 220 KV DLK-DLK-D/C & will be solely dependant upon Malda.

Remedial Measure taken for both bus tripping in DMT scheme for Bus Bar operation:-

Action taken :

- Bus Coupler CB status wiring from Control Room to Bus Coupler MB checked and re-terminated/extended the wire upto TB which was found opened from TB at CB MB . Contact Multiplier of the Bus Coupler Auxiliary Contact installed at Bus Coupler Panel Checked after Switching On/Off of CB and found in order and same also been checked at Relay Binary Input Status and found in order i.e when Bus Coupler CB Status Open then Binary Input 1 at Bus bar Protection Relay.
- During shifting of 3 feeders of Bus-2 to Bus-1 one after another, the spill current checked and found in the range of 5 to 10A.
- After equal distribution of 6 feeders to Bus-1 and Bus-2, the spill current also checked and found in the range of 0 to 10 A.

Corrective measures implemented :

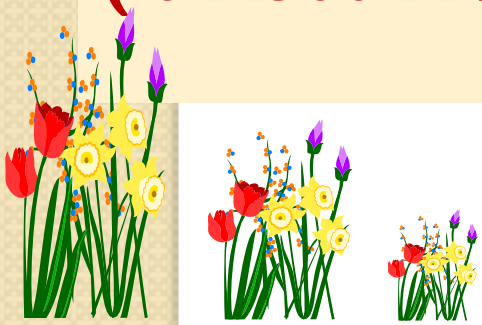
- Annunciation for Bus Coupler CB input Status Monitoring system has been established out side of the Relay to avoid such type incident in future.

WELCOME TO PRESENTATION ON SPS OPERATION ON 16/05/2018 (HVDC TALCHER-KOLAR)

Presented by M Panigrahi .

TSTPS , Kaniha

(6 X500 MW Units)



Issues related with Generation Backing down during Talcher-Kolar SPS operation on 16th May 2018

ISSUES RAISED BY ERPC

On 16th May 2018 at 15:34 Hrs, HVDC Talcher Kolar Pole 1 was carrying 2000 MW and in the next 45 seconds due to transient fault it came down to RVO mode to 1350 MW followed by one pole tripping and other pole in Ground return mode. With this, the SPS operation was as per the 1350 MW instead of 2000 MW Power order of HVDC. This has caused effective fast generation reduction of 165 MW in Talcher Stage 2 and 1000 MW load shedding in SR. The above inadequategeneration reduction in ER has led to:

ERPC’s observations--

1.Severe loading on 400 kV Talcher-Meramundali and Talcher-Angul circuit (Refer Figure)

2. High loading on the 765/400 kV Vemagiri ICTs (Refer Figure).

3. Due to inadequate generation reduction at Talcher in eastern region the loading on 400 kV Talcher Stage 1 and 2 Interconnector were more than 1400 MW for 6 minutes (Refer Figure).

4.Issues related to GMR,JITPL

EVENTS ON 16-05-2018

In TSTPS all 6 units were running with all switchyard elements available

With SPS -1000 in operation with stg-II gen as 1885MW.

- **16-May-18 15:32:01.675 3BYA00AP002 OFFNRM H 00 HVDC FLOW DEV ALARM APPEARED .**
- **PRIOR TO THAT HVDC LOAD FLOW WAS 1997MW.**
- **At 15:34:59 Pole-1 was blocked with power flow in HVDC 1210.88 MW. From HVDC we get signal as Pole 1 block,Pole-1deblock,pole-2 block,pole -2 deblock.There is no separate signal for Pole block with ground return mode.**
- **In SPS logic it takes Pole block condition with power flow condition in HVDC for -2.4sec(called modified HVDC flow in DCS)**
- **This modified HVDC flow was 1356.17MW.**
- **Corresponding to this MW SPS logic operated for load band of 1300-1450.In this band U-4 & U-5 had to be backed down to 350MW.SPS_Scheme_TSTPS.xlsx**
- **We had got only Pole-1 blocked signal.When HVDC flow fell down to below 200MW it sensed ground return and then backing down command was issued to U-4 & U-5. 16may2018 pole block\16may_pole_block_TREND.xls**

EVENTS ON 16-05-2018

Backing down signal-

a)16-May-18 15:36:26.003 SPS_ACTION OFFNRM H 00 UNIT 4 RAMP DOWN 150MW ON

b)16-May-18 15:36:27.003 SPS_ACTION OFFNRM H 00 UNIT 5 RAMP DOWN 150MW ON16may2018 pole block\POLE _BLOCK_Events.pdf

This delay of 90 sec is because of ramp down scheme of HVDC,PGCL.

8)The U-4 Load was 497MW & U-5 Load was 395MW at the time of ramp down started.. 16may2018 pole block\all unit data_BACKING.xlsx

time	U-3	U-4	U-5	U-6	Stg-II gen	
3:36:26 PM	449	497	395	475		Ramp down started
3:36:52 PM	451	476	350	473		U-5 ramped down
3:37:02 PM	451	350	337	472	1511	U-4 ramped down

EVENTS ON 16-05-2018

So total time to ramp down
Pole-1 blocked-15:34:59 Pole-1 blocked
16-May-18 15:36:26.003 ramp down started
16-May-18 15:37:02.003 ramp down completed.
Total timing-98 sec from pole block at TSTPS.
Backing down=192MW.
Stage-II generation was 1511MW (gross).
It has operated as per scheme & there is no deviation.

HVDC SPS FAULT SENSING SCHEME-

1)From HVDC we get signal as Pole 1 block,Pole -1 deblock,pole-2 block,pole -2 deblock.There is no separate signal for Pole block with ground return mode. SPS_Scheme_TSTPS.xlsx

2)These signals come from HVDC through fibre optic cable to PGCL's AC Power Control Interface at NTPC switchyard control room end.

3)At NTPC end these contacts have been multiplied by auxiliary Contactors for use in following set ups

i)NTPC Switchyard control room annunciation facia (Pole block/pole deblock)

ii)Input to NTPC's DCS system for SPS logic

iii)Onward transmission to JITPL and GMR in PLCC of 400KV Angul feeder Ch-I & Ch-II

iv) Onward transmission to Sterlite in PLCC of 400KV Rourkela I & II ckt's PLCC Ch-II.

HVDC SPS FAULT SENSING SCHEME-

v)All these initiating contacts are instantaneous.

vi)SPS logic at TSTPS for stage-II units implemented through DCS.

Sensing of Pole block with G/R

Pole blocked signal is received .HVDC flow is monitored with -2.4sec as modified HVDC flow from pole block instant.

If MW flow of HVDC comes below 200MW, it senses pole block with G/R.

ISSUES-

1)Presently no signal as Pole blocked with G/R is received at NTPC end. It is learnt from PGCL that if Line ground fault is sensed, it goes to RVO mode and then takes around 90 sec to ramp down powerto 150MW.

2) **Severe loading on 400 kV Talcher-Meramundali and Talcher-Angul circuit**=

That day Meramunduli ckt -1 loading was around 690 MW momentarily. Angul feeder loading was 540MW on dt 16.05.2018.

As presently during pole block higher loading is observed in 400KV Kaniha Meramunduli-1 and 400KV Kaniha Angul line.

So healthy condition of these lines in totality may be ensured by PGCL and OPTCL.

(In last one year one occasion 400KV Angul line conductor had snapped with a loading of 670MW.

ISSUES

In another occasion sparking was observed at OPTCL Meramunduli grid end from wave trap connection and further backing down was done by NTPC beyond SPS mandate to reduce load flow.

3)As of recent, pole blocking phenomena is more frequent.PGCL may look into it.

4)Sterlite SPS PLCC signal is not reaching from Rourkela onwards.

5)As SPS signal is transmitted to Sterlite,JITPL,GMR continuously vide PLCC of Rourkela I &II,Angul feeder , the carrier protection goes out as PLCC fault appears on continuous signal transmission of pole outage.

Annexure-B16

List of line tripping in the month of May 2018 where violation of protection standard has been observed

LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	PCC comments	Follow up by ERLDC	Utility to Respond
Fault Clearing time violating protection standard										
400KV JEYPORE-BOLANGIR-SC	17-05-2018	16:47		Z1, R-Y-B phase. F/C: R: 4.41 KA, Y: 4.86 KA, B: 4.62 KA; F/D: 0.3 KM; Physically inspected few towers from Bolangir	R-Y-B Fault	500 msec		Loss of Carrier/loss of Guard to be enabled at both end and to be co-ordinated with Zone-II timing.	PGCIL Odisha project may update the status of corrective action taken for timely clearance of fault.	PGCIL Odisha project
Multiple tripping at the same time										
220KV ATRI-PANDIABILI-II	13-05-2018	4:17	O/C	B_N,8.3 KA,10.5 KM	B-N Fault	< 100 msec	Multiple tripping at the same time	Rectified, Relay at Atri replaced	OPTCL informed that faulty relay has been replaced and no further such tripping will occur	
220KV PANDIABILI-SAMANGARA-I	13-05-2018	4:17	Z1 B_N 1.13 KA 29.7 KM		B-N Fault	< 100 msec	Multiple tripping at the same time		Healthiness of A/R status at both end to be intimated by OPTCL	OPTCL
220KV CHANDIL-RANCHI-I	20-05-2018	16:35	Z2/82.3 KM/ IY 1.99 KA	Y-N/Z1/FD 21.53 KM/FC 3.59 KA	Y-N Fault	< 100 msec	Multiple tripping at the same time		Healthiness of A/R status at Chandil to be intimated by BSPTCL and at Ranchi end by PGCIL ERTS-I	BSPTCL & PGCIL ERTS-I
220KV RANCHI-HATIA-II	20-05-2018	16:35	Not tripped, A/R successful	24.54 km, 1.96 kA, B-n	B-N Fault	< 100 msec	Multiple tripping at the same time		Healthiness of A/R status at Hatia to be intimated by BSPTCL	BSPTCL
Miscellaneous: Tripping on DT, No Fault observed in PMU										
400KV FSTPP-DURGAPUR-I	03-05-2018	16:09	DT received	Did not trip	DT received at FSTPP				Reason for DT to be intimated	PGCIL ER-II and NTPC Farakka
400KV PATNA-KISHANGANJ-II	03-05-2018	18:27	Did not tripp	DT received	DT received at Kishanganj				Reason for DT to be intimated	PGCIL ER-I
400KV JHARSUGUDA-STERLITE-II	18-05-2018	7:52	DT RECEIVED		DT RECEIVED AT JHARSUGUDA				Reason for DT to be intimated	OPTCL and PGCIL Odisha Project
400KV PPSP-BIDHANNAGAR-II	29-05-2018	10:17	DT Received		DT Received at PPSP		No fault observed in PMU		Reason for DT to be intimated	WbSETCL
Autoreclose related issues										
400KV RANCHI-NEW RANCHI-I	02-05-2018	15:56	R-N, 11.01KA, 21KM	DT received at New Ranchi	R-N Fault	< 100 msec			PGCIL ERTS-I to intimate healthiness of A/R at both end	PGCIL ERTS-I
400KV RANCHI-MAITHON RB-I	02-05-2018	16:16	A/R successful	R-N	R-N Fault	< 100 msec			Healthiness of A/R status at Maithon RB-I to be intimated by MPL	MPL
400KV RANCHI-MAITHON RB-I	25-05-2018	20:33	Y-N,126.8 KM,2.83 KA Z1, A/R successful	MAIN 1: Y-N,82.3 KM,2.7 KA MAIN 2 :Y-N,81.1 KM,2.81 KA	Y-N Fault	< 100 msec				
400KV RANCHI-RAGHUNATHPUR-II	20-05-2018	15:54	A/R successful	BN,132.5 KM,3.086 KA	B-N Fault	< 100 msec			DVC may intimate the status	DVC
220KV CHANDIL-RANCHI-I	30-05-2018	18:11	R-N		R-N Fault	< 100 msec			Healthiness of A/R status at Chandil to be intimated by BSPTCL and at Ranchi end by PGCIL ERTS-I	BSPTCL & PGCIL ERTS-I
220KV RANCHI-HATIA-I	27-05-2018	23:07	R-N , Z-1 , F/D1.5 KM , F/C-13 KA , A/R SUCCESSFUL		R-N Fault	< 100 msec			Healthiness of A/R status at Hatia to be intimated by BSPTCL	BSPTCL
400KV KHARAGPUR-CHAIBASA-I	04-05-2018	21:22	A/R SUCCESSFUL , Z1,B-N,FD-88.33KA,FC 3.07 KA	B-N,74.6 KM,Z1,4.12 KA	B-N Fault	< 100 msec		Will be solved during S/D	PGCIL ERTS-I to intimate if the problem is solved or not	PGCIL ERTS-I
400KV KHARAGPUR-CHAIBASA-I	05-05-2018	19:16	BN, 9.119 KM, 11.19 KA, A/R successful	BN,160.9 KM, 2.14 KA	B-N Fault	< 100 msec		Will be solved during S/D		

LINE NAME	TRIP DATE	TRIP TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks	PCC comments	Follow up by ERLDC	Utility to Respond
400KV KHARAGPUR-CHAIBASA-I	16-05-2018	15:21	y_n,z1,125 km.1.462 ka, a/r successful	y_n;15.512 ka 0.9km	Y-N Fault	< 100 msec		Will be solved during S/D		
400KV MEERAMUNDALI-STERLITE-II	05-05-2018	16:28	YN,62.6 KM, 7.8 KA	YN,161 KM, 632 A	Y-N Fault	< 100 msec		Problem at Meeramundali end rectified	OPTCL to intimate healthiness of A/R at Sterlite end	OPTCL
400KV MEERAMUNDALI-MENDHASAL-SC	31-05-2018	18:07		Y PHASE LA BLAST AT MERAMUNDALI, carrier related issue	Y-N Fault	< 100 msec			OPTCL to intimate healthiness of A/R at Mendhasal	OPTCL
400KV BINAGURI-KISHANGANJ-I	11-05-2018	2:14	Y-N ,Z-1,F/D-92.7KM,F/C-5.8KA, A/R successful		Y-N Fault	< 100 msec			PGCIL ERTS-I to intimate healthiness of A/R at Kishanganj end	PGCIL ERTS-I
400KV BINAGURI-KISHANGANJ-I	27-05-2018	5:32	R-N , 137 KM , R 4.5 KA , B-1.5 KA, A/R successful	R-N , 1.8KM , IR 13KA	R-N Fault	< 100 msec				
400KV KOLAGHAT-KHARAGPUR-II	10-05-2018	12:05	A/R lockout B-N;Z-1;56 KM ,5.06 KA	KTPP B Z-1,37.3 KM,5.57 KA	B-N Fault	< 100 msec		plcc issue, will be solved by _____, new installaion is going on	WBSETCL and WBPDCL to intimate the status of new installation of PLCC and estimated target date of completion	WBSETCL and WBPDCL
400KV KOLAGHAT-KHARAGPUR-II	16-05-2018	13:46		Z1, B-N, F/C-2.54 KA, 63.13 km	B-N Fault	< 100 msec		plcc issue, will be solved by _____, new installaion is going on		
400KV SUBHASGRAM-SAGARDIGHI-SC	11-05-2018	18:28	B_N, 28.3 KM, 5.94 kA, A/r successful		B-N Fault	< 100 msec		Problem at Sagardighi will be solved by 6 th July after getting S/D		
400KV DURGAPUR-SAGARDIGHI-II	25-05-2018	16:31	A/R successful	R-N, Z1, 32.35km, FC 7.254kA	R-N Fault	< 100 msec				
400KV DURGAPUR-SAGARDIGHI-II	10-05-2018	6:12	A/R successful	R N Z2 177.4 KM 1.73 KA	R-N Fault	< 100 msec				
400KV NEW PURNEA-BIHARSARIFF(PG)-II	14-05-2018	1:42	R-N Fault, 71.7 Km, 3.71 KA	R-N Fault , 157 Km, 1.56 KA	R-N Fault	< 100 msec			PGCIL ERTS-I to intimate healthiness of A/R at both end	PGCIL ERTS-I
400KV NEW PURNEA-BIHARSARIFF(PG)-I	28-05-2018	23:23	B-N,Z1,17.7 KM,8.12KA	B-N,Z2,213.4 KM,2.6 KA	B-N Fault	< 100 msec				
400KV ROURKELA-JHARSUGUDA-IV	22-05-2018	14:57	B-N , 4.6 ka , 90 km		B-N Fault	< 100 msec			PGCIL Odisha project to intimate healthiness of A/R at both end	PGCIL Odisha project
400KV JHARSUGUDA-STERLITE-II	29-05-2018	18:52		B-N, FD-7.88KM, FC-14 KA.	B-N Fault	< 100 msec			PGCIL Odisha project and OPTCL to intimate healthiness of A/R at both end	PGCIL Odisha project and OPTCL
220KV KISHANGANJ-DALKHOLA (PG)-II	27-05-2018	5:34	B-N , 20 KM ,2 KA		B-N Fault	< 100 msec			PGCIL ER-I and ER-II to intimate healthiness of A/R at both end	PGCIL ER-I and ER-II
220KV DEHRI -GAYA-II	28-05-2018	14:20		A/R Successful, RN, 70.8 KM, 2.2 KA	R-N Fault	< 100 msec			BSPTCL to intimate availability and healthiness of A/R at Dehri	BSPTCL
400KV KhSTPP-BARH-I	28-05-2018	18:58	Y-N, 40 KM , FC 6.9 KA		Y-N Fault	< 100 msec			NTPC Kahalgaon and Barh to intimate healthiness of A/R at both end	NTPC Kahalgaon and Barh
220KV MAITHON-DHANBAD-II	28-05-2018	22:55	Y-N,Z1,23.9 KM,6.17 KA	Y-N,Z1,22.45 KM,3.52 KA	Y-N Fault	< 100 msec			PGCIL ER-II and DVC to intimate healthiness of A/R at both end	PGCIL ER-II and DVC
220KV ARRAH-NADHOKHAR-SC	31-05-2018	19:31	R-N , 64 KM		R-N Fault	< 100 msec			PGCIL ER-I and BSPTCL to intimate healthiness of A/R at both end	PGCIL ER-I and BSPTCL

MINUTES OF MEETING HELD AT THE OFFICE OF CHIEF GENERAL MANAGER (O & M) OPTCL, BHUBANESWAR ON 29TH DECEMBER'2014.

Meeting attended by: The list of participants is annexed.

Topic: The Special Protection Scheme for Islanding of IB Thermal Generating Units on system disturbance.

The Chief General Manager (O&M), OPTCL welcomed the participants and opined that the present form of islanding scheme need relook for effective islanding of IB TPS Units. The present islanding scheme at 220/132/33kV Grid Substation Budhipadar was discussed by the participants. The present islanding scheme is adopted as per discussion held on 11th April'2014 at Aditya Aluminum Training Centre, Lapanga, Jharsuguda. As per the arrangement, the Islanding relay is installed in 220kV Bus Coupler Panel. The load & IB TPS lines are distributed evenly so that on bus fault on one bus the Islanding relay will decouple the buses & the IB generation will be diverted to healthy bus .

The representative of IB TPS taking part in the discussion said that in the present scheme, as the IB Units are still connected to the main system, may not survive due to gap in the load & generation in the loop. They suggested arrangement of 220kV Buses is to be made such that on the event of system disturbance, the load in one 220kV Bus becomes radial with IB generation. Hence, on system disturbance the IB Unit can be islanded with the radial loads and synchronized with main system after clearance of disturbance.

After detail deliberations, the Special Protection Scheme for IB TPS islanding at Budhipadar Bus, following decisions were taken.

1. **Arrangement of Load in 220kV Bus of Budhipadar:**

BUS-1: KORBA 1 & 2, IBTPS 1 & 3, BHUSAN 1 & 2, RAIGARH, KATAPALLI 1 & 2, TARKERA 1 & 2, VAL 1 & 2.

BUS-2: IBTPS 2 & 4, AT 1 & 2, SPS, AAL 1 & 2.

2. **Arrangement of Radial Load.**
   - i. BUS-2 (220kV): IBTPS 2 & 4, AT 1 & 2, SPS, AAL 1 & 2.
   - ii. 132kV Bus: Station Load (20MW)+Rajgangpur (80MW)+Brajrajnagar (50MW)+Jharsuguda (35MW)+Sundergarh+MCL+MSP; **Total: 235MW**

Mahapatra

3. In the event of system disturbance and Islanding relay operation, command from Islanding relay will trip the following breakers to achieve islanding of IB TPS Units with radial load.

Budhipadar 220Kv Bus: Bus Coupler & IBTPS 1 & 3 connected to Non-islanded Bus.

Budhipadar 132kV Bus : Tarkera & Burla 1 & 2.

Tarkera 132kV Grid Sub-station: Rajgangpur 1 & 2.

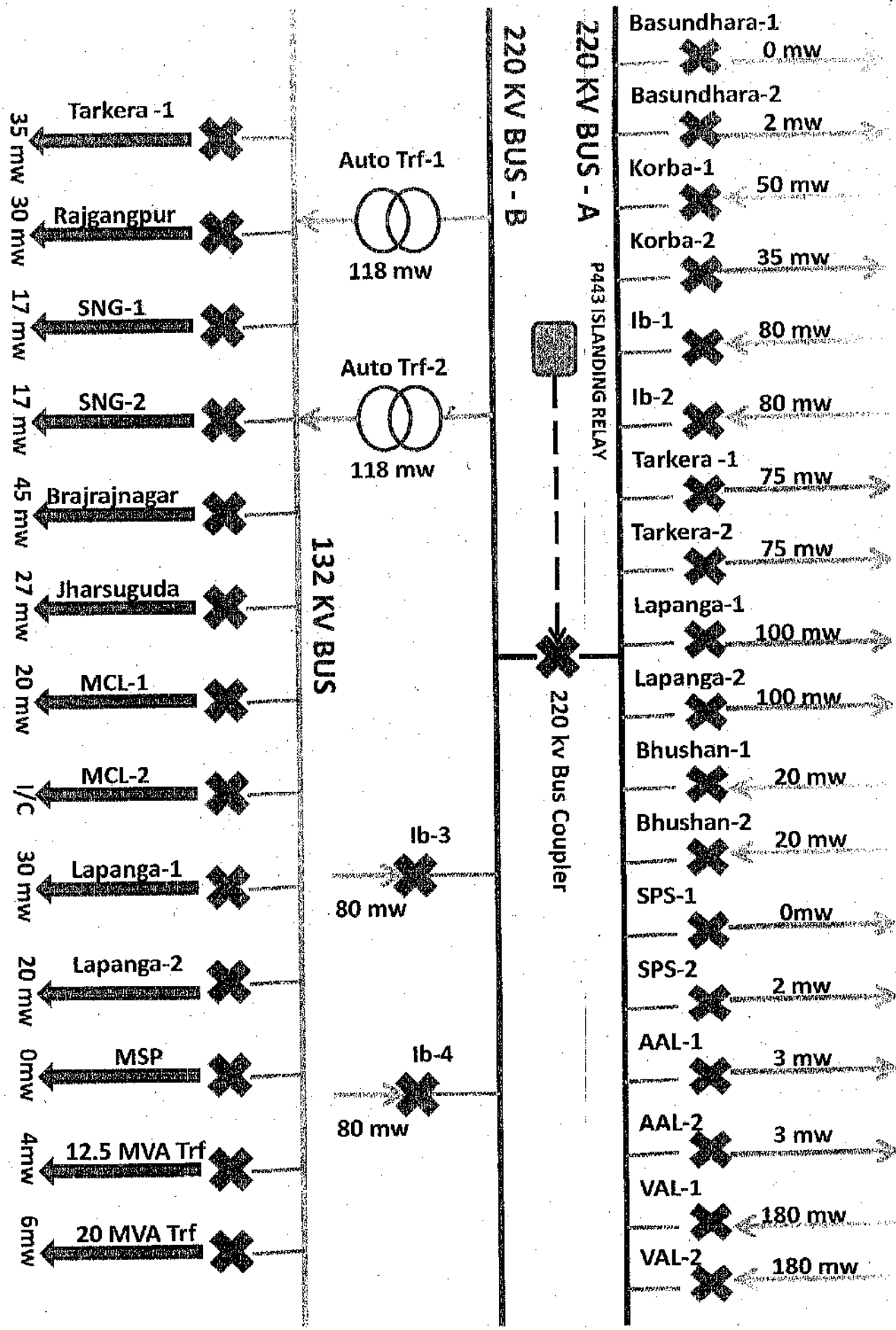
4. Provision for disconnection of 132kV Tarkera-Rajgangpur ckts from Tarkera end to make Budhipadar–Rajgangpur 132kV line to feed Rajgangpur load radially is required. The following arrangement need to be made for above. The command from Islanding relay is to be transmitted through carrier channel to Tarkera Grid S/S to trip Rajgangpur 1 & 2 Circuit Breaker at Tarkera Grid S/S.
5. GM (Telecom), OPTCL informed that the carrier protection provision between 132kV Budhipadar & Tarkera is to be provided on priority basis.
6. The facility of transmitting signal through OPGW/Carrier link to IB TPS from Islanding relay to ramp the generation to match the load is to be provided.
7. Further, provision of the carrier protection (Permissive & Direct Trip) to all four number 220kV lines between Budhipadar & IB TPS needs to be made for selective tripping of the lines.
8. GM (Telecom) informed that the above provision (Sl. 6 & 7) can be made after laying of OPGW cables between Budhipadar Grid & IBTPS and installation & commissioning of end equipment thereof. OPGC is to ensure necessary co-operation in this regard.

The above scheme can be adopted after installation of Carrier protection Scheme between 132kV Tarkera & Budhipadar, OPGW link & carrier protection (Permissive & DTT) for four number 220kV lines from IBTPS to Budhipadar Substation.

OPTCL/GRIDCO

OPGC

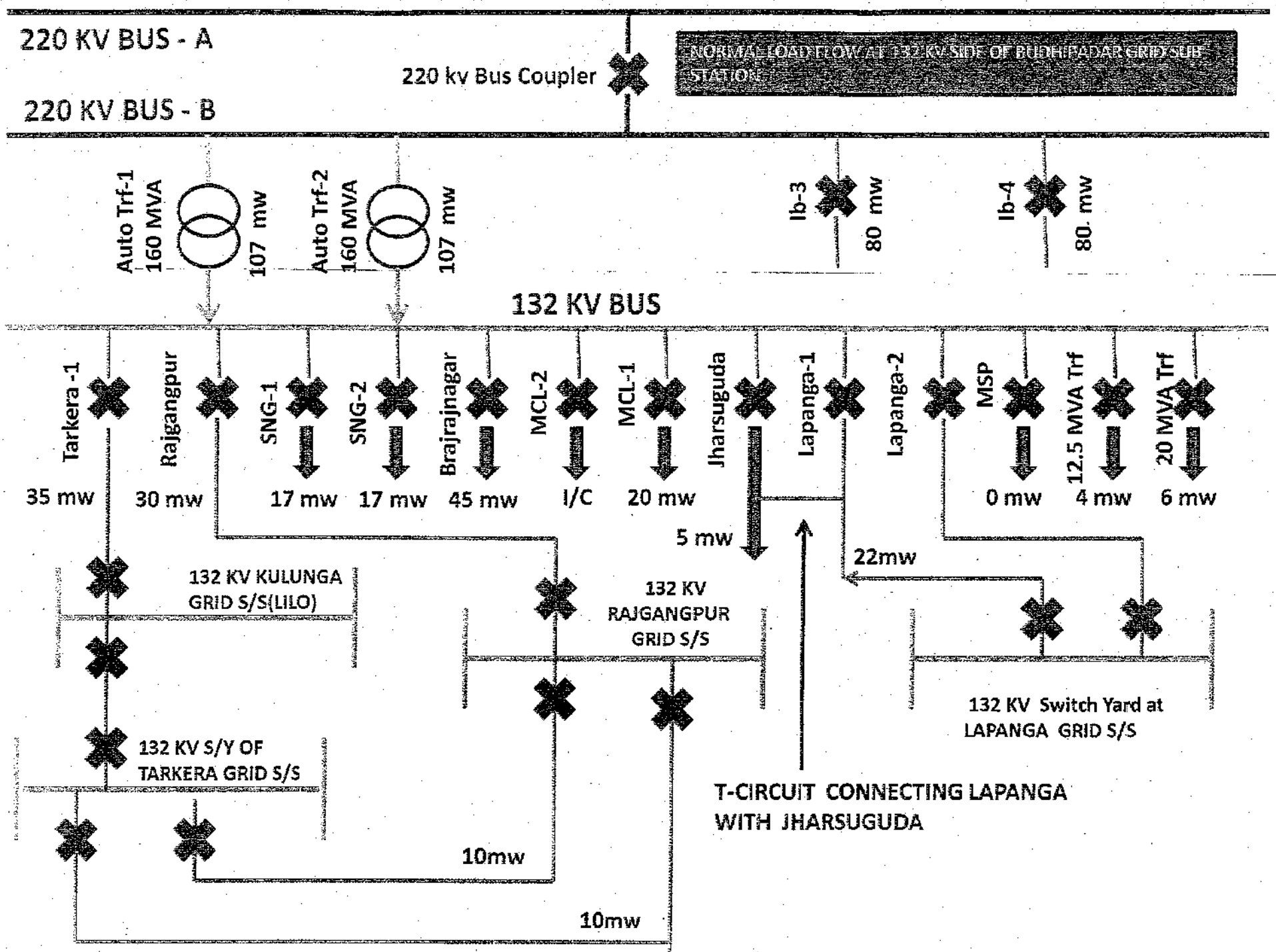
Mahapatra
(P K MAHAPATRA)

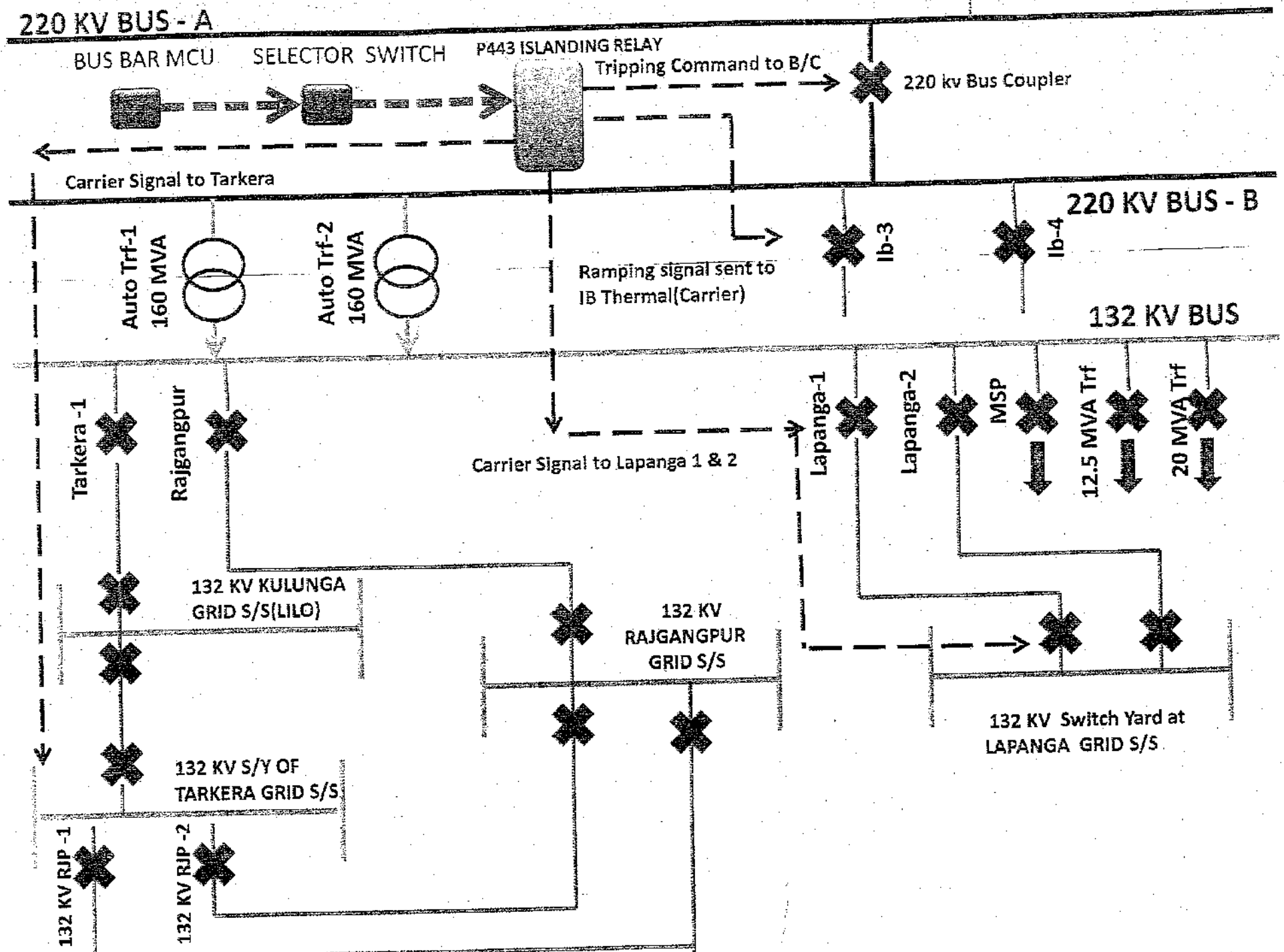

NORMAL LOAD ARRANGEMENT AT 220/132/33 Kv BUDHIPADAR GRID SUB-STATION
220 KV BUS - B
220 KV BUS - A
P443 ISLANDING RELAY
220 kv Bus Coupler
132 KV BUS
Auto Trf-1
118 mw
Auto Trf-2
118 mw
Ib-3
80 mw
Ib-4
80 mw
Tarkera -1
35 mw
Rajgangpur
30 mw
SNG-1
17 mw
SNG-2
17 mw
Brajrajnagar
45 mw
Jharsuguda
27 mw
MCL-1
20 mw
MCL-2
I/C
Lapanga-1
30 mw
Lapanga-2
20 mw
MSP
0mw
12.5 MVA Trf
4mw
20 MVA Trf
6mw
Basundhara-1
0 mw
Basundhara-2
2 mw
Korba-1
50 mw
Korba-2
35 mw
Ib-1
80 mw
Ib-2
80 mw
Tarkera -1
75 mw
Tarkera-2
75 mw
Lapanga-1
100 mw
Lapanga-2
100 mw
Bhushan-1
20 mw
Bhushan-2
20 mw
SPS-1
0mw
SPS-2
2 mw
AAL-1
3 mw
AAL-2
3 mw
VAL-1
180 mw
VAL-2
180 mw

CONDITIONS FOR ISLANDING RELAY

1. DF/DT.
2. >HZ (Over Frequency).
3. <HZ (Under Frequency).
4. Over Voltage.
5. Under Voltage.

Note- 132 /33 Kv Kuchinda Grid S/s will get power from either Rajgangpur or sambalpur


NORMAL LOAD FLOW AT 132 KV SIDE OF BUDHIPADAR GRID SUB STATION
220 KV BUS - A
220 kv Bus Coupler
220 KV BUS - B
Auto Trf-1 160 MVA
107 mw
Auto Trf-2 160 MVA
107 mw
Ib-3
80 mw
Ib-4
80. mw
132 KV BUS
Tarkera -1
35 mw
Rajgangpur
30 mw
SNG-1
17 mw
SNG-2
17 mw
Brajrajnagar
45 mw
MCL-2
I/C
MCL-1
20 mw
Jharsuguda
5 mw
Lapanga-1
Lapanga-2
22mw
MSP
0 mw
12.5 MVA Trf
4 mw
20 MVA Trf
6 mw
132 KV KULUNGA GRID S/S(LILO)
132 KV RAJGANGPUR GRID S/S
132 KV S/Y OF TARKERA GRID S/S
10mw
10mw
132 KV Switch Yard at LAPANGA GRID S/S
T-CIRCUIT CONNECTING LAPANGA WITH JHARSUGUDA


220 KV BUS - A
BUS BAR MCU
SELECTOR SWITCH
P443 ISLANDING RELAY
Tripping Command to B/C
220 kv Bus Coupler
Carrier Signal to Tarkera
220 KV BUS - B
Auto Trf-1 160 MVA
Auto Trf-2 160 MVA
Ramping signal sent to IB Thermal(Carrier)
Ib-3
Ib-4
132 KV BUS
Tarkera -1
Rajgangpur
Carrier Signal to Lapanga 1 & 2
Lapanga-1
Lapanga-2
MSP
12.5 MVA Trf
20 MVA Trf
132 KV KULUNGA GRID S/S(LILO)
132 KV RAJGANGPUR GRID S/S
132 KV Switch Yard at LAPANGA GRID S/S
132 KV S/Y OF TARKERA GRID S/S
132 KV RJP -1
132 KV RJP -2

Annexure-I

Annexure-C1.2

OUTLINE FOR ISLANDING SCHEME OF KANTI TPS

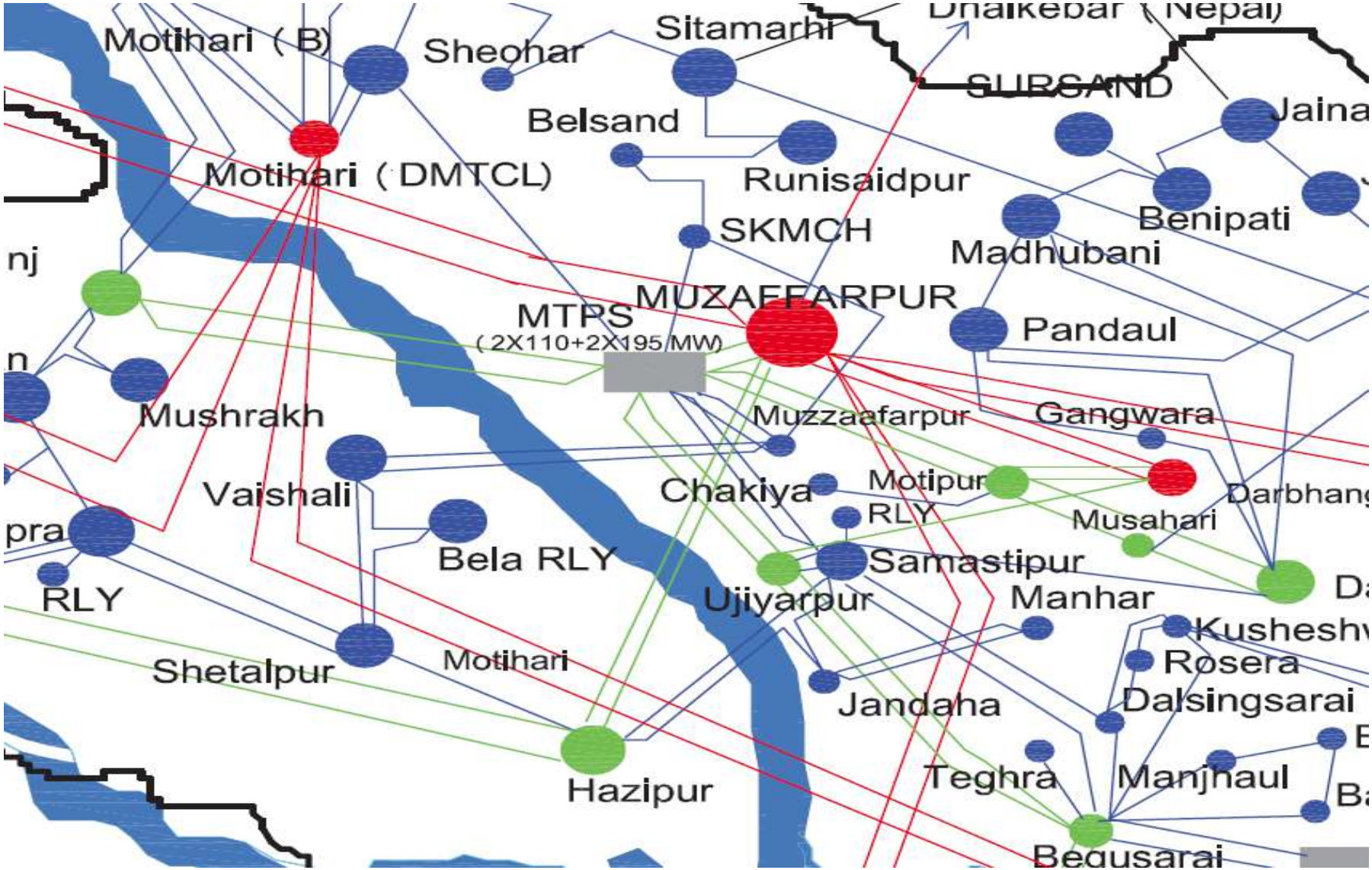
May 2018

ERLDC, POSOCO

Introduction

- Kanti TPS has installed capacity of 610 MW (Stg-I: 2 x 110 MW + Stg-2: 2 x 195 MW) located near to load centres in north Bihar
- At present there is no islanding scheme in Bihar system
- In 142nd OCC meeting it was decided to explore the possibility of implementing a power station islanding scheme for Kanti TPS

Network around MTPS (Kanti)



Lines normally kept open

- Following lines are normally kept open during normal operation
  - 132 kV Motihari-MTPS S/C
  - 132 kV Muzzafarpur-SKMCH S/C
  - 132 kV Sitamarhi-Runisaidpur S/C
  - 132 kV Shetalpur-Chapra D/C
  - 132 kV Shetalpur-Hazipur S/C

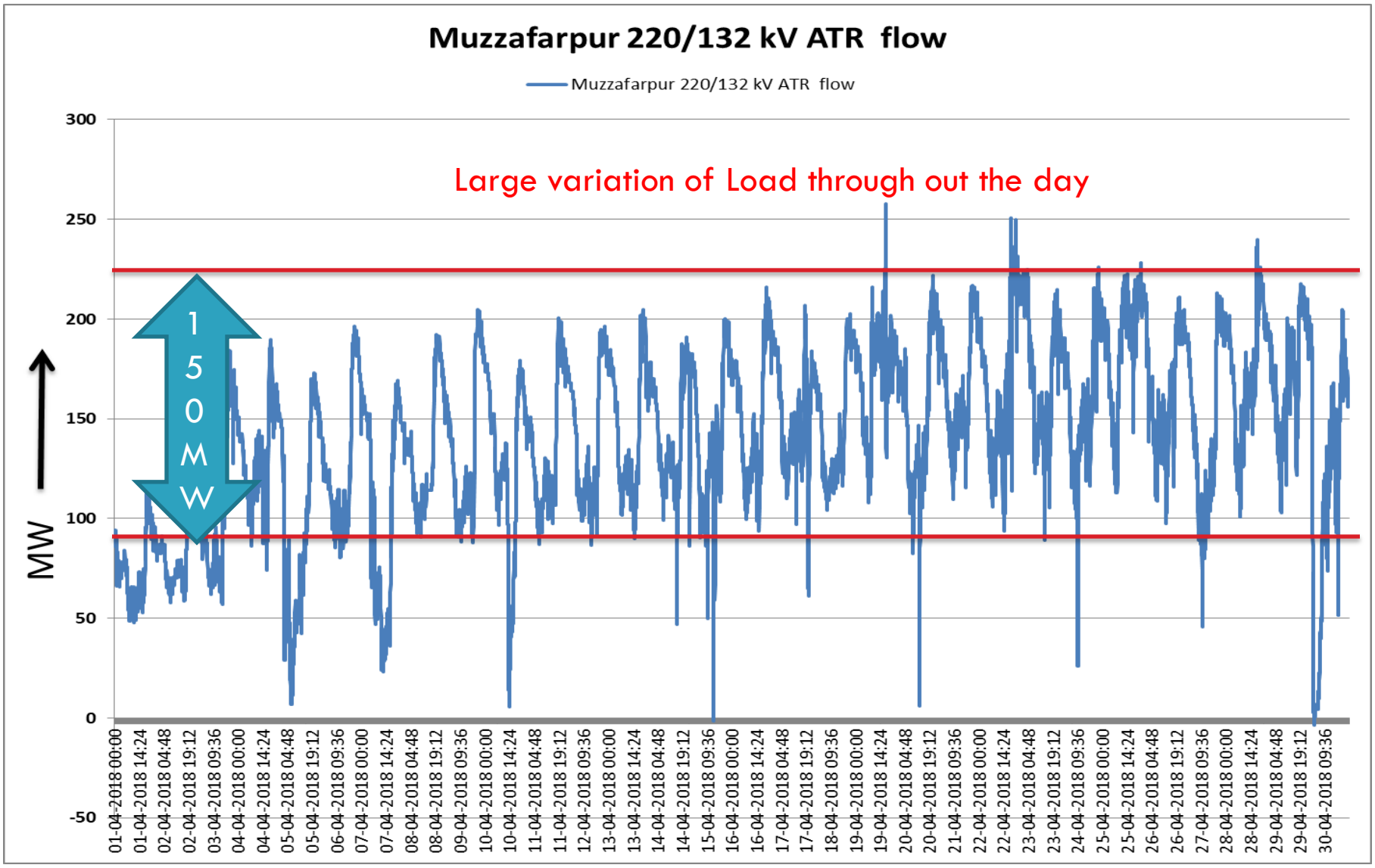
*BSPTCL may please confirm the above

Nearby substations and their loads

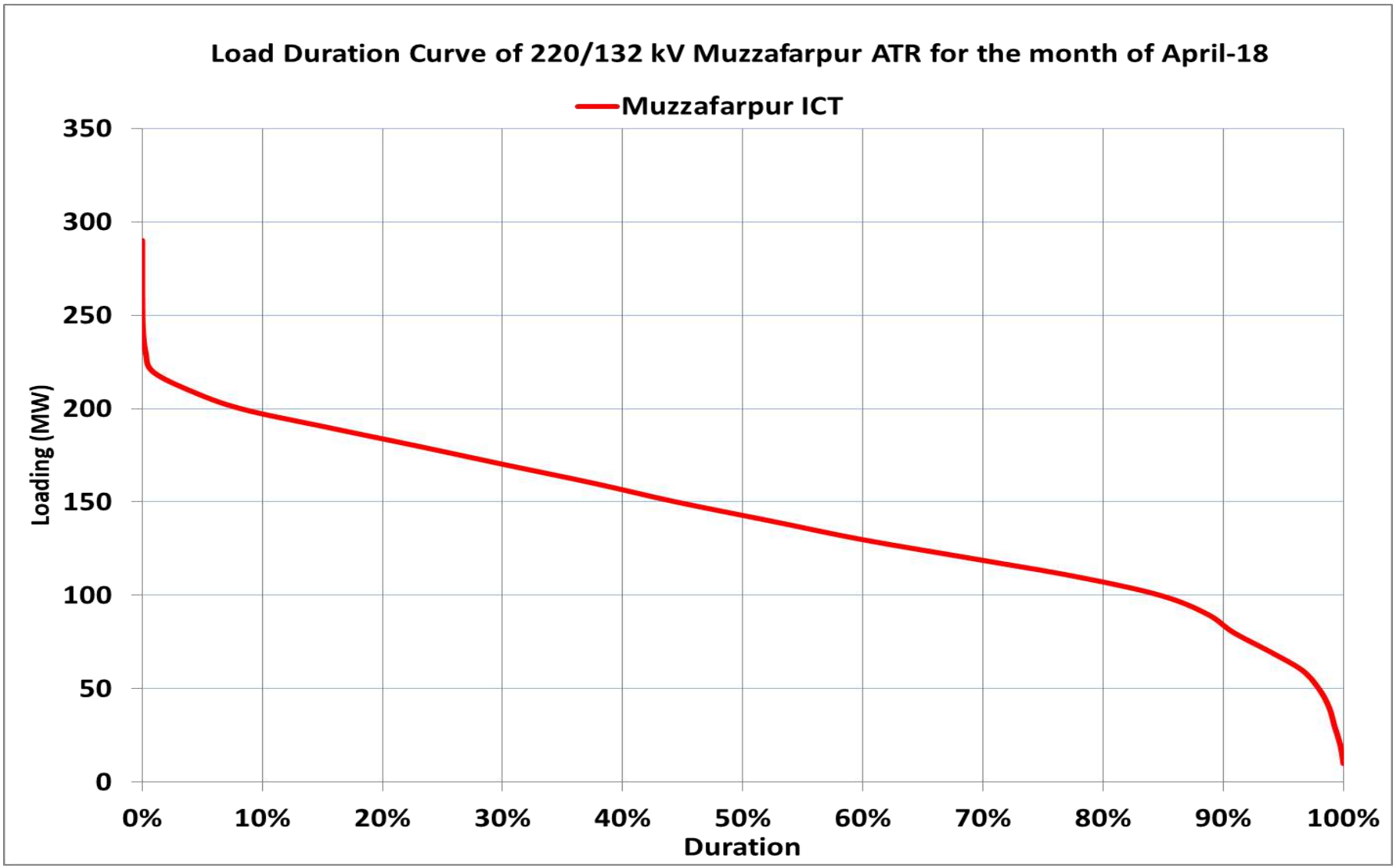
Sl Number	Name of Substation	Peak load	Off Peak Load
1	Kanti TPS	25(Plant load)	25(Plant Load)
2	Muzaffarpur	70	45
3	Vaishali	49	25
4	Shetalpur	25	15
5	SKMCH	57	45
6	Belsand	15	10
7	Runisaidpur	20	12
	Total	261	177

*BSPTCL may please confirm the above load quantum

Flow through 220/132 kV ATRs of MTPS for April-18



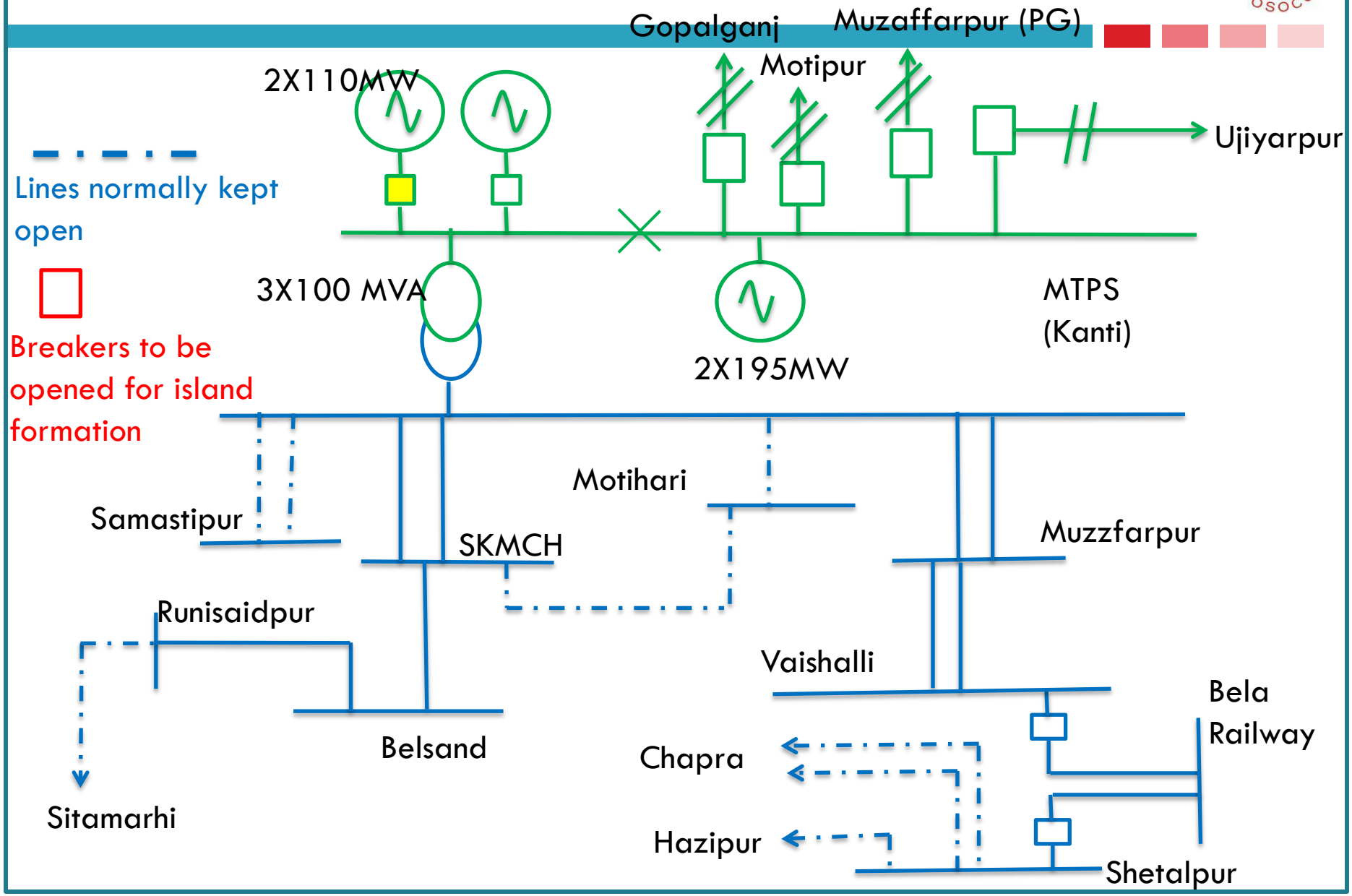
Load duration curve of 220/132 kV ATRs at MTPS for April 2018



Logic for formation of island

- If summation of power flow through 220/132 kV ATRs at MTPS is
  - Greater than 200 MW
    - Select both 195 MW units of KBUNL-2 for Islanding
    - In case one unit is out(planned or forced outage) select one 195 MW unit and one 110 MW unit(KBUNL-1) for islanding
  - In between 110 MW and 200 MW
    - Select one 195 MW unit of KBUNL-2 for Islanding
  - Is below 110 MW
    - Select one 110 MW unit of KBUNL-1 for Islanding

Formation of island (cont.....)



Formation of island

- Once the frequency falls to say 48.2 Hz the PLC at MTPS should give signal to appropriate C.Bs to open following lines to form an island with above loads, after 500 ms delay.
  - At 220 kV MTPS
    - 220 kV Muzaffarpur(PG)-MTPS D/C
    - 220 kV Ujiyarpur-MTPS D/C
    - 220 kV Gopalganj-MTPS D/C
    - 220kV Motipur-MTPS D/C
    - Units of KBUNL-1 and/or KBUNL-2 depending upon logic
  - At 132 kV Vaishali
    - 132 kV Vaishali-Bela Railways S/C
  - At 132 kV Shetalpur
    - 132 kV Vaishali-Bela Railways S/C
- Further PLC will continuously monitor both 195 MW and 110 MW units of Kanti and depending upon parameter of unit (i.e. Steam temp, pressure etc.) it will select the Suitable one for islanding

Load-generation balancing

- Islanding will trigger PMS (Power Management System). Post Islanding Power & Load will be calculated.
- If the mismatch between load and generation of one of the 195 MW units is within (±5%) then the other unit would be tripped. However if the mismatch is within (±5%) of the total generation, then both units would be kept on bar.
- If frequency of the island shoots above 51.0 Hz, then HP-LP steam bypass is to be activated from PMS via DCS.
- Immediately after the islanding, governor operation of the unit(s) of Stg-2 should change from load control to frequency control mode
- If frequency falls below 48.0 Hz, further load shedding within the island has to be carried out by tripping appropriate 33/11 kV feeders (say at 47.9 Hz). Since the power number of formed island will be very low a very precise load generation matching technique is needed

Some Typical numbers/facts

- U#3 CMC mode operation in practice.
- U#4 CMC mode operation to be commissioned.
- Droop characteristic setting for EHTC mode operation is 5%.
- Switchyard SLD attached. 220 kV Bus sectionalizer bay to be erected. Switchyard package for balance of work is under award stage. 220 kV Darbhanga & Begusarai lines only one circuit in service.
- Critical minimum limit to run the unit is 55% of 195 MW, i.e. 107 MW
- Maximum overload capacity on continuous operation is 105% of 195 MW, i.e. 204.75 MW.
- Maximum & minimum ramp up rate is 1 MW/ min.
- Maximum frequency for stable operation of unit < 52.5 Hz, full load rejection at 52.5 Hz.
- Minimum frequency for stable operation of unit is > 47.5 Hz, full load rejection at 47.5 Hz.
- Total auxiliary load during islanding is 25 MW.

Issue of concern

- Large variation of flow through 220/132 kV ATRs at MTPS
- Due to large variation of load and uncertainty of availability of units the 110 MW units of KBUNL may also need to be considered for formation of Island and thus its healthiness is also need to be ensured
- Healthiness of turbine governing system of the units
- Availability of dedicated communication /PLCC in 132 kV lines for formation of island or in the extreme case of absence of same, tripping of requisite CBs using UFR
- Loads selected for power station islanding should not overlap with those under normal UFLS scheme
- Due to small size of island, its power number is expected to be very low (6-10 MW/Hz) so precise load shedding at 33/11 kV is required.

2nd Third Party Protection Audit Observations of DVC Sub-stations in Eastern Region

Sl. No.	Name of Sub-station	Date of Audit	Observations/Remarks	Category
1	Chandrapura TPS B (New) 220kV - DVC	01-06-2018	1. Only one DCDB is available. Other DCDB may be provided and protection relays should be subdivided into two groups to provide redundancy	B
			2. Time synchronizing equipment is not available	B
			3. Old ABB make PLCC panels are being used for BTPS lines.PLCC system may be upgraded to new system as availability of spares is an issue.	B
			4. Line CVT is available for only one phase and distance relay measurement voltage input is taken from bus CVT. Line CVT may be installed in all three phases and distance relay voltage measurement input may be taken from line CVT.	B
2	Chandrapura TPS A (old) 220kV - DVC	01-06-2018	1. Isolation of 220 V DC supply positive w.r.t. Ground is not proper. All DC cables are old and needs replacement.	B
			2. Event logger is not available	B
			3. LBB protection CAG 34 A for 220kV level is not service	B
			4. Only one DCDB is available. Other DCDB may be provided and protection relays should be subdivided into two groups to provide redundancy	B
			5. Electromechanical relays of primary and backup protection are to be replaced with numerical relays	B
			6. CVTs, CTs, CBs, Isolators and Surge Arresors of 132kV system are 50 years old and these equipments needs to be replaced.	B
			7. Panel and control cable wirings are old and needs replacement.	B
			8. All indicating instruments in control room may be upgraded to digital meters as old analog instruments give high burden to CT	B
			9. Line CVT is available for only one phase and distance relay measurement voltage input is taken from bus CVT. Line CVT may be installed in all three phases and distance relay voltage measurement input may be taken from line CVT.	B
			10. Busbar protection for 220kV system CAG 34 A is not service	A
			11. Time synchronizing equipment is not available	B
			12. Old PLCC panels are being used in some 220kV and 132kV lines. PLCC system may be upgraded to new system as availability of spares is an issue.	B
			13. Autorecloser is not in service for 220kV Kalyaneswari lines and 132kV Rajabera lines	B
			14. Overflux protection is not available for 150 and 160 MVA, 220/132 kV ATRs	B
			15. Backup directional over current Earth Fault protection is not available for 150 and 160 MVA, 220/132 kV ATRs	B
			16. Main protection of 132kV Purulia (L58) and Gola(L6) are not in service.	B
			17. Huge vegetation up to 3 feet grass was observed in the switchyard. The same has to be removed and proper gravelling is to be done.	A
3	Bokaro TPS B 220/132/33kV - DVC	31-05-2018	1. Isolation of 220 V DC supply negative w.r.t. Ground is not proper. All DC cables are old and needs replacement.	B
			2. Event logger is not available	B
			3. DG set is not available	B
			4. Only one DCDB is available. Other DCDB may be provided and protection relays should be subdivided into two groups to provide redundancy	B
			5. Electromechanical relays of primary and backup protection are to be replaced with numerical relays	B
			6. CVTs, CTs, CBs, Isolators and Surge Arresors are 30 years old and these equipments may be upgraded to present fault level	B
			7. Panel and control cable wirings are old and needs replacement.	B
			8. All indicating instruments in control room may be upgraded to digital meters as old analog instruments give high burden to CT	B
			9. Line CVT is available for only one phase and distance relay measurement voltage input is taken from bus CVT. Line CVT may be installed in all three phases and distance relay voltage measurement input may be taken from line CVT.	B
			10. Terminal connections directly connected to CVT needs to be modified i.e. Line dropper to Surge Arrestor then CVT	A
			11. Time synchronizing equipment is not in service	B
			12. 0.5 class CTs may be replaced with 0.2 class	B
			13. REL 670 of 220kV Ramgarh line may be used as Main II distance protection and backup directional over current E/F protection may be enabled in SEL 311C and REL 670.	A
			14. Overflux protection is not available for 150 MVA, 220/132 kV ATRs	B
			15. Backup directional over current Earth Fault protection is not available for 150 MVA, 220/132 kV ATRs	B
			16. Autorecloser and carrier tripping are not in service for all 132kV lines	B
4	400kV Bokaro TPS - DVC	31-05-2018	1. 315 MVA, 400/220kV ICT-II is charged from 400kV side only 220kV side bay is yet to be commissioned.	B
5	Durgapur 220/33kV - DVC	30-05-2018	1. Busbar protection is not in service	B

			2. Event logger is not available	B
			3. One 220 V DC source is available. Second source may be provided	B
			4. Electromechanical relays of primary and backup protection are to be replaced with numerical relays	B
			5. Time synchronizing equipment is not available	B
6	Durgapur TPS 220/132kV - DVC	30-05-2018	1. Busbar protection is not available	B
			2. Event logger is not available	B
			3. LBB is not available	B
			4. Dedicated 220 V DC source may be provided for 220kV Switchyard or DC source of 132kV switchyard may be extended for 220kV Switchyard.	B
			5. Electromechanical relays of primary and backup protection of ATRs are to be replaced with numerical relays	B
			6. CVTs, CTs, CBs, Isolators and Surge Arresors are 30 years old and these equipments may be upgraded to present fault level	B
			7. Backup directional over current Earth Fault protection is not available for 160 MVA, 220/132 kV ATRs	B
			8. Overflux protection is not available for 160 MVA, 220/132 kV ATRs	B
			9. Line CVT is available for only one phase and distance relay measurement voltage input is taken from bus CVT. Line CVT may be installed in all three phases and distance relay voltage measurement input may be taken from line CVT.	B
			10. Terminal connections directly connected to CVT needs to be modified i.e. Line dropper to Surge Arrestor then CVT	A
			11. Time synchronizing equipment is not service	B
			12. RED 670 is yet to be commissioned for 132kV ASP lines	A
			13. DG set is not available	
			14.Autorecloser is not service for all 220kV lines	B
7	Mejia TPS 220kV - DVC	29-05-2018	1. Isolation of 220 V DC supply positive w.r.t. Ground is not proper. All DC cables are old and needs replacement.	B
			2. Event logger is not available	B
			3. Autorecloser is not service for all 220kV lines	A
			4. Only one DCDB is available. Other DCDB may be provided and protection relays should be subdivided into two groups to provide redundancy	B
			5. Electromechanical relays of primary and backup protection are to be replaced with numerical relays	B
			6. CVTs, CTs, CBs, Isolators and Surge Arresors are old and these equipments may be upgraded to present fault level	B
			7. Panel and control cable wirings are old and needs replacement.	B
			8. All indicating instruments in control room may be upgraded to digital meters as old analog instruments give high burden to CT	B
			9. Line CVT is available for only one phase and distance relay measurement voltage input is taken from bus CVT. Line CVT may be installed in all three phases and distance relay voltage measurement input may be taken from line CVT.	B
			10. DR and Fault locator are not available for Kalyaneswari, Burnpur DTPS lines	B
			11. Time synchronizing equipment is not available	B
			12. PLCC is not available for 220kV MTPS-Gola line	B

Note:

1. As per CERC order dated 21st Feb 2014 protection deficiencies are categorised as
Category-A : The deficiencies which can be corrected without any procurement.
Category-B : The deficiencies involving procurement of equipments.

UFR Inspection Report of 220/33kV Durgapur (DVC) substation on 30.05.2018

The ERPC UFR inspection group visited 220/33kV Durgapur (DVC) S/s for UFR Audit on 30.05.2018. The team physically inspected the feeders which are connected with UFRs at the above sub-stations. The report of the inspection is furnished below:

Sl. No.	Name of the substations	Feeder connected with UFR	Voltage rating	Adopted UFR setting	Tested initiated frequency	UFR make
			(kV)	(Hz)	(Hz)	
1	220/33kV Durgapur	Graphite India I & II	33	48.6	48.6	Siemens 7SJ8042
2		Jai Balaji Industries	33			
3		SRB Steel I & II, VSP	33			
4		Brahma Alloy	33			
5		Venky steel	33			

The above UFR setting were tested with help of Secondary injection Kit owned by DVC. The UFRs are provided with direct trip wiring and tripped at desired frequency.

400/132 kV Motihari(DMTCL) and 400/220 kVDarbhanga(DMTCL) Substation Auidt Findings and Recommendations

In view of repeated tripping of various lines from Motihari 400/132KV(DMTCL) substation and unreliable operation of the protection system, an audit team was formed by MS, ERPC during the 67th PCC meeting for auditing the protection system of 400/ 132 KV Motihari and 400/220 KV Dharbhanga substation of DMTCL. Members of the above Protection Audit team were:

1) Sh. J. Ganeswara Rao, EE, ERPC
2) P.P. Jena, AEE, ERPC
3) Sh. Chandan Kumar, Sr. Engineer, ERLDC
4) Sh. Saibal Ghosh, Engineer, ERLDC
5) Sh. Vivek Pushphakar, Manager, NTPC Barh
6) Sh. Mohsin Raza, Manager, POWERGRID

Protection Audit team visited the 400/132 KV Motihari Substation on 11/06/18 and inspected all the settings and relay test reports in presence of DMTCL executives and matter of concerns and protection standard violation along with operational issues were flagged to them for taking the corrective action. A brief summary of findings of the audit team at 400/132 KV Motihari S/S is as below:

1) **Wiring issues:** In Disturbance Recorder, the wrong status of CB opening was noticed which was also highlighted during the tripping report by ERLDC. Along with this for Zone 1 fault, the pickup for zone 2 and zone 3 is not being observed. The above indicates wrong connection and the same was informed to DMTCL protection team for a thorough check for all the disturbance reorders available in the substation.
2) **Non-operation of Pole Discrepancy relay:** Pole Discrepancy relay for Gorakhpur -2 line has not operated properly, so its time setting and wiring need to be checked. Similar activity has to be done for all the 400 kV as well as 132 kV lines.
3) **Distance protection issue:**
    a. For some line, distance setting for all the zones was found to be incorrect and further, the Main 1 and Main 2 relays were found to having different settings for the same line. In one of the Main protection, (7SA522) for 400 kV lines, the carrier receipt is not configured in distance protection logic.
    b. Zone 2, Zone 3 and zone 4 time delay settings are to be reviewed as per the ERPC protection philosophy.
    c. **P.O.P Z2 scheme Usage:** P.O.P Z2 scheme has been used instead of Under reach scheme for the 400 kV lines.
    d. Reversal guard timer has been used which is not required.
    e. **Power swing block:** Blocking is used for all zones, but for the zone -1 it should be unblocked.
    f. **SOTF:** This was inactive in 7SA522 relay and DMTCL was asked to activate it.

400/132 kV Motihari(DMTCL) and 400/220 kVDarbhanga(DMTCL) Substation Auidt Findings and Recommendations

4) **Directional Earth Fault:** DT send for DEF protection have been activated however in practice utilities do not use a direct trip in case of DEF
5) **Disturbance Recorder timing:** DR timing was found to be 1.5 sec, which is quite less and does not capture the entire event in one DR file. DMTCL was intimated to make it 5 sec (0.5 s pre and 2,5post-fault) or higher as per the capability of Disturbance recorder file.
6) **Coordination of Overcurrent Protection of 400/132 kV ICTs:** The 400/132 kV ICT overcurrent protection need proper coordination with respect to the downstream 132 kV network in order to avoid any unwanted tripping due to a downstream network fault. Presently 400/132 kV ICTs are set to trip at 110% of rated current. However, the overcurrent tripping of the ICT needs to be set as per the overload alarm and overcurrent tripping also need to be reviewed with respect to the capacity of the ICTs.
7) **Station Operating Procedure during Blackout:** The details of action required to be done during any substation level blackout were found to be not available in the Control Room to assist the operator under emergency. This document is quite necessary in order to help and guide operator under such situation.
8) **Spares Management for GIS Substation:** As the 400 kV Gorakhpur-Motihari 2 Inter-regional circuit is on prolonged outage due to the issue of unavailability of spare at the Motihari substation. The Audit team is of the view that adequate spare need to be maintained at GIS substation to meet such contingency.
9) **Training of the Manpower:** It was observed that the shift personnel need adequate training for real-time operation of the GIS substation and the same has been informed to the DMTCL.
10) **Switchyard maintenance:** Lot of vegetation in the yard was found. So proper anti-weed treatment in regular interval need to be carried out.

The Audit team has also visited the 400/220 kV Darbhanga substation on 12/06/18 and the issues observed in the Motihari Substation were also found in Darbhanga substation.

Recommendations of Protection Audit Team for 400/132 kV Motihari and 400/220 kV Darbhanga Substation:

In view of the above issues, the Protection Audit Team informed DMTCL operation and protection team to for the smooth operation of both the 400 kV substations

1. Thoroughly check all the soft logic, setting and wiring connection for ensuring protection reliability of this important inter-regional corridor.
2. Adequate spare management to meet contingency
3. Training of control room operator for GIS substation operation
4. System Operating procedure availability in control room
5. Ensuring the protection coordination with the downstream network

MINUTES OF MEETING BETWEEN POWERGRID (HVDC SASARAM) AND GE T&D INDIA LTD.

Date: 14/10/17

Members Present:

GE T&D INDIA LTD.

Mr. Sunil Joshi

POWERGRID

Mr. Sunit Kumar Singh

Mr. D.S. Karthik

Mr. Aman Kumar

M/s GE T&D repersentative reported at Sasaram site on 11.10.2017 to analyse the long pending issues related to HVDC Back to back to Station.

SL NO	ISSUE	Comment
1	**Converter control and Protection: Software issues** a. Control System SYS fail, Independent booting, frequent failure of compact flash cards, Profibus signals updating problems are still persisting. The problem is yet to be resolved. b. Spurious tripping of HVDC pole showing switchyard connectivity lost during opening of any bay connected to HVDC system. c. All AC harmonic filters/ Line reactors become unavailable after resetting of lane inspite of availability of same. d. Only one APEX PC is running, need stand by APEX PC available	a. GE to analyse sysfail logs and revert. b. Switchyard connectivity tripping test done and found that HVDC is blocking upon opening of CWD50Q50 breaker. GE to check the logs and revert. Scheme generally blocks after any breaker open command. c. GE to check the logs and revert. d. New Apex PC has been configured. Issue resolved.
2	**Supply of Spare Control and Protection card as per modified hardware architecture.** The card supplied as spare is for old type of installed cards architecture, which has been modified by GE. So spares cards for C&P panel should be changed as per new modified card architecture. 04 nos. Cards (02 nos. CIBS, 01no. Pentium and 01 no. PMC251) taken by GE in April-2014 for repairing is yet to be returned. Required spare configured compact flash cards as the rate of card corruption is very high (Once in a two month).	GE to check and update the status of cards taken in 2014. Spare cards urgently required at site. Failure rate of compact flash card is very high (15 card fail/year on an average). GE to urgently provide 10 no. pre-configured compact flash cards and procedure to configure new flash card.
3	**HVDC controls and Protection Lane-1 is out of order since long time.** Both the Lane has never worked simultaneously since commissioning and HVDC block is running only through Lane-2	One PMC card found defective on Side B Lane-1 M2 subrack (L1SBM2). Card has been replaced with spare PMC card and Lane is now not having any sys fail and VBE protection also reset.

	Both the Lane has never worked simultaneously since commissioning and HVDC block is running only through Lane-2 from April-2014 without any redundancy. Also in Lane-2 intermittent problems are observed during running and at the time of re-start corruption of compact flash cards. M/s GE has done many up gradation of software but system is not yet satisfactory.	has been replaced with spare PMC card and Lane is now not having any sys fail and VBE protection also reset. One Pentium card(VMIC 7740) found defective on Side A Lane-1 control subrack(L1SACP1). The P1 of control (Side A Lane-1) is also showing "Interrupt VME bus coupler error" inspite of replacing faulty card with healthy card from M1 subrack. subrackSpare card is not available at site. Lane redundancy test can only be done after replacing Side A Lane-1 control subrack VMIC 7740 card.
4	**Malfunctioning/failure of VBE cards** Problem persisting since commissioning. GE is yet to provide the solution.	S5004 is getting failed very frequently(2 card failure/year). GE to check and revert.
5	**Converter Transformer issue** None of the Hydran transformer gas monitoring system and Drycol breather in operation condition. Matter taken up with GE from 2006 and matter not resolved. Converter transformer WTI/OTI unit is not working properly. GE to provide compatible replacement.	GE to check and revert.
6	**Pending contractual tests:** Auto reclose test on inverter side with both line available, and one line available and system isolation test with one line available at inverter side. It was committed during September 2010 that AREVA shall conduct these tests in 3 months but still pending	GE to check and revert.
7	**Long term spares** AREVA has been requested to give quotation for long term spares but the quotation is yet to be received.	GE to check and revert.
8	**Valve cooling PLC B problem** Reported to M/s AREVA on 18.07.2011. Alarm from PLC B of Valve cooling is continuously being reflected in SCADA. The alarms are "Valve cooling PLC B Fuse failed", "Valve cooling PLC B operation error". GE committed in MOM dtd 13.12.11 to provide the same, not provided. PLC software has not been provided by M/s GE.	GE to provide PLC software application of valve cooling system.

9	**Addition of newly commissioned line in Eastern Side to HVDC system** Earlier HVDC Back to back system is connected through only two 400 KV transmission lines namely Biharshariff-I &II in Eastern Side. Now the connectivity in eastern bus is extended with 1500 MVA, 765/400 KV ICT, 400 Kv S/c Varanasi and one D/C 400Kv Line Nabinagar-I &II. Integrated for last feeder protection to be done.	Details have been provided to GE by PGCIL. GE to check and revert.
10	**Breaking of System Docking Station (RTU) from their base unit due to brittleness of material used** The SDS is breaking from their base plate due to the excessive brittleness of fibre/ plastic installed in Bay Interface Outstations (BIOS) panels.	Defective RTU can not be repaired. RTU upgrade is required.
11	**Failure of DC-DC converters** All 12 nos. 220 V, DC-DC converters and 02 nos. 48 V DC-DC converters have been failed.	Power supply to be replaced with new power supply.

POWERGRID raised their concern to resolve the above long pending issues and requested to take necessary action for rectification of converter control and protection issues immediately.

POWERGRID also requested to assign single contact person to discuss technical issues in the intermittent period till the final resolution of aforesaid problems.

GE to check all above-mentioned issues and revert detailed plan within 3 weeks.

Checklist for Submission of new transmission elements for updation in Protection Database

NAME OF ORGANISATION:
FOR THE MONTH OF:

SUBSTATION DETAIL:

Sl No	DETAILS OF ELEMENTS	DATA TYPE	Status of Submission (Y/N)	Remarks
1	TRANSMISSION LINE	LINE LENGTH, CONDUCTOR TYPE, VOLTAGE GRADE		
2	POWER TRANSFORMER	NAMEPLATE DETAILS		
3	GENERATOR	TECHNICAL PARAMETERS		
4	CURRENT TRANSFORMER	NAMEPLATE DETAILS		
5	VOLTAGE TRANSFORMER	NAMEPLATE DETAILS		
6	RELAY DATA	MAKE, MODEL and FEEDER NAME		
7	RELAY SETTINGS	NUMERICAL RELAYS: CSV or XML file extracted from Relay ELECTROMECHANICAL RELAYS: SNAPSHOT of RELAY		
8	REACTOR	NAMEPLATE DETAILS		
9	CAPACITOR	NAMEPLATE DETAILS		
9	UPDATED SLD			

SIGNATURE:
NAME OF REPRESENTATIVE:
DESIGNATION:
CONTACT:
E-MAIL ID: