Minutes
of
72nd PCC Meeting

Date: 14.11.2018
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 72ND PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 29.10.2018 (MONDAY) AT 10:30 HOURS

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

PART – A

ITEM NO. A.1: Confirmation of minutes of 71st Protection sub-Committee Meeting held on 19th September, 2018 at ERPC, Kolkata.

The minutes of 71st Protection Sub-Committee meeting held on 19.09.18 circulated vide letter dated 08.10.18.

Members may confirm the minutes of 71st PCC meeting.

Deliberation in the meeting

The minutes were confirmed without any modification.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN SEPTEMBER, 2018

ITEM NO. B.1: Repeated disturbances at 220/132 kV Purnea(PGCIL) & 132 kV Purnea(BSPTCL) substation.

On 16.09.18 at 15:38 hrs.

220 kV Purnea –New Purnea D/C tripped from New Purnea end. At the same time 220/132 kV ICTs and 132 kV Purnea(PG) – Purnea(BSPTCL) T/C tripped at Purnea(PG) end.
Failure of Y phase CT of 132 kV Purnea - Tribenigunj S/C at Tribenigunj was reported at the same time.

Load Loss: 178 MW

On 16.09.18 at 20:52 hrs.

220 kV Purnea –New Purnea D/C tripped from New Purnea end. At the same time 220/132 kV ICTs and 132 kV Purnea(PG) – Purnea(BSPTCL) T/C tripped at Purnea(PG) end. The 220/132 kV ICTs at Kishangunj also tripped at the same time leading to a load loss of around 212 MW at Kishangunj and its surrounding area.

BSPTCL and Powergrid may explain.

Deliberation in the meeting

On 16.09.18 at 15:38 hrs:

BSPTCL explained that the disturbance at 15:38 hrs was due to Y-Ph CT blasting at Purnea (BSPTCL) substation in 132 kV Purnea-Triveniganj feeder. Triveniganj end cleared the fault on zone-I distance protection. BSPTCL added that the CT was placed in bus side at Purnea end and there was no tripping at Purnea (BSPTCL) end.

Powergrid explained that the following elements tripped in the upstream network:

Name of the elements	***End 1 Relay Indication***	***End 2 Relay Indication***
132 KV Purnea(PGCIL)-Purnea(BSPTCL) Circuit-I	*Back up E/F*	*No tripping*
132 KV Purnea(PGCIL)-Purnea(BSPTCL) Circuit-II	*Zone-II distance protection*	*No tripping*
132 KV Purnea(PGCIL)-Purnea(BSPTCL) Circuit-III	*Zone-I distance protection*	*No tripping*
220/132 kV ICTs at Purnea(PGCIL)	*O/C protection*	
220 kV New Purnea-Purnea(PGCIL) D/C	*DEF protection*	*No tripping*

PCC observed that the tripping of 220/132 kV ICTs and 220 kV lines are not desirable. ERLDC informed that the fault was converted into 3-ph fault before the fault clearing time 350 ms, therefore DEF of 220 kV New Purnea-Purnea(PGCIL) D/C line New Purnea end should not be tripped on reset.

On 16.09.18 at 20:52 hrs:

It was informed that there was a high resistance fault in downstream network of Purnea BSPTCL system. ERLDC informed that 1kV voltage dip was observed in PMU plot.

BSPTCL informed that no protection relays were operated at 132kV Purnea (BSPTCL) S/s due to low voltage in 220 V DC system. DC system has been checked after the disturbance and DC cable issues were resolved.

Powergrid informed that 132 kV Purnea(PG) – Purnea(BSPTCL) T/C line and 220/132 kV ICTs tripped from Purnea(PG) end. At the same time 220 kV Purnea –New Purnea D/C tripped from New Purnea end. Thereafter, 220/132 kV ICTs at Kishangunj got tripped on overload.

PCC observed that the tripping of 220/132 kV ICTs and 220 kV lines are not desirable.

Powergrid informed that the tripping of 220/132 kV ICTs at Purnea was due to reduced TMS setting (same as zone-II time setting of 132kV lines). Powergrid added that they have increased the TMS setting 220/132 kV ICTs at Purnea after this incidence to avoid uncoordinated tripping of ICTs.

PCC advised Powergrid to properly coordinate the relay settings from 400kV side to 132kV side at Purnea(PGCIL). PCC also advised Powergrid to verify 220 kV New Purnea-Purnea (PGCIL) D/C line on DEF at 15:38 hrs.

ITEM NO. B.2: Total power failure at 220 kV New Bolangir(Sadaipalli) S/s on 17.09.18 at 10:59 hrs.

220 kV New Bolangir – New Bargarh S/C tripped at 10:34 hrs due to operation of LBB operation at New Bargarh. While charging this circuit, 220 kV New Bolangir – Bolangir S/C tripped from New Bolangir end at 10:59 hrs on O/C, E/F resulting total power failure at New Bolangir end.

Load Loss: 121 MW

Relay indications are as follows:

Time	Name of the elements	End 1 Relay Indication	End 2 Relay Indication
10:34 hrs	220 kV New Bolangir – New	LBB	Z-I, 5.32 km from New

	Bargarh S/C		Bargarh, IR = 0.151 A, IY = 5.3 kA, IB = 5.3 kA, O/C.
10:59 hrs	220 kV New Bolangir – Bolangir S/C	O/C, E/F, IR = 0.38 kA, IY = 0.43 kA, IB = 1.42 kA	Did not trip.

As per PMU data, the fault clearing time was 800 msec.

OPTCL may explain.

Deliberation in the meeting

OPTCL informed that there was an L-L-G fault in 220 kV New Bolangir-New Bargarh S/C line at 10:34 hrs which was cleared from both the ends in zone-I of distance protection.

During restoration of the above line at 10:59 hrs another fault was initiated in 220 kV New Bolangir-New Bargarh S/C line. The relay at New Bolangir end had failed to clear the fault. OPTCL added that New Bolangir end of 220 kV New Bolangir –Bolangir S/C line tripped on backup O/C Earth fault protection.

PCC observed that 220 kV New Bolangir –Bolangir S/C line should trip from Bolangir end on zone 3 instead of New Bolangir end in this case.

OPTCL explained that O/C Earth fault protection at New Bolangir end of 220 kV New Bolangir – Bolangir S/C line was operated due to non-directional settings.

OPTCL added that they have changed the relay settings with directional feature for 220 kV New Bolangir –Bolangir S/C line and rectified the issue of mal-operation of distance protection relay for 220 kV New Bolangir-New Bargarh S/C line. The relay was tested and put into service again.

ITEM NO. B.3: Disturbance at Tenughat (TVNL)S/s on 27.09.18 at 13:14 hrs.

At 13:14 hrs, 220 kV TTPS – Biharshariff S/C tripped from both ends due to high resistive fault (Phase current was less than 800A at both ends). Line tripped on O/C protection from TTPS end and E/F (IN>1) protection from Biharshariff end. At the same time, 220 kV PTPS- TTPS S/C tripped from PTPS end only in Y phase E/F.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
220 kV PTPS- TTPS S/C	Y-phase Earth fault.	Did not trip.
220 kV Biharshariff-TTPS S/C	IN>1	Y-phase O/C.

Generation Loss: 159 MW

TVNL, JUSNL and BSPTCL may explain.

Deliberation in the meeting

TVNL informed that the fault was in Y-phase of 220 kV TTPS-Biharsharif S/C line and of high resistive nature. Biharshariff end cleared the fault on Backup O/C, E/F protection and TTPS end cleared the fault in overcurrent protection. But before clearing the fault from TTPS end, the 220 kV PTPS-TTPS S/C line tripped from PTPS end on overcurrent protection.

During analysis, it was observed that distance protection at TTPS and Biharshariff ends failed to pickup the fault due to high fault resistance. The O/C and E/F protection setting of TTPS end in

220 kV TTPS-Biharsharif line was set for definite time, whereas Biharshariff and PTPS end has time settings as per IEC curve.

PCC viewed that the tripping of 220kV PTPS-TTPS S/C was due to improper coordination in the relay settings between both the ends.

PCC advised TVNL to change the timer settings of O/C and E/F relay at TTPS end as per IEC curve in order to have a proper coordination among the stations.

ITEM NO. B.4: Repeated tripping of 220 kV Jorethang-New Melli D/C and Tashiding-N. Melli S/C

At 12:00 hrs on 04.09.18

At 12:00 Hrs, resistive nature fault occurred on 220 kV Jorethang-New Melli D/C and the lines tripped after 660 ms on Directional earth fault protection. At the same time, 220 kV Tashiding-New Melli line also tripped in distance protection in Zone 2 from Tashiding end. Consequent upon tripping of evacuation lines from Jorethang HPS, both the units tripped causing generation loss of 97 MW.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
220 kV Jorethang-New Melli-I	DEF Operation, Fault Location 33.82 m; IA 134.8 Amp; IB 88.38 Amp; IC 270.4 Amp; In : 256 Amp; Fault Duration: 660.0 ms.	Not received.
220 kV Jorethang-New Melli-II	DEF Operation, Fault Location: 22.52km; IA 134.1 Amp; IB 88.64 Amp; IC 270.6 Amp; In : 258 Amp ;Fault Duration: 661.0 ms	Not received.
220 kV Tashiding –New Melli	B-N,Z-2 Distance Protection, Fault Duration : 534 ms, Fault Location : 17.15 km , IA 63 Amp, IB 62 Amp, IC 705 Amp , Tripped after 500 ms of the fault initiation in 220 kV Jorethang-New Melli D/C	Not received.

At 11:13 hrs on 16.09.18

At 11:13 Hrs, Resistive nature fault occurred in B phase on 220 kV Jorethang-New Melli D/C which got tripped after 320 ms after it was detected in zone 1 from Jorethang end. At the same time, 220 kV Tashiding-New Melli circuit also tripped in zone 2 due to distance protection operation from Tashiding end but fault distance is reverse direction. With the tripping of evacuation lines from Jorethang, it's both units tripped causing generation loss of 97 MW.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
220 kV Jorethang-New	B-N,Z-1 Distance Protection,	Not received.

Melli-I	Fault Duration: 320.7 ms, Relay Trip Time: 80.12 ms, Fault Location: 37.33 Km.	
220 kV Jorethang-New Melli-II	B-N,Z-1 Distance Protection Fault Duration: 329.1 ms, Relay Trip Time: 80.06 ms, Fault Location: 1.67 km	Not received.
220 kV Tashiding –New Melli	B-N,Z-2 Distance Protection Fault Duration : 510 ms, CB Operate Time : 31 ms, Relay Trip Time : 474 ms, Fault Location : -18.95 km ,	Not received.

Issues Observed:

1. The Tripping of 220 kV Tashiding-New Melli circuit from Tashiding end on distance protection in Zone 2 is not desirable as prior to these 220 kV Jorethang-New Melli D/C should have tripped from the New Melli end in DEF or Distance Protection.

2. Fault distance from Tashding end for the fault was in reverse direction however tripping occurred in zone- 2 indicating the issue of directionality in the distance protections setting.

DANS energy, Tashiding and Powergrid may explain.

Deliberation in the meeting

After detailed deliberation, it was concluded that in both cases the fault was in 220kV Tashiding-N.Melli line and of high resistive nature. New-Melli end distance protection cleared the fault on zone 2 within 350 ms whereas Tashiding end cleared the fault on zone 2 in 500ms. In the mean time 220 kV Jorethang-New Melli D/C line tripped from Jorethang end on zone 1.

PCC opined that the tripping of 220kV Jorethang-N.Melli D/C line from Jorethang end was not desirable and the fault in 220kV Tashiding-N.Melli line should be cleared from Tashiding end within 350 ms. PCC advised DANS energy to review the relay settings of for both the lines.

PCC also advised DANS energy and Tashiding HEP to do regular patrolling for 220 kV Jorethang-N.Melli D/C and 220 kV Tashiding-N.Melli S/C lines to avoid this type of disturbances in future.

ITEM NO. B.5: Disturbance at Dikchu S/s on 22.09.18 at 14:38 hrs.

400 kV Teesta III-Dikchu S/C tripped at 14:38 hrs on B-N fault. On Investigation it was found some of the bushes/plantation came in to contact with B phase conductor in the out yard between ICT & GIS at Dikchu.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
400kV Teesta-III-Dikchu S/C	B-N, fault current= 9.1 kA, 15.6 km	B-N, Z-IV, E/F, fault current= 9.195 kA, 700 m

Both units at Dikchu tripped on differential protection though overvoltage and over speed protection operated correctly. O/C earth fault protection of 400/132 kv ICT picked up but did not tripped as time delay (1.2 s) was more than fault clearing time.

Generation Loss: 96 MW

Dikchu HEP may explain.

Deliberation in the meeting

Dikchu informed that the fault was due to vegetation growth in outside substation yard between 440/132 kV ICT and 400 kV GIS bus.

The fault was cleared from Teesta-III end instantaneously in zone-I of distance protection, whereas from generation side of Dikchu HPS, it was cleared in both cable differential protection and overall unit differential protection.

Dikchu added that the relay at Dikchu end for 400 kV Dikchu-Teesta III S/C line was also tripped in STUB protection.

Regarding non-tripping of transformer differential protection, Dikchu informed that the relay was inadvertently made disabled during last testing operation. They have enabled it after this disturbance.

Regarding tripping of 400kV Dikchu-Teesta-III from Dikchu end in STUB protection, Dikchu informed that the STUB protection was included and enabled by the OEM during commissioning stage. They further added they will review the tripping incident on STUB protection after consulting the OEM.

On query from PCC regarding tripping of cable differential protection for any nearby external faults, Dikchu explained that they had consulted the OEM regarding the issue and as per their opinion, the issue can be attributed to saturation of HV side CT in Generating Transformer. Dikchu added that they are going to test the CT very soon and if required, it will be replaced with a new one.

The issue of unit synchronization without informing ERLDC after tripping of the units on SPS-II operation, Dikchu informed that they have modified their standard operating procedure accordingly and assured that the issue will not be repeated in future.

ITEM NO. B.6: Tripping of 400 kV Alipurduar- Binaguri-I and 400 KV Alipurduar-Bongaigaon-II on 25.09.18 at 14:40 hrs.

400 KV Alipurduar- Binaguri-I and 400 KV Alipurduar- Bongaigaon-II are on a multi circuit tower. R phase conductor of 400 KV Alipurduar - Binaguri I snapped and fell on 400 KV Alipurduar - Bongaigaon II (between loc. 8 & 9, 3 KM from Alipurduar) resulting tripping of both the circuits at same time.

Load/Generation Loss: Nil

ENICL may explain.

Deliberation in the meeting

PCC opined that the tripping was in order.

ITEM NO. B.7: Tripping Incidences in the month of September, 2018.

Other tripping incidences occurred in the month of September 2018 which needs explanation from constituents of either of the end is given in **Annexure-B.7.**

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-B7.***

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

PART- C:: OTHER ITEMS

ITEM NO. C.1: Islanding scheme at IbTPS- OPGC

68th 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.

In 69th PCC, OPTCL presented the revised islanding scheme based on updated network configuration and power flows. The details are enclosed at **Annexure-C.1**.

In 70th PCC, OPGC has submitted the updated details which are enclosed at **Annexure-C1.a.**
It was decided that ERLDC and ERPC will study and finalize the islanding scheme in next PCC Meeting.

In 71st PCC, it was decided that the islanding scheme would be finalized after detailed discussion with OPGC and OPTCL.

ERLDC & ERPC may update.

Deliberation in the meeting

PCC advised OPTCL and OPGC to prepare a joint presentation highlighting the below mentioned points in order to have a clarity of the overall scheme.

- *The logic for islanding operation such as frequency limit, overvoltage settings, vector shift settings etc.*
- *Logic/Actions to be adopted for different grid scenarios for both generator side and transmission side.*
- *The actions to be taken at generator side vis-a vis at transmission side for different conditions.*

ITEM NO. C.2: Total power failure at 220kV Hatia(JUSNL) S/s on 20.07.18 at 09:10 hrs.

Due to clearance issue with some 11 KV feeder (which has an in feed from Hatia old) repeated faults occurred in 220 kV Ranchi - Hatia-I and II. As a result total power failed at 220kV Hatia S/s.

In 70th PCC, JUSNL informed that repeated disturbances and total power failure at Hatia substation on 20.07.18 was due to the clearance issue with 11kV feeder under 220kV Ranchi-Hatia D/C line. JUSNL informed that the 11 kV feeders were re-routed after the above incidences to get the sufficient clearance.

PCC advised JUSNL to check the Sag level and clearance of 220 KV lines to avoid this type of tripping.

From the analysis of PMU plot and disturbance recorders at Ranchi & Hatia end, a number of protection related issues came into notice.

PCC analysed the issue & advised JUSNL to take the following actions

- Whenever PLCC will remain out of service, the auto reclose operation should be made to non-auto mode and zone 2 timing may be reduced (preferably less than 0.35 Sec.) to minimize the fault clearing time.
- The trip on reclose function should be enabled in the relay whenever autoreclose function is in operation.

Regarding unwanted tripping of 220/132 kV ATRs at Hatia and Patratu substations and tripping of Hatia-Patratu line in zone-4, PCC felt that there was a protection coordination issue and advised JUSNL to submit the corresponding relay settings to ERPC/ERLDC at the earliest.

The issue of delayed opening of breaker at Hatia end i.e.400 msec after zone-I tripping initiation was remained unexplained. The sequence of operation as well as the details of elements tripped during the incident could not be explained by JUSNL.

PCC decided to discuss this issue in next PCC meeting and advised JUSNL to explain the issue in next meeting with all the relevant details.

In 71st PCC, JUSNL was advised the details at the earliest.

JUSNL may explain.

Deliberation in the meeting

JUSNL informed that they will submit the details within one week.

ITEM NO. C.3: Repeated interruption of power supply at Lalmatia and Sahebgunj area

PCC advised JUSNL to comply the earlier observations/recommendations regarding frequent tripping incidences at Lalmatia S/s.

In view of repeated uncoordinated trippings and mal-operation of relays at 220/132kV Lalmatia S/s in the past, PCC decided to form a Committee with members from NTPC, Powergrid, ERLDC and ERPC. The Committee would visit Lalmatia and adjoining substations for on-site inspection and Third Party Protection Audit.

In 70th PCC, Audit team presented the report highlighting the major issues with respect to Lalmatia substation. The report is attached in **Annexure-C.3**.

ERPC secretariat has also communicated the audit observations to JUSNL and NTPC for early

compliances.

In 71st PCC, JUSNL informed that the audit observations have been forwarded to concerned division for compliance.

JUSNL may update.

Deliberation in the meeting

JUSNL submitted the compliance/status report with respect to the audit party observations.

PCC decided to place the Protection Audit observations along with the compliance report of JUSNL in next TCC meeting scheduled to be held on 16.11.2018.

ITEM NO. C.4: Auto-Reclosure on Lines from PPSP Generating station.

It has been observed that, no transmission lines from 400 kV PPSP Plant are having the auto-reclosure facility in enabled condition. Further, the auto-reclosure facilities are also not enabled at remote end substation.

Element Name	Tripping Date	Tripping Time	Type of Fault
400KV PPSP-BIDHANNAGAR-I	05-08-16	21:43	R Phase to E/F
400KV PPSP-NEW PPSP-2	25-02-18	12:58	R Phase to E/F
400KV PPSP-BIDHANNAGAR-II	11-03-18	23:45	Y phase to E/F
400KV PPSP-BIDHANNAGAR-II	30-04-18	8:21	Y phase to E/F
400KV PPSP-BIDHANNAGAR-II	10-05-18	6:15	B phase to E/F
400KV PPSP-BIDHANNAGAR-II	20-05-18	16:39	R Phase to E/F
400KV PPSP-BIDHANNAGAR-I	01-06-18	11:37	Y phase to E/F
400KV PPSP-BIDHANNAGAR-II	08-06-18	2:32	B phase to E/F
400KV PPSP-BIDHANNAGAR-II	08-06-18	23:50	Y phase to E/F
400KV PPSP-BIDHANNAGAR-II	12-06-18	14:34	R Phase to E/F

Non-Implementation of Auto-reclosure results in the non-compliance of CEA Technical Standard for Construction of Electrical Plants and Electric Lines 43.4.C.

WBPDCL may kindly update on the status of healthiness and enabling of the auto-reclosure on the transmission lines from PPSP Power plant. It may kindly be noted that, most of the power plant (Thermal/Hydro/Gas) in the Indian Power System have no issue in enabling single-phase auto-reclosure for the line emanating from their plant. This has indeed increased their reliability during bad weather conditions during which transient fault occur on the lines.

The agenda could not be discussed in 70th & 71st PCC meeting as WBSEDCL representative was not present in the meeting.

Members may discuss.

Deliberation in the meeting

WBSEDCL representative was not present in the meeting. It was informed that the representatives of WBSEDCL would be requested to attend regularly in the PCC meeting.

PCC advised ERPC Secretariat to place this agenda in next OCC meeting where the agenda item could be discussed with WBSEDCL.

ITEM NO. C.5: Time Setting for Digital Disturbance Recorder in the Relay

Disturbance recorder file is the most important data during any event analysis. Further, it is essential that the disturbance recorder file should have adequate information about the event. In order to achieve that, it is desired to have 3-5 seconds as the recording time so that all the important aspect of event can be captured. However, it has been observed that, most of the Disturbance Recorder files have very small time window of record (0.5-1.5 seconds) and thus leading to lack of data for events like auto-reclosure, PDR operation etc.

In view of this, it is suggested to adopt a pre-event time window of 0.5 second and Post-event time window of 2.5 to 4.5 seconds.

All the constituents were advised by PCC to comply the above suggestion.

Members may discuss.

Deliberation in the meeting

PCC advised all the constituents to comply the above suggestion.

ITEM NO. C.6: FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)

The decisions of previous PCC Meetings are given at **Annexure-C.6**.

Members may update the latest status.

Deliberation in the meeting

The updated status was given in Annexure-C.6.

ITEM NO. C.7: 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.
In 70th PCC, PRDC was advised to resend the list of the lines to all constituents and constituents were advised to verify the settings at the earliest.

Members may update.

Deliberation in the meeting

It was informed that some of the constituents have verified the settings.

PCC advised all other constituents to verify the settings by next month and report discrepancy, if any.

ITEM NO. C.8: 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, in West Bengal from 09th July 2018 to 13th July 2018, in Bhubaneswar from 06.08.18 to 10.08.18 and in Jharkhand from 10th Septemebr 2018 to 14th September 2018.

Members may update.

Deliberation in the meeting

PRDC informed that training has been completed for all state utilities except Sikkim.

ITEM NO. C.9: Status of Third Party Protection Audit

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

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

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

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

Members may note.

Deliberation in the meeting

Members noted.

ITEM NO. C.10: 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		In service
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		In service
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	*Work is in progress expected to be commissioned by December 2017.*
2.	220 kV Biharshariff- Begusarai line	
3.	220 kV Biharshariff- Bodhgaya line	
4.	220kV MTPS-Motiari line	
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.

In 70th PCC, WBSETCL informed that PLCC was in service for both the ends of 220kV Bidhannagar-Waria-II line.

Members may update the status.

Deliberation in the meeting

WBSETCL informed that PLCC was in service for 400 kV Kolaghat-Kharagpur-II.

ITEM NO. C.11: Non-Submission of Details of Alipurduar HVDC pole tripping to ERLDC.

On 27th Aug 2018 at 00:23 Hrs and on 6th Sept 2018 at 04:01 Hrs, HVDC Pole 3 at Alipurdwar tripped due to line fault. In order to know how the issue and analyse the event as per the IEGC and CEA grid standard, the flash report/FIR and DR/EL was asked from Alipurdwar end however it has not been received.
In view of coordinated analysis of any event it is desired that the DR/EL and flash report/FIR of any pole tripping from Alipurdwar may kindly be forwarded to ERLDC/ERPC also in line with IEGC 5.2.r and CEA grid Standard 15.3.

In 71st PCC, Powergrid informed that for all inter regional HVDC lines their corporate office is centrally coordinating the HVDC pole tripping and submitting the report to NLDC. It was decided to take up the issue with NLDC and Powergrid corporate office for submission of details to ERLDC.

Members may update.

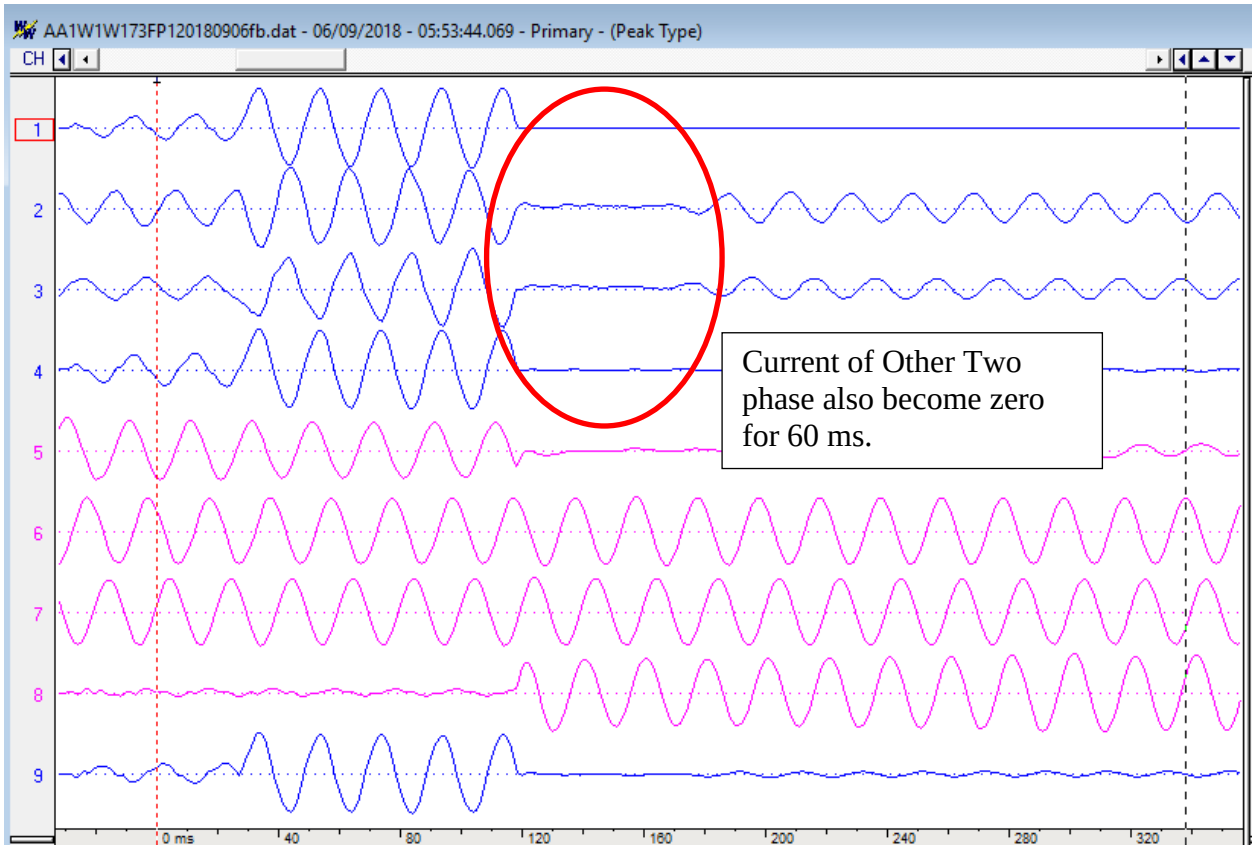
Deliberation in the meeting

Powergrid informed that the details would be submitted by their nodal point.

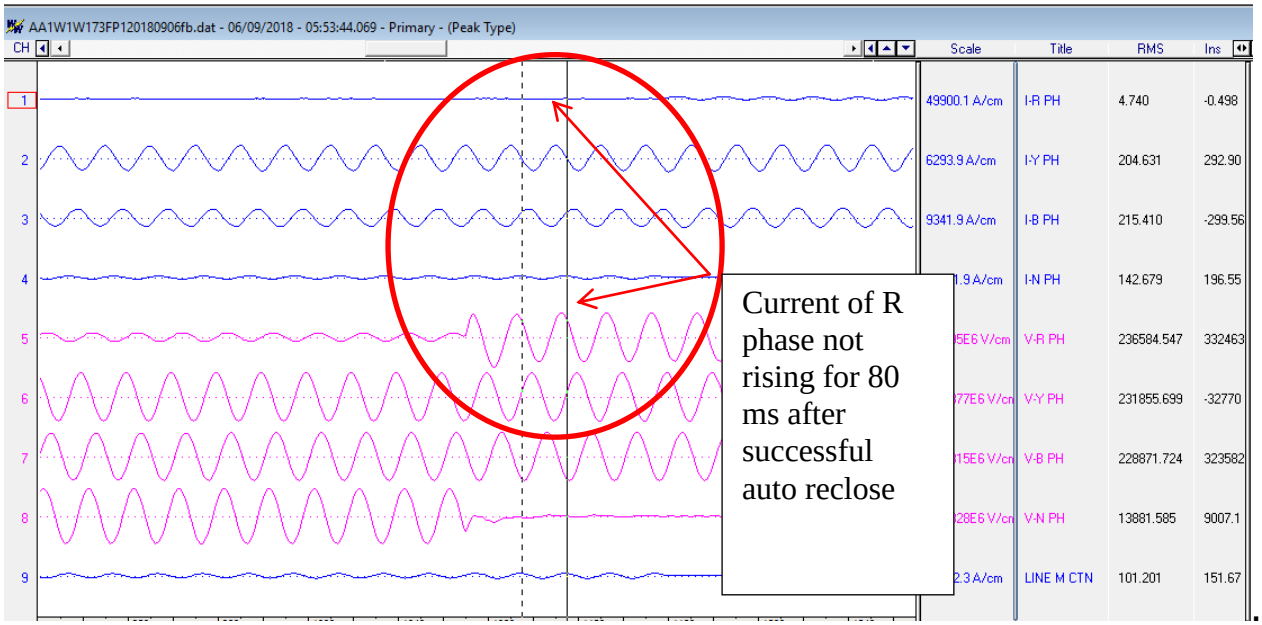
ITEM NO. C.12: AC-DC interaction: HVDC TFR triggering standardization and reporting requirements.

On 06.09.2018, R-phase fault took place in 400 KV Alipurduar-Bongaigaon-I line followed by successful auto reclose. The special observations in this case are as follows:

1. After opening of R phase, the other two phase also become zero for 60 ms then suddenly restored to is normal value.



2. After 1 sec, R phase successfully auto reclose but R phase current did not rise for next 80 ms.



The event must be investigated carefully for understanding this AC-DC interaction which is very critical for grid security. To analyze this type of events, triggering of HVDC TFR during AC system faults is required.

In this matter, one of the international TFR specification and triggering criterion are attached in the **Annexure-C.12.** Powergrid may share their current TFR specification and triggering criterion.

Members may discuss.

Deliberation in the meeting

Powergrid informed that the details would be submitted by their nodal point.

ITEM NO. C.13: Disturbance monitoring equipment(DME) standardization

The power system is routinely subjected to faults or disturbances which can range from transient faults on transmission lines to system-wide disturbances involving multiple control areas, states and even countries. Investigation of each incident is critical in optimizing the performance of protection systems with the goal of preventing future incidents from becoming wide-area disturbances. The tools required to perform post-incident analyses include DME which can capture pre-event, event, and post-event conditions with a high degree of accuracy.

Recorders can be classified into two categories:

- FR (Fault Recorder)
- Sequence of events Recorder (SER)

For FR (Fault Recorder) following points may be standardized:

a. Deployment
b. Record Length
c. Triggers
d. Sampling Rates

For Sequence of events Recorder following points may be standardized:

a. SER Capability
b. Point Assignments
c. Use of RTUs for SER

Common issues:

a. Data format
b. Power Supply
c. Monitoring

Reference documents for this:

1. NERC Standard PRC-002-2 Disturbance Monitoring and Reporting Requirements

2. NPCC Regional Reliability Reference Directory # 11 Disturbance Monitoring Equipment Criteria

Members may discuss.

Deliberation in the meeting

ERLDC informed that many a times the analysis of grid disturbances could not be done thoroughly due to improper configuration of the disturbance recorders. This is due to the non-availability of any standards for configuring the disturbance recorder.

In view of the above, ERLDC suggested to formulate a common standard which can be followed by all the constituents in the region.

Constituents informed that it is difficult to set common standard as they are using relays of different manufacturers and different versions.

PCC advised all the constituents to submit the settings related to configuring disturbance recorders to ERLDC.

ITEM NO. C.14: Auto-Reclosure Dead Time on 400 kV Transmission Lines from WBPDCL Circuit.

During the tripping of 400 kV Jeerat –Bakreshwar on 17 Aug 2018 from Bakreshwar end and successful Auto-reclosure at Jeerat, it was found that the dead time is kept 600 ms at Bakreshwar end. Further, also for 400 kV Kolaghat-Arambag circuit, the A/R at Kolaghatis kept as 600 ms.It may kindly be noted that dead time of A/R has been kept as one second in most of the utilities across India to ensure successful A/R with extinguishment of the arc.

In view, of the above it is advised that the uniform practice of 1 second may be adopted as the dead time in all 400 kV lines from WBPDCL generating for A/R. Members May like to Discuss.

In 71st PCC, WBPDCL agreed to go through the proposed suggestion and inform their views to PCC at the earliest.

WBPDCL may update.

Deliberation in the meeting

WBPDCL informed that PCC recommendation has been implemented.

ITEM NO. C.15: Issue of Static Overvoltage Relay at 400 kV Binaguri Substation in Eastern region

400 kV Binaguri Substation recently has seen spurious over voltage tripping of circuit. The details of these events are given below:

1. **On 13th June 2018 at 06:32 Hrs :**There was a successful Auto-Reclosure on 400 kV Binaguri- Bongaigaon 2 circuit due to B phase to earth fault. At the same time , 400 kV Binaguri-Rangpo circuit 2 which is in same diameter of 400 kV Binaguri-Bongaigaon 2 at Binaguri end got tripped from Binaguri end on Over voltage stage 2 operation (Y phase voltage). In addition 400 kV Bingauri-Tala 1 also has tripped on over voltage stage 2 operation from Binaguri end (R phase Voltage). The reason for the transient overvoltage is not known. Rest of the circuit from Binaguri end did not trip during this event.
2. **On 10th Sept 2018 at 11:31 hrs :** 400 kV Tala-Binaguri 4 circuit tripped on overvoltage protection from Binaguri end while the voltage at Binaguri was 407 kV. During this event, there was no fault in the system.
3. **On 11th Sept 2018 2018 at 08:10 Hrs:** 400 kvBinaguri-Malbase circuit tripped on overvoltage protection from Binaguri end while the voltage at Binaguri was 404 kV. During this event, there was no fault in the system.

The above tripping of lines from Binaguri on spurious over voltage protection when the system is not having high voltage is serious in view of long outage of 400 kV Purnea-Biharsharif D/C and 400 kV Kishenganj-Patna D/C. PGCIL ERTS-2 has informed that the event 2 and 3 have occurred due to sensitive over voltage static relay.

In view of the above three events, Following issues need detailed deliberation:

4. Detailed analysis and Reason for Over-Voltage Stage 2 operation at Binaguri in case of event 1.
5. Why the numerical relay over voltage protection are not being utilised when such mal-operation are being observed from the static relay.

In 71st PCC, Powergrid informed that the overvoltage issue was due to the static relays used in those lines. They added that all the static relays have been removed and they had already been replaced by numerical relays.
They further informed that the overvoltage function of numerical relays has been enabled but testing is yet to be done.

Powergrid may update.

Deliberation in the meeting

Powergrid informed that testing of the relays will be completed upon clearance to avail the shutdown.

ITEM NO. C.16: 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-C14**.

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.17: Additional Agenda By Powergrid

1. Creation of Transient Fault & implementation of exact distance modelling in 400 KV Andal-Jamshedpur-D/C.

In recent past there are numerous A/R operation observed in 400 KV Andal-Jamshedpuer D/C. Initial 3.5 Km is looked after by DVC (Loc 01-15). On Investigation it is found that although the fault distance is repetitively showing around 9-15 KM, but severe tree infringement observed in that 3.5 Km. In this regard a letter also send to DVC on dated 12.10.18 from ER-II. (Attached for reference).
However, considering the discrepancy observed in the distance & to make it right for further assistance to the patrolling team, POWERGRID/ER-II proposed for carrying out an exercise, for creation of transient fault and further checking of distance relays of both end.

Initially the fault will be created and distance will be checked in Relays, if it is found improper the impedance will be measured by impedance measurement kit and further the test will be repeated to ascertain the correctness.
Members may discuss the plan.

Deliberation in the meeting

DVC informed that as per the disturbance recorders of both the ends the fault location is exactly matching. However, in order to analyze in detail the fault location shown by repeated AR of Andal-Jamshedpur Ckt # 2 on 24-08-2018 14:05:09 hrs and 26-08-2018 12:49:09 hrs, DVC requested the following data regarding the said event:

1. DR [.cfg, .dat & .hdr(for ABB only)] files of both Main 1 and Main 2 relay at Jamshedpur End.
*2. **Event record** snapshot showing the fault voltage and currents, fault resistance and reactance & fault location for P442 relay*
*3. **Trip log** for Siemens 7SA relay.*
4. Line parameters used by PGCIL (i.e. R1, X1, R0, X0, B1 & B0) for calculations of relay settings.
5. PDF of setting files of both Main 1 & Main 2 relays.
6. Present fault level of Jamshedpur PGCIL bus (both 3LG & 1LG).

DVC added that further testing will be planned after detailed scrutiny by DVC.

Meeting ended with vote of thanks to the chair.

****

ERPC::KOLKATA

ATTENDANCE SHEET

72ND PROTECTION CO-ORDINATION SUB-COMMITTEE (PCC) MEETING

VENUE: ERPC CONFERENCE ROOM,KOLKATA TIME: 10:30 HRS DATE:29.10.2018 (MONDAY)

Sl. No.	Name	Designation & Organisation	Contact Number	E-mail Id	Signature
1	J.BANDYOPADHYAY	MS,ERPC	9432326351	mserpc-power@gov.in	
2	D.K.Jain	ED,ERLDC	9910344127	dk.jain@posoco.in	
3	SURAJIT BANERJEE	DGM, ERLDC	9433041823	surajit.banerjee@posoco.in	
4	CHANDAN KUMAR	Sr. Engr, ERLDC	9869251460	Chandan@posoco.in	
5	ANKUR KUMAR	Manager, PRC	9431815656	ankur@powergrid.co.in	
6	S. MAITI	S.D.E, DVC	7545867453	sudiptamiti@gmail.com	S. Maiti
7	P. CHTOPADH.	Dy. Mgr, ERPC	9434744742	parthe.jha@powergrid.co.in	
8	Ch. Mohan Rao	Mngr, PG-odisha	9437962459	mohan.rao@powergrid.com	
9	KV SATYA NARAYANA	SR. DCM - kolkata	9490611070	SATYANARAYANA@POWERGRIDINDIA.COM	
10	Deepak Vinnakota	Sr. Engineer PRPC	9966912284	deepak.vin208@gmail.com	
11	Nishant Kumar	DMTCL (Mgr).	7987210324	nishant.kumar@jitra.com	
12	T. Satya Deep	Sr. Mgr (O&M) Dikchu H.E.P	7797305405	satyadeep.t@greenkoenergyprojects.com	
13	Devendra Yadav	TUL	7479017653	devendra.yadav@andritz.com	
14	Saibal Ghosh	POSOCO,	8584072093	Saibal@posoco.in	Saibal Ghosh
15	Ranadip Das	ERLDC,	8584072081	ranadipdas@posoco.in	
16	Chandan Mallick	ERLDC, Posoco	9007059660	chandan.mallick@Posoco.in	
17	A. K. Basak	ERLDC, POSOCO	9007059569	akbasak@posoco.in	
18	RAJ PROTIM	Sr. Engr., ERLDC	9903329591	rajprotim@posoco.in	
19	S. P. Datta	AGM, ERPC	9433067022	spdatta@rediffmail.com	
20	S. M. Jha	Consultant ERPC	9874738913	erpcjha@yahoo.co.in	
21	RAJDEEP BHATTACHARJEE	RE, BSPHCL, Kolkata	9830380689	rekolbsphcl@gmail.com	
22	A. SEN PRADHAN	SE, DVC	9932719986	aditi.senpradhan@dvc.gov.in	
23	Sudipta Ghosh	Mgr. (OS)	8336917005	sghosh04@ubpdcl.co.in	S. Ghosh

Sl. No.	Name	Designation & Organisation	Contact Number	E-mail Id	Signature
24	SUCHARIT MONDAL	ASST. MANAGER, CESC Ltd.	7595956952	sucharit.mondal@rp.sg.in	Smandal.
25	P. P. Jena	AEE, ERPC-	9776198491	ppjena.erpc@gov.in	Jena
26	B. SARKHEL	Consultant ERPC	9433065744	buddha_sarkhel@yahoo.co.in	Sarkhel
27	PRASHANT KUMAR	AEXE/BSPTCL	7763818080, 9835726742	prashantkumarsahay@yahoo.com	
28	DILSHAD ALAM.	AExE/ BSPTCL.	7763818081	mail2me.dlam@gmail.com	
29	Govind yadav	ESE, JUSNL	9431708974	Govind2333@gmail.com	Yadav
30	Vinod Kumr Bhoi	EEE, CRITL/JUSNL	7488284956	cecritl.jusnl@rediffmail.com	
31	Rajendra Prasad	A.EE. TVNL	9031049936	rp.ttps@gmail.com	R.P.
32	Dilip Kumar Das	A.C.E WBSETCL	9434910544	cectdwbsetcl@gmail.com	Ddas
33	C. R. Haldar	ACE, WB SLDC	9434910379	ckhaldar@yahoo.co.in	
34	chiranjib Bhowmik	DGM (projects)	9163321557	chiranjib.bhowmik@rp-sg.in	
35	Debi prasad kar	AGM, SLDC, OPTCL	9438907416	debiprasadkar@yahoo.co.in	DPKar
36	S. S. Nanda	DGM & EMR Dtm Burla, OPTCL	9438907803	ele.ssnanda@optcl.co.in	29/10/18
37	H. P. Mahapatra	GM, OHPC, BBSR	7328840015	hpm.ohpc@gmail.com	29/10
38	Gourav Kumar	L.E Testing & M.P.L.	9234001683	gourav.kumar@tatapower.com	
39	PRAKASH KR GUPTA	DGM(OS)/KBSPDCL	8336903960	pgupta@kbspdcl.co.in	
40	J. G. Rao	EB, ERPC	9547891353	eseb_cea@yahoo.co.in	
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					

Annexure-B.7

List of line tripping in the month of September 2018 which was be discussed in 72nd PCC

LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Auto Recloser status	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	72nd PCC Minutes
Miscellaneous: Tripping on DT, No Fault observed in PMU												
400KV NEW PPSP-NEW RANCHI-II	09-09-2018	8:40	09-09-2018	8:51	DT received at New Ranchi		DT received at New Ranchi	< 100 msec	No Fault observed in PMU			No DT sent from New PPSP
220KV MUZAFFARPUR-HAJIPUR-II	26-09-2018	21:45	26-09-2018	21:57		FALSE DT RECEIVED	FALSE DT RECEIVED	--	No Fault observed in PMU			DT receipt cable was kept open due to some problem. BSPTCL will check the issue.
Autoreclose related issues												
400KV RANCHI-RAGHUNATHPUR-III	03-09-2018	2:07	03-09-2018	3:14	R-N,FC 4 KA FD 75.2 KM,A/R SUCCESSFUL	Z1,R-N,FC 4.73 KA,76.82 KM	R-N Fault	< 100 msec	No Autoreclose operation			Problem in R-Ph only. Checked but nothing found
220KV DARBHANGA (DMTCL)-SAMASTIPUR-SC	05-09-2018	21:10	05-09-2018	21:50	Z1, 27.3 KM, BN, 0.653 KA		B-N Fault	< 100 msec	No Autoreclose operation			A/R not in service
400KV MOTIHARI-GORAKHPUR-1	08-09-2018	12:58	08-09-2018	13:39	Z1,Y-N,FC 2.6,FD 20.9KM		Y-N Fault	< 100 msec	No Autoreclose operation	Yes		As per DR, Ph-Ph fault
220KV JODA-RAMCHANDRAPUR-SC	09-09-2018	12:24	09-09-2018	13:04	Y_N, 1.54 kA, 28.5 KM	Y_N, 0.896 kA, 136.5 KM	Y-N Fault	500 msec	No Autoreclose operation			Tripped on Back-up overcurrent
220KV DARBHANGA (DMTCL)-MOTIPUR-I	10-09-2018	8:19	10-09-2018	9:00	B_N, 78 KM, Z II		B-N Fault	< 100 msec	No Autoreclose operation			A/R not in service (PLCC available)
400KV GMR-ANGUL-II	10-09-2018	17:13	10-09-2018	17:28	B_N, Z1 FD : 11.6 KM	BN, Z1, 12 KA, 20.6 KM	B-N Fault	< 100 msec	No Autoreclose operation	Yes		Angul end A/R successful
400KV KOLAGHAT-KHARAGPUR-II	13-09-2018	14:05	13-09-2018	14:30	ZONE 1, BLUE-N, LOCATION- 54.8KM, IF = 2.545KA.	ZONE1, BLUE-N, DT RECV, LOCATION 34KM, IF= 5.9KA...	B-N Fault	< 100 msec	A/R timing issue	Yes		Will be solved during next S/D
400KV MALDA(PG)-NEW PURNEA-I	13-09-2018	22:21	13-09-2018	22:44	YN, Z1, 84 KM, 3.66 KA	YN,53.4 KM, 4.47 KA, A/R Successful	Y-N Fault	< 100 msec	No Autoreclose operation	Yes		Tripped in reclaim time
400KV ARAMBAGH-BAKRESWAR-SC	14-09-2018	9:34	14-09-2018	20:03	Z1, R-N,93 KM, 4 KA	Z1,R-N,40 KM, 4.7KA	R-N Fault	< 100 msec	A/R timing issue			A/R timing issue solved
220KV CHANDIL-RANCHI-I	14-09-2018	14:02	14-09-2018	14:24	b-n fault , FD-29.05 Km, IB-5.08 Km	z1,FC 1A 304 A,IB 3.211A,IC 1.924 KA,FD 67.12KM	B-N Fault	< 100 msec	No Autoreclose operation			PLCC problem at Chandil
400KV JEERAT-BAKRESWAR-SC	14-09-2018	14:52	14-09-2018	15:00	Yph, Z2, 157.5 km, Iy= 1.92kA	Yph, Z1, 3.8km, Iy=6.96kA ,A/R successful	Y-N Fault	< 100 msec	No Autoreclose operation			Relay contact prob at Jeerat, solved
220KV PANDIABILI-SAMANGARA-II	14-09-2018	18:52	14-09-2018	19:30	B-N,Z1,37.5 KM,3.8 KA	Z1,B-N,15.3 KM	B-N Fault	< 100 msec	No Autoreclose operation			Carrier problem
400KV ARAMBAGH-BAKRESWAR-SC	16-09-2018	11:10	16-09-2018	11:42	C-N,Z1 ,FD 21.07 KM,FC 1.023KM, A/R L/O	C-N,Z2,FD 106.7 KM,FC 1.245KM, AR SUCCESSFUL	B-N Fault	< 100 msec	No Autoreclose operation			First time A/R successful, 2nd time A/R Lock-out
220KV FSTPP-LALMATIA-SC	16-09-2018	12:35	16-09-2018	14:17	Z1,B-N,61.7 KM AT FARAKKA	CB CLOSED AT LALMATIA	B-N Fault	< 100 msec	No Autoreclose operation			No PLCC in the line
400KV MAITHON-GAYA-I	16-09-2018	13:57	16-09-2018	14:16	R_N, 221.6 KM, 0.6 kA	R_N, 3.5 kA, 64.6 KM, A/R Successful	R-N Fault	900 msec	No Autoreclose operation	Yes	Yes	Carrier loss occurred, Carrier receipt at Maithon after tripping. Problem rectified.
400KV MEERAMUNDALI-JSPL-I	18-09-2018	14:58	18-09-2018	16:21	ZONE-1, B-E, DIST- 17.8 KM, IB-8.91 KA	ZONE-1, B-E, DIST-24 KM, IB-7.2 KA	B-N Fault	< 100 msec	A/R timing issue			Will be solved during next S/D
220KV GAYA-SONENAGAR-II	19-09-2018	1:33	19-09-2018	1:49		R-N Fault , 24.1 km, 4.63 KA, A/R successful	R-N Fault	< 100 msec	No Autoreclose operation		Yes	A/R was disabled, Issue resolved
400KV KOLAGHAT-KHARAGPUR-II	19-09-2018	11:54	19-09-2018	12:13	Z-1, B Ph, 10.07 KM, FA:- 33.69 KA	Z-1, B- PH, 79.56 KM, FA:- 2.65 KA.	B-N Fault	< 100 msec	A/R timing issue	Yes		Will be solved during next S/D
220KV DARBHANGA (DMTCL)-MOTIPUR-I	20-09-2018	8:51	20-09-2018	9:27	B-N, 72.8 km, 1.2kA	BN, 46.56 KM	B-N Fault	< 100 msec	No Autoreclose operation			A/R not in service (PLCC available)
400KV JEERAT-BAKRESWAR-SC	20-09-2018	10:22	20-09-2018	10:32	Yph, Z1,30.02km, 4kA	Yph,119.8km,z2,1.17kA	Y-N fault	< 100 msec	No Autoreclose operation			Relay contact prob at Jeerat, solved
400KV PATNA-BARH-I	20-09-2018	13:32	20-09-2018	13:57	YN, 48.4 KM, 5.75 KA, AR Successful	Y_N FD : 45.7 KM FC: 7.48 KA	Y-N Fault	< 100 msec	No Autoreclose operation			Both end are saying A/R successful, DR will be sent by PGCIL ER-II and Barh
400KV GORAKHPUR-MOTIHARI-I	20-09-2018	15:13	20-09-2018	16:00	Z1, Y-N, 45 KM, IF-1.32 KA,		Y-N Fault	< 100 msec	No Autoreclose operation			Motihari will send DR
400KV ANGUL-TALCHER-I	21-09-2018	0:28	21-09-2018	12:36	B_N, 23.18 kA, 1.5 KM, A/R successful	B_N, Z I, 61.8 KM, 6.6 kA	B-N Fault	< 100 msec	No Autoreclose operation			
220KV GAYA-SONENAGAR-I	24-09-2018	13:47	24-09-2018	13:57	R-N,91.60 KM,1.775 KA, A/R successful	Z1 1.994 KM,R-N	R-N Fault	< 100 msec	No Autoreclose operation			A/R was disabled, Issue resolved
220KV GAYA-SONENAGAR-II	24-09-2018	13:47	24-09-2018	13:57	R-N,91.6 KM,2.091 KA, A/R successful	Z1 1.994 KM,R-N	R-N Fault	< 100 msec	No Autoreclose operation			A/R was disabled, Issue resolved
220KV ALIPURDUAR-SALAKATI-II	25-09-2018	0:25	25-09-2018	0:52	R-N ,F/D-0.3 KM , F/C-11KA	CLOSED FROM SALAKATI END (AR SUCCESSFUL)	R-N Fault	< 100 msec	No Autoreclose operation	Yes	Yes	Ph-Ph fault seen at Alipurduar
220KV ALIPURDUAR-SALAKATI-I	25-09-2018	0:25	25-09-2018	0:51	Y-N Z-1 , 6.2 KM FROM SALAKTAI , 10.2KA,	CLOSED FROM SALAKATI END (AR SUCCESSFUL)	Y-N Fault	< 100 msec	No Autoreclose operation	Yes	Yes	Ph-Ph fault seen at Alipurduar
400KV DARBHANGA (DMTCL)-MUZAFFARPUR-II	25-09-2018	11:13	25-09-2018	11:41	BN, Z2	BN, 6.44 KA, 25.9 KM	B-N Fault	< 100 msec	No Autoreclose operation	Yes		BCU change-over coil burnt
400KV ARAMBAGH-BAKRESWAR-SC	25-09-2018	14:10	25-09-2018	14:21	R-N, Ir=4.962 KA, 61 km	A/R SUCCESSFUL	R-N Fault	< 100 msec	No Autoreclose operation		Yes	

LINE NAME	TRIP DATE	TRIP TIME	RESTORATION DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Auto Recloser status	DR/EL RECEIVED FROM LOCAL END	DR/EL RECEIVED FROM REMOTE END	72nd PCC Minutes
400KV KHARAGPUR-CHAIBASA-I	25-09-2018	14:31	25-09-2018	14:40	R_N, 22.6 KM< 7.5 kA	R_N, 149.2 KM, 1.89 kA	R-N Fault	< 100 msec	No Autoreclose operation	Yes		No Problem found.
400KV KhSTPP-BARH-I	26-09-2018	0:19	26-09-2018	0:47	33.18% DISTANCE, AR SUCCESSFUL	B-N,153 KM,2.91 KM	B-N Fault	< 100 msec	No Autoreclose operation			PLCC Cable shorted, rectified
220KV DALKHOLA-PURNEA-I	26-09-2018	13:27	26-09-2018	13:51	B_N, 32.6 KM, 1.0 kA	B_N, 4.08 KM, 6.37 kA	B-N Fault	< 100 msec	No Autoreclose operation			Old relay at Dalkhola will be replaced in December, 2018
220KV BARIPADA-BALASORE-I	26-09-2018	14:32	26-09-2018	15:09	RN, 3.41 KA, 43.1 KM, Z1		B-N Fault	< 100 msec	No Autoreclose operation			PLCC defective,will be solved by November,2018 end
220KV DARBHANGA (DMTCL)-MOTIPUR-I	30-09-2018	11:30	30-09-2018	11:57	B-N, z-1 , f/d 80km		B-N Fault	< 100 msec	No Autoreclose operation			A/R not in service (PLCC available)

ISLANDING SCHEME FOR IB THERMAL – BUDHIPADAR GSS

ISLANDING SCHEME DESCRIPTION

1. Islanding schemes are implemented by generating stations & transmission system to isolate the healthy subsystems following a large-scale disturbance. This is a system requirement under contingency conditions according to which the power network may be split into healthy and self-sustaining zones so that cascade tripping of all generating stations in the entire region is avoided.
2. With a view to protect the generation of IB TPS during sudden and major disturbance in power system network, one special islanding scheme with part loads of Budhipadar GSS of OPTCL has been proposed.
3. Two numbers 210 MW generators of IB TPS connect to 220/132/33kV Grid substation through four numbers dedicated 220kV lines.
4. The islanding scheme envisages segregation of a group of matching 132kV load in closed loop with the IB generators.

ISLANDING SCHEME DESCRIPTION

5. 132kV feeders will be arranged radially in order to form islanding scheme with IB generation.
6. 220kV Budhipadar GSS has system has two main bus and a transfer bus system. The generation & matching loads put into two buses with bus coupler in operation.
7. The two numbers 220kV feeders from IB TPS put into Bus –II and the other two are kept in the other bus as normal arrangement.
8. 220 kV interstate line to Korba-2 & 3 and Raigarh will be in normal condition distributed to both the buses.
9. The islanding relay Micom P341 is installed at Bus coupler panel of the 220kV system.

ISLANDING SCHEME DESCRIPTION

10. In the event of system disturbance and actuation of islanding relay:

a. Relay will give command to trip all 220KV feeders connected to Bus-I and Bus II along with Bus coupler except selected islanding IB ckts. either (IB -1 & 3)/ (IB-2 & 4) and Auto transformer- I & II.
b. It will also trip non- selected islanding IB ckts. incomer breaker either (IB -1 & 3)/ (IB-2 & 4).
c. It will send carrier command to Tarkera end and to trip 132kV Tarkera –Rajgangpur feeder I & II and 132kV Tarkera- Kalunga feeder so as to feed Rajgangpur , Kuchinda and Kalunga Grid Load will be in radial arrangement.
d. It will send carrier signal to Lapanga end to trip 132kV Lapanga – Jharsuguda feeder at Lapanga in order to feed Jharsuguda load radially.
e. It will send carrier signal to IB thermal to start ramping and adjust IB generation to match the load.

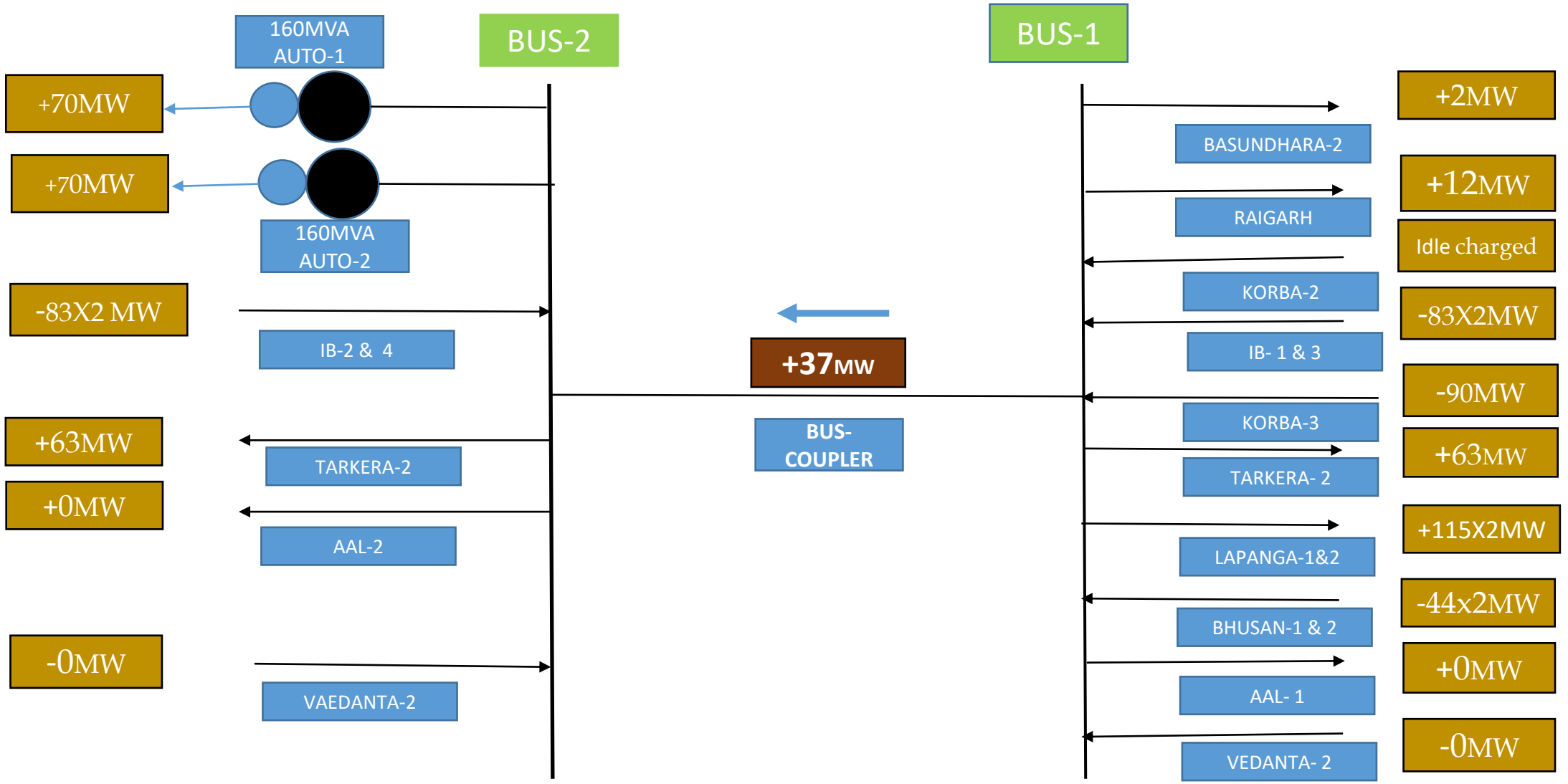
ISLANDING SCHEME DESCRIPTION

11. The CGP feeders such as Vedanta , Bhusan and Aditya Aluminium have their own islanding schemes to cater their industry load.

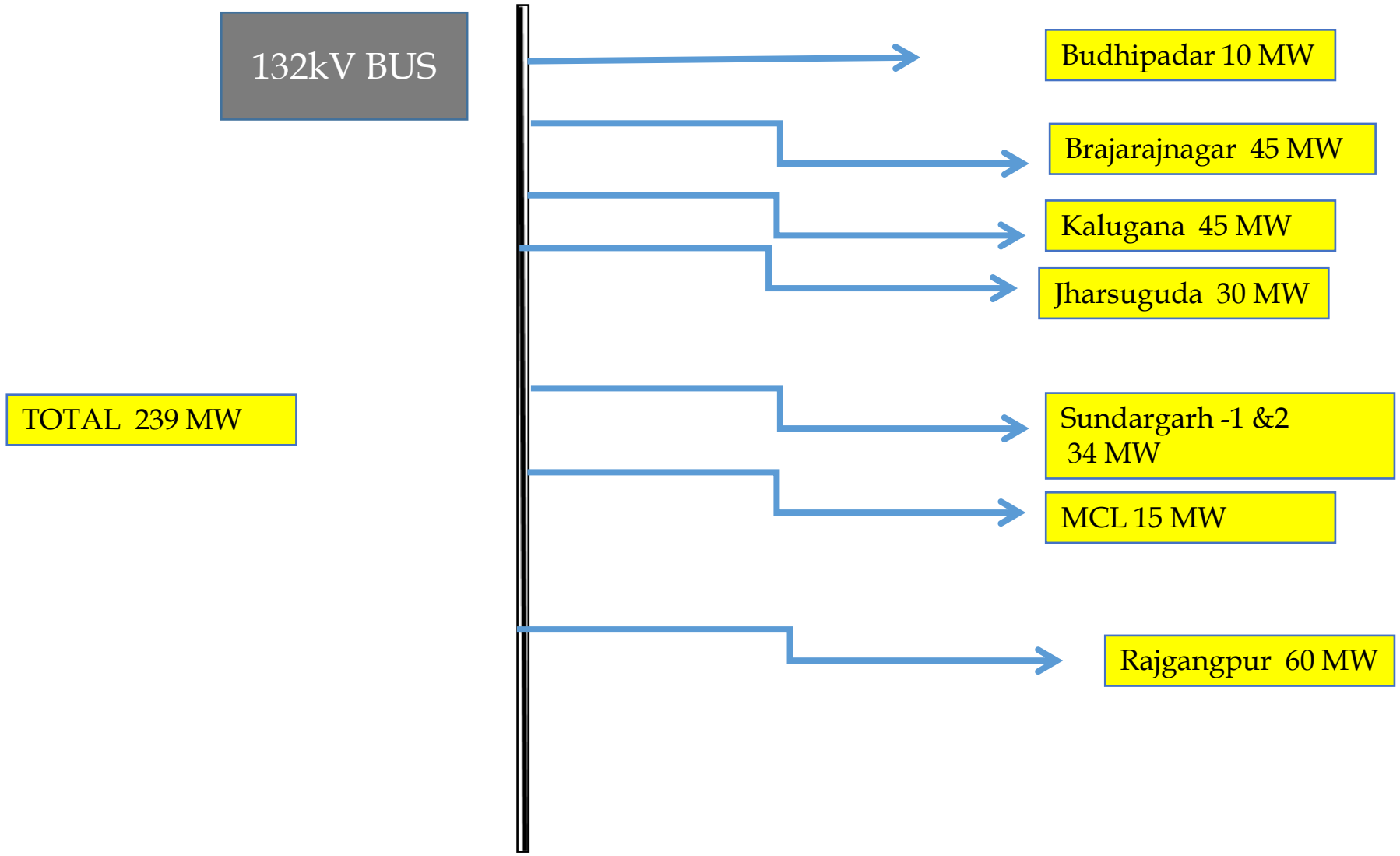
12. The general arrangement of 220kV feeder configuration, 132kV loads for islanding has shown in following slides.

POWER FLOW DETAILS OF 220KV SYSTEM

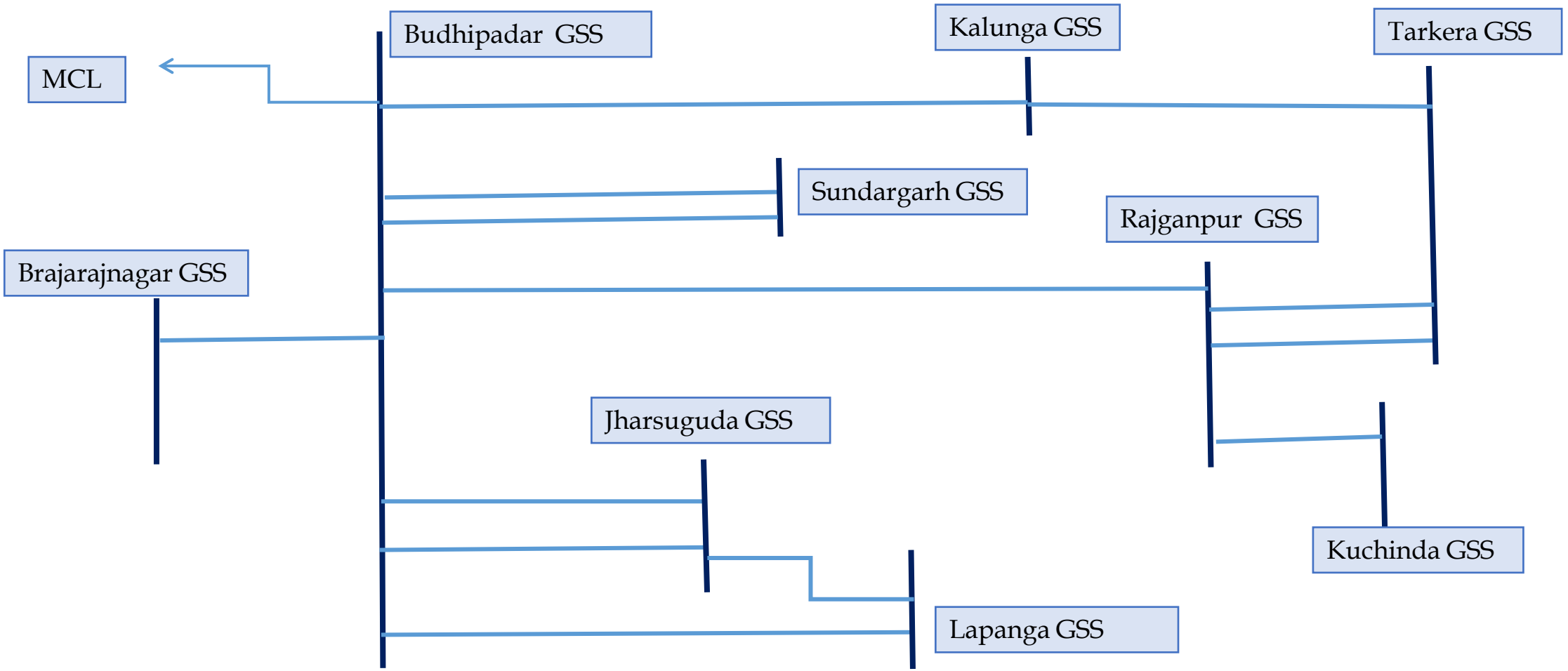
LOAD PATTERN OF DIFFERENT FEEDERS 12.07.2018 AT 12.00 HRS.

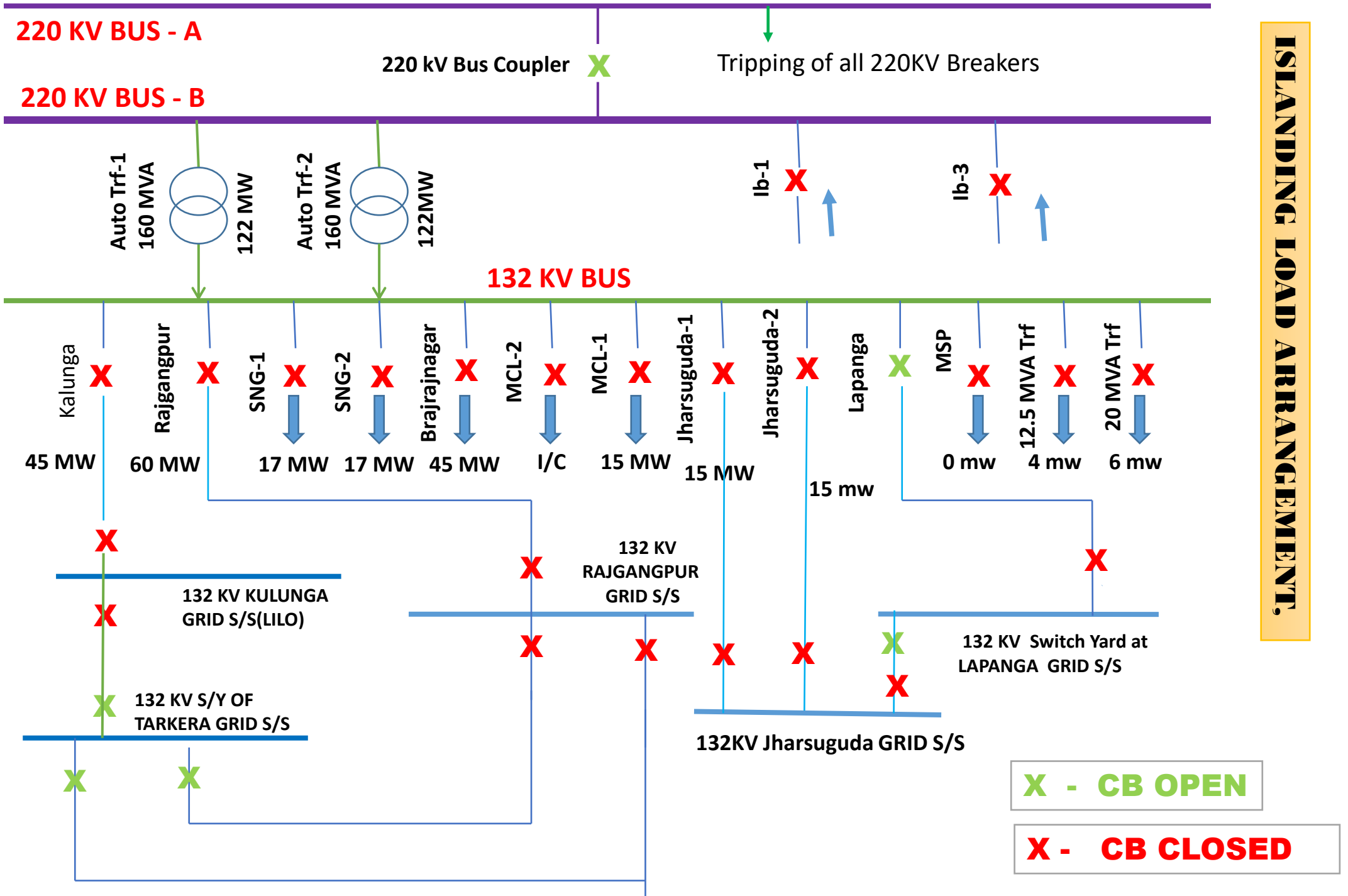


132kV RADIAL LOAD ARRANGEMENT FOR ISLAND SCHEME

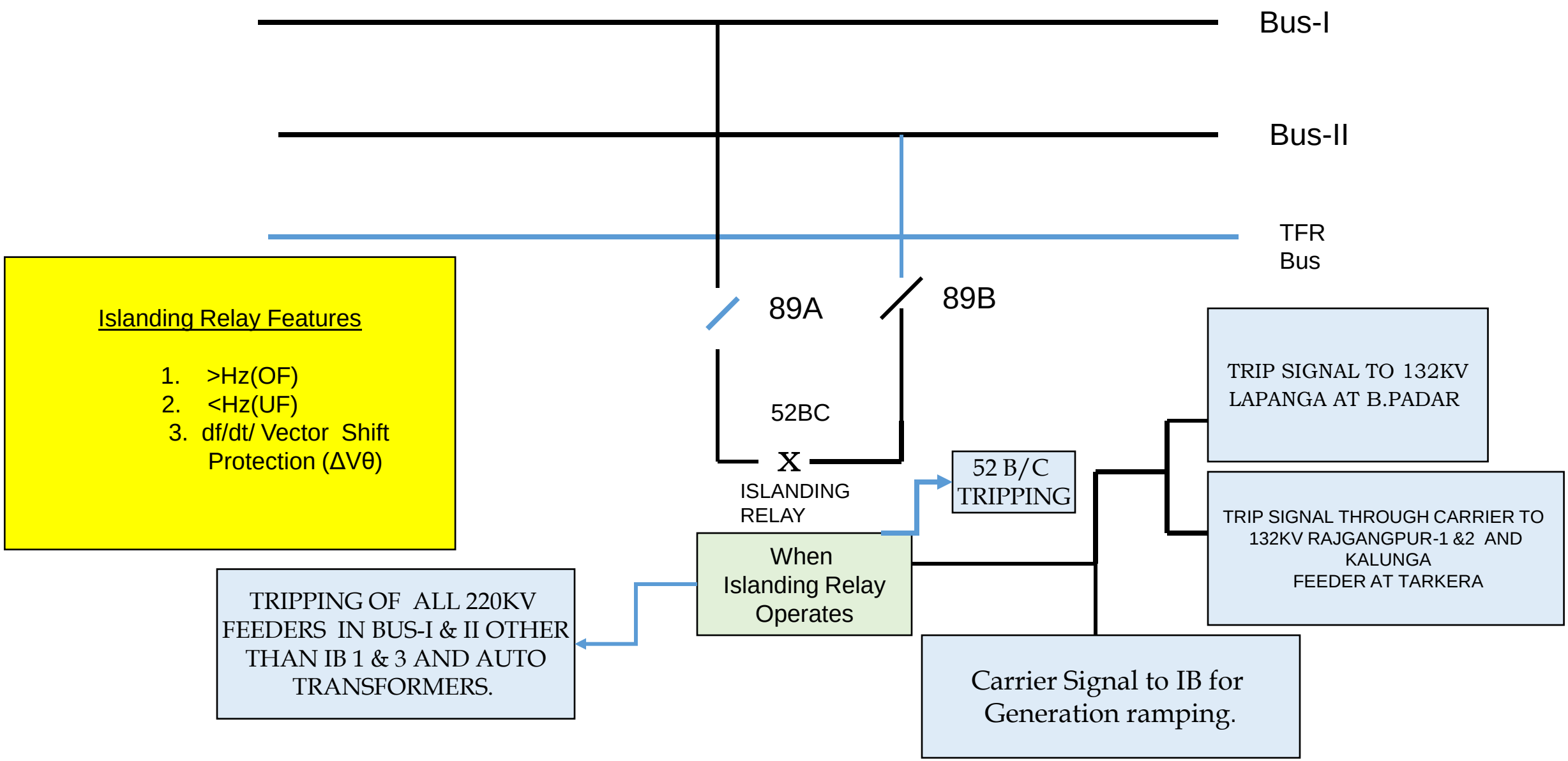


132KV Connectivity of Budhipadar GSS

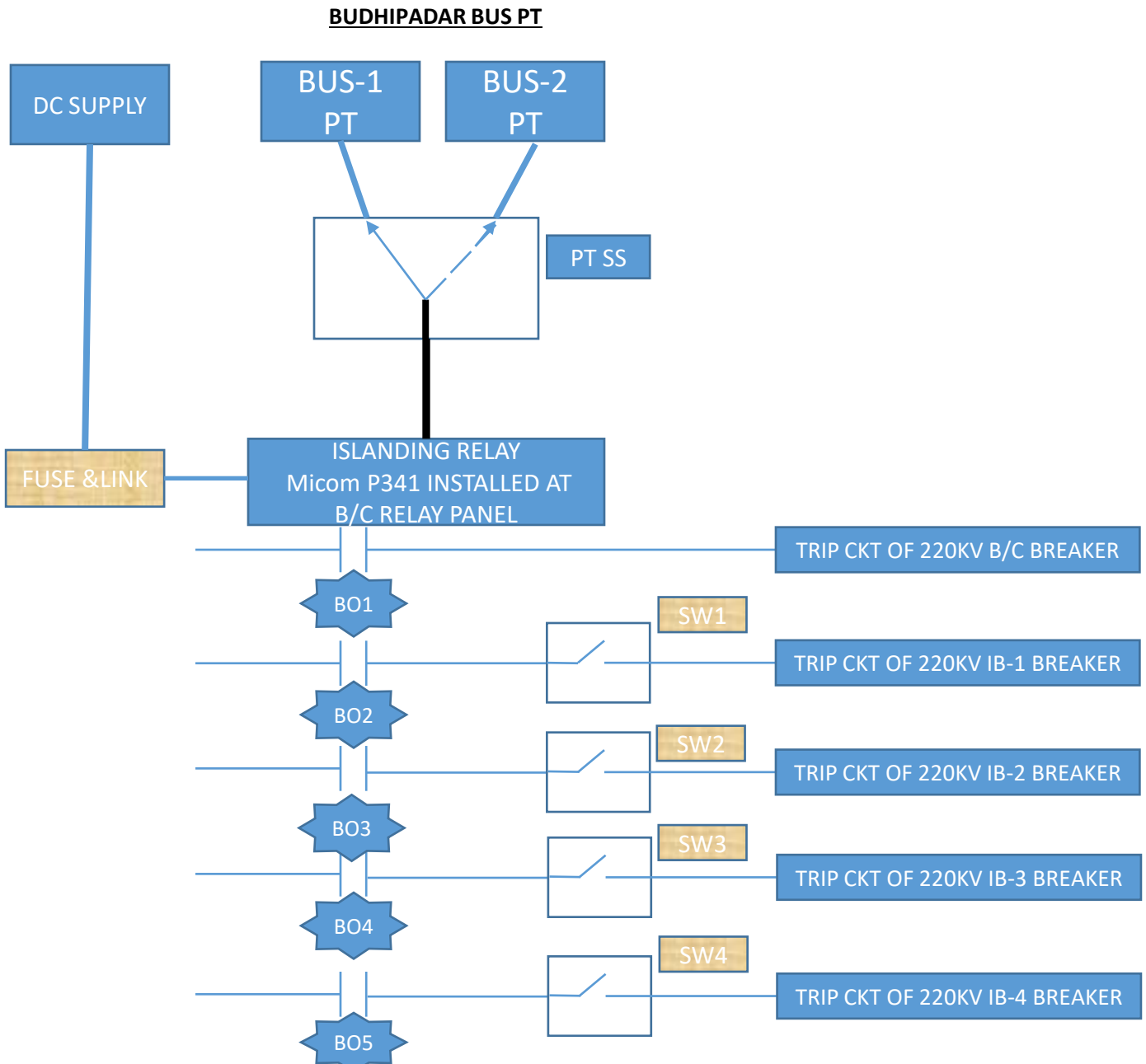


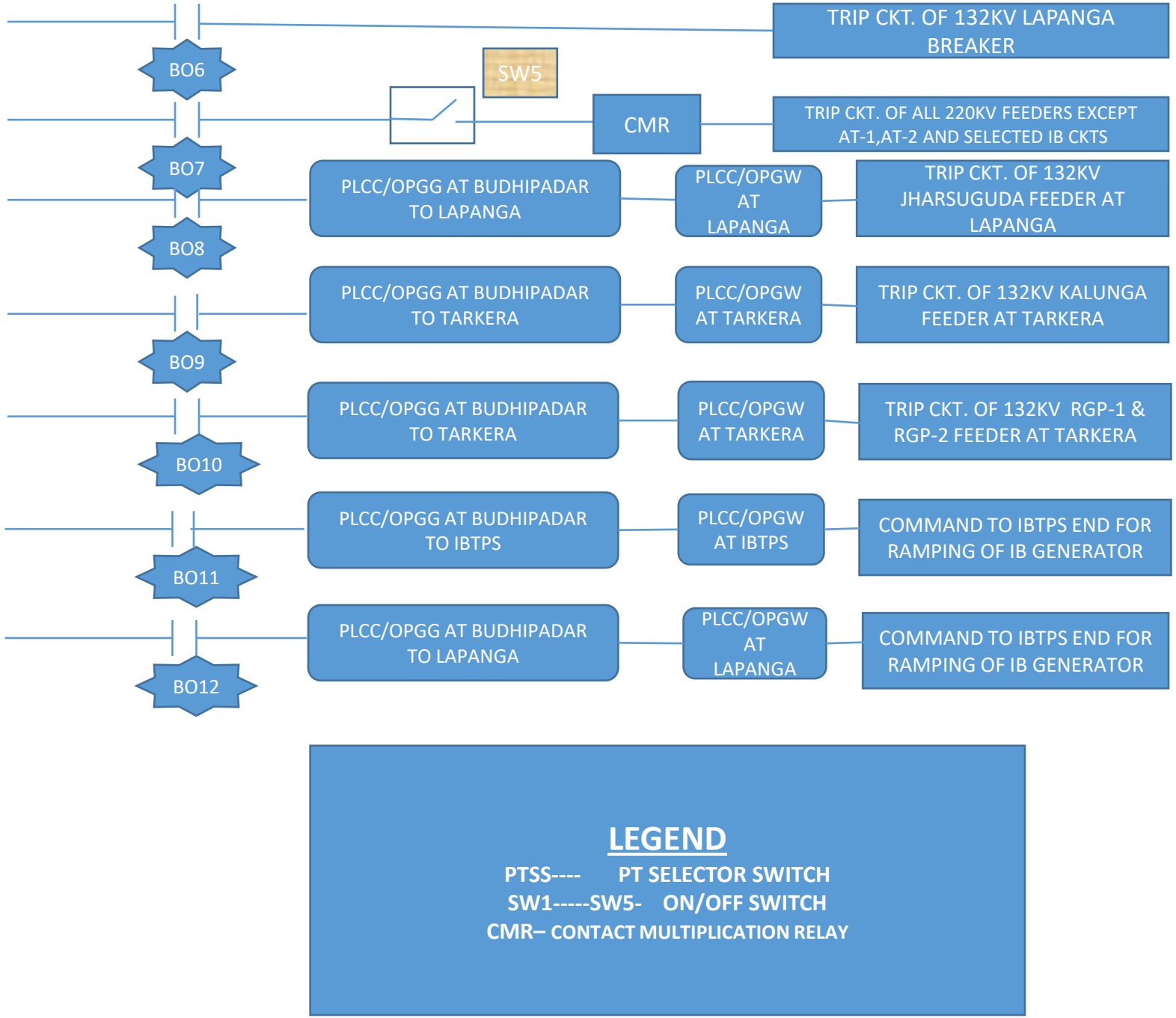

220 KV BUS - A
220 KV BUS - B
220 kV Bus Coupler
Tripping of all 220KV Breakers
Auto Trf-1 160 MVA
122 MW
Auto Trf-2 160 MVA
122MW
Ib-1
Ib-3
132 KV BUS
Kalunga
Rajgangpur
SNG-1
SNG-2
Brajrajnagar
MCL-2
MCL-1
Jharsuguda-1
Jharsuguda-2
Lapanga
MSP
12.5 MVA Trf
20 MVA Trf
45 MW
60 MW
17 MW
17 MW
45 MW
I/C
15 MW
15 MW
15 mw
0 mw
4 mw
6 mw
132 KV KULUNGA GRID S/S(LILO)
132 KV RAJGANGPUR GRID S/S
132 KV S/Y OF TARKERA GRID S/S
132KV Jharsuguda GRID S/S
132 KV Switch Yard at LAPANGA GRID S/S
ISLANDING LOAD ARRANGEMENT,
X - CB OPEN
X - CB CLOSED

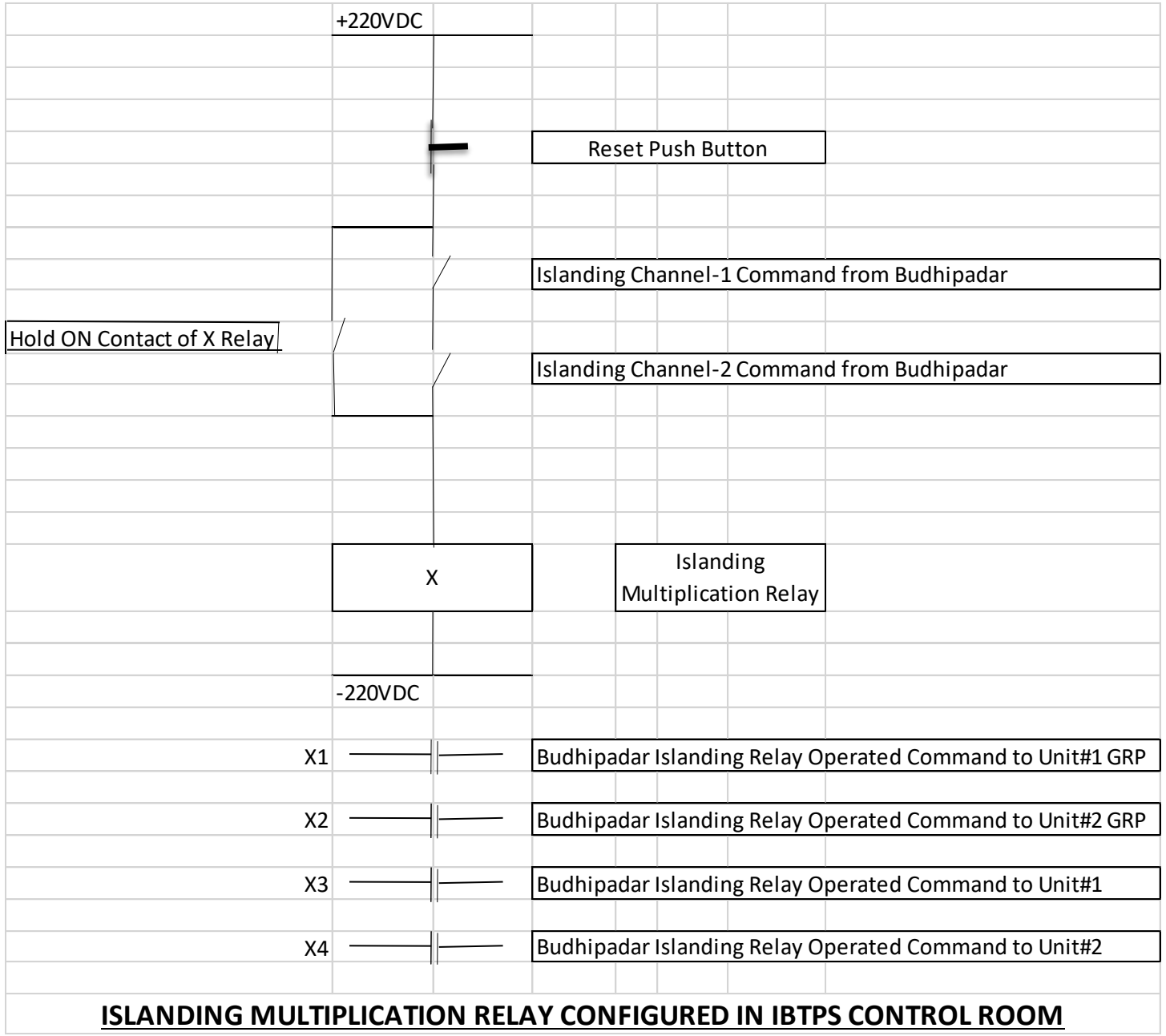
SCHEMATIC DRAWING OF ISLANDING RELAY INSTALLED IN B/C PANEL FOR TRIPPING OF DIFFERENT FEEDERS AT BUDHIPADAR GRID S/S.



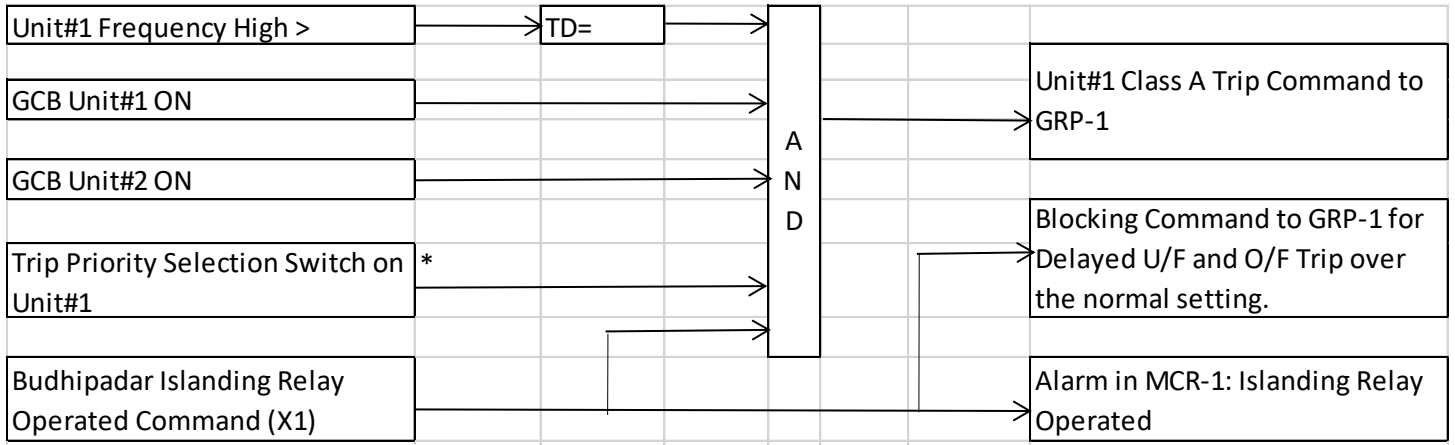
CONNECTION DIAGRAM OF ISLANDING RELAY (Micom P341) AT BUDHIPADAR SUB-STATION




BO6
SW5
TRIP CKT. OF 132KV LAPANGA BREAKER
CMR
TRIP CKT. OF ALL 220KV FEEDERS EXCEPT AT-1,AT-2 AND SELECTED IB CKTS
BO7
PLCC/OPGG AT BUDHIPADAR TO LAPANGA
PLCC/OPGW AT LAPANGA
TRIP CKT. OF 132KV JHARSUGUDA FEEDER AT LAPANGA
BO8
BO9
PLCC/OPGG AT BUDHIPADAR TO TARKERA
PLCC/OPGW AT TARKERA
TRIP CKT. OF 132KV KALUNGA FEEDER AT TARKERA
BO10
PLCC/OPGG AT BUDHIPADAR TO TARKERA
PLCC/OPGW AT TARKERA
TRIP CKT. OF 132KV RGP-1 & RGP-2 FEEDER AT TARKERA
BO11
PLCC/OPGG AT BUDHIPADAR TO IBTPS
PLCC/OPGW AT IBTPS
COMMAND TO IBTPS END FOR RAMPING OF IB GENERATOR
BO12
PLCC/OPGG AT BUDHIPADAR TO LAPANGA
PLCC/OPGW AT LAPANGA
COMMAND TO IBTPS END FOR RAMPING OF IB GENERATOR
LEGEND
PTSS---- PT SELECTOR SWITCH
SW1-----SW5- ON/OFF SWITCH
CMR– CONTACT MULTIPLICATION RELAY

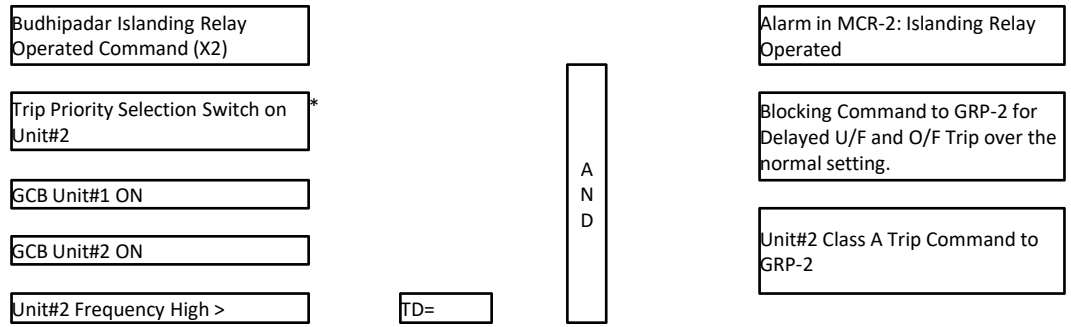


ISLANDING MULTIPLICATION RELAY CONFIGURED IN IBTPS CONTROL ROOM



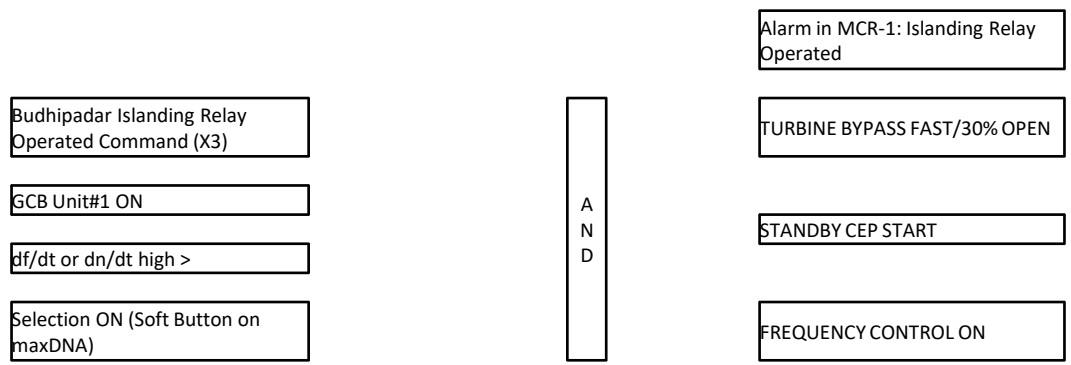
Hardware single selection switch (3 position: I, OFF, II) for both units installed on one GRP.

PRIORITY TRIPPING SCHEME CONFIGURED IN GRP-1 NUMERIC RELAY

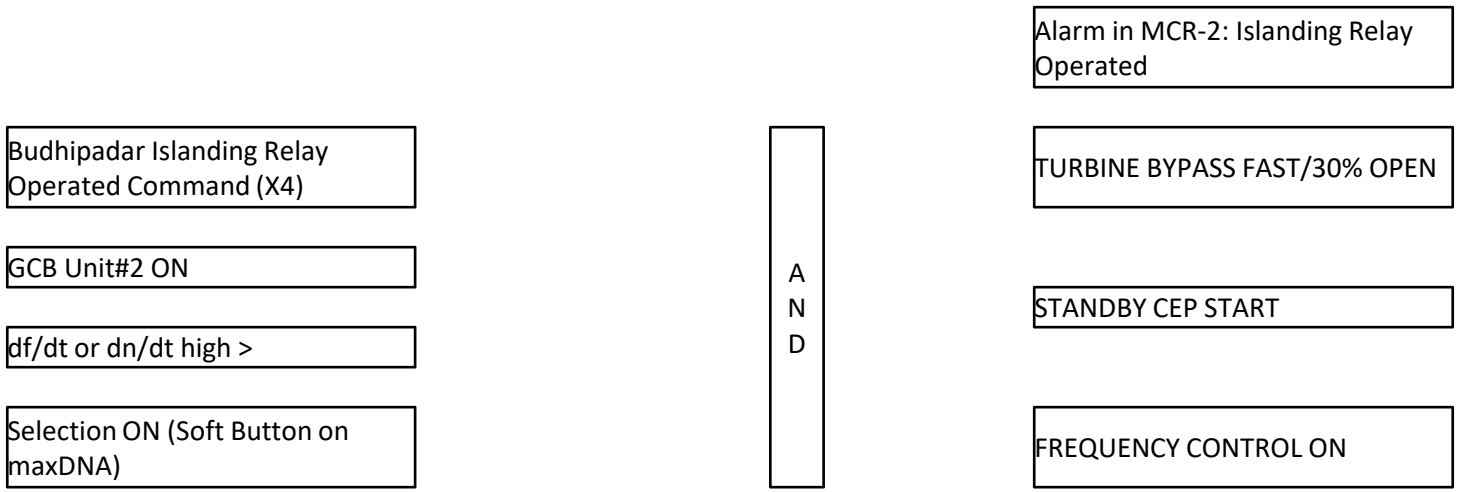


*Hardware single selection switch (3 position: I, OFF, II) for both units installed on one GRP.

PRIORITY TRIPPING SCHEME CONFIGURED IN GRP-2 NUMERIC RELAY



LOAD-GENERATION BALANCE SCHEME CONFIGURED IN UNIT#1 MAXDNA CONTROL SYSTEM



LOAD-GENERATION BALANCE SCHEME CONFIGURED IN UNIT#2 MAXDNA CONTROL SYSTEM

NOTES ON INTERCONNECTING RELAY FUNCTION.

Over voltage protection

An over voltage condition could arise when a generator is running but not connected to a power system, or where a generator is providing power to an islanded power system. Such an over voltage could arise in the event of a fault with automatic voltage regulating equipment or if the voltage regulator is set for manual control and an operator error is made. Over voltage protection should be set to prevent possible damage to generator insulation, prolonged over-fluxing of the generating plant, or damage to power system loads.

Under frequency protection

Under frequency operation of a generator will occur when the power system load exceeds the prime mover capability of an islanded generator or group of generators. Power system overloading can arise when a power system becomes split, with load left connected to a set of 'islanded' generators that is in excess of their capacity. Automatic load shedding could compensate for such events. In this case, under frequency operation would be a transient condition. This characteristic makes under frequency protection a simple form of "Loss of Mains" protection on system where it is expected that the islanded load attached to the machine when the grid connection fails exceeds the generator capacity.

Over frequency protection function

Over frequency running of a generator arises when the mechanical power input to the alternator is in excess of the electrical load and mechanical losses. The most common occurrence of over frequency is after substantial loss of load. When a rise in running speed occurs, the governor should quickly respond to reduce the mechanical input power, so that normal running speed is quickly regained.

Rate of Change of Frequency Protection (81R)

The two main applications for df/dt protection are network decoupling (loss of mains/loss of grid) and load shedding. During severe disturbances, the frequency of the system oscillates as various generators try to synchronize on to a common frequency. The frequency decay needs to be monitored over a longer period of time and time delayed df/dt can be used to make the correct decision for load shedding or provide early warning to the operator on a developing frequency problem.

Voltage Vector Shift Protection (ΔVθ)

The Voltage Vector Shift protection element measures the change in voltage angle over successive power system half-cycles. The element operates by measuring the time between zero crossings on the voltage waveforms. A measurement is taken every half cycle for each phase voltage. Over a power system cycle this produces 6 results, a trip is issued if 5 of the 6 calculations for the last power system cycle are above the set threshold. Checking all three phases makes the element less susceptible to incorrect operation due to harmonic distortion or interference in the measured voltage waveform.

The fast operation of this vector shift function renders it to operate at the instant of a disturbance rather than during a gradual change caused by a gradual change of power flow. Operation can occur at the instant of inception of the fault,at fault clearance or following non-synchronized reclosure, which affords additional protection to the embedded generator.


Thank
you

AnnexureC1.a






ISLANDING SCHEME FOR OPGCL

By

ODISHA POWER GENERATION CORPORATION LTD.

Objective:

Formation of proposed island shall achieve the following objectives:-

i) Prevention from total black out by avoiding effect of cascade tripping of the Power System.

ii) Fast restoration of supply.

Present Status:

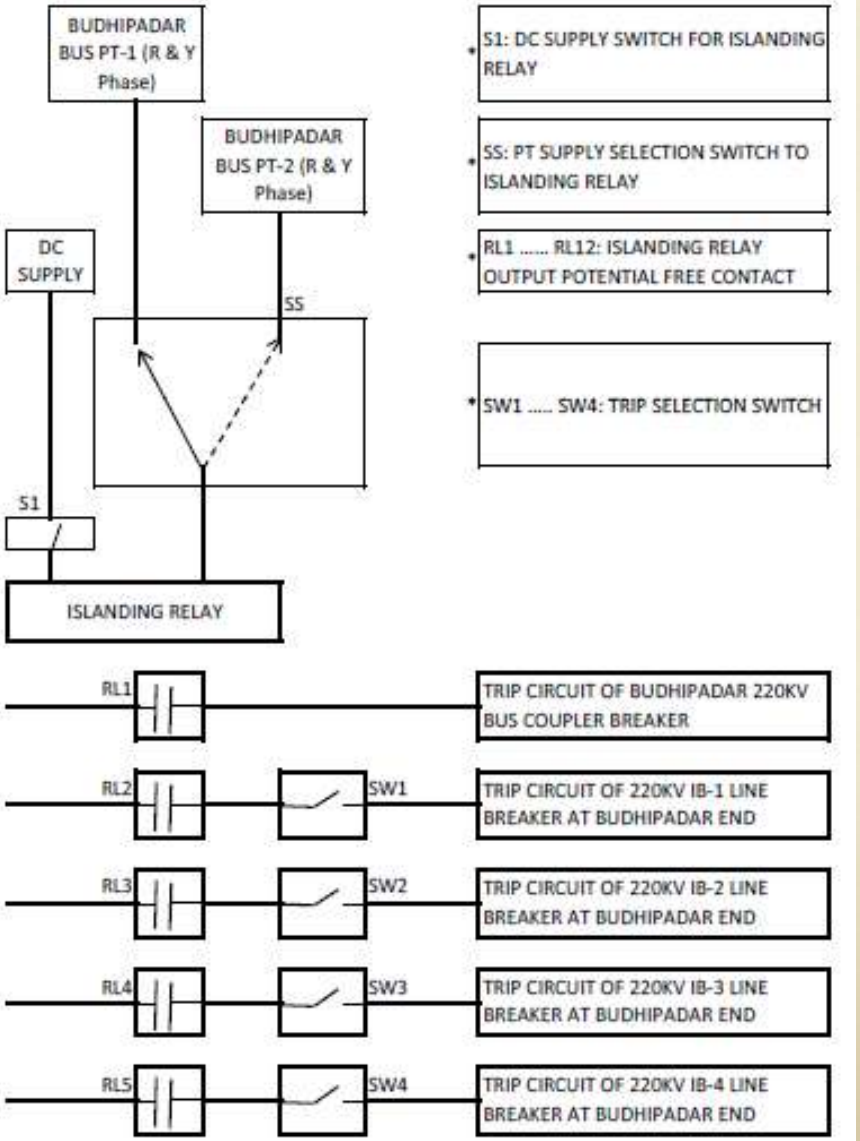
Presently there is no islanding scheme in operation in OPGCL.

Methodology of Proposed Islanding Scheme:

The methodology adopted for the proposed Islanding scheme is as under :-

- Islanding relay out put trip command extended to 220KV budhipadar bus coupler breaker and 220KV IB Line breakers at Budhipadar connected to non islanded Bus.
- Islanding relay output command extended to IBTPS through OPGW link for load – generation balance by fast governor/HPBP operation.
- Further two IB line(out of four) should always be connected to Islanded Bus and the radial Load should be maintained with in 185MW.

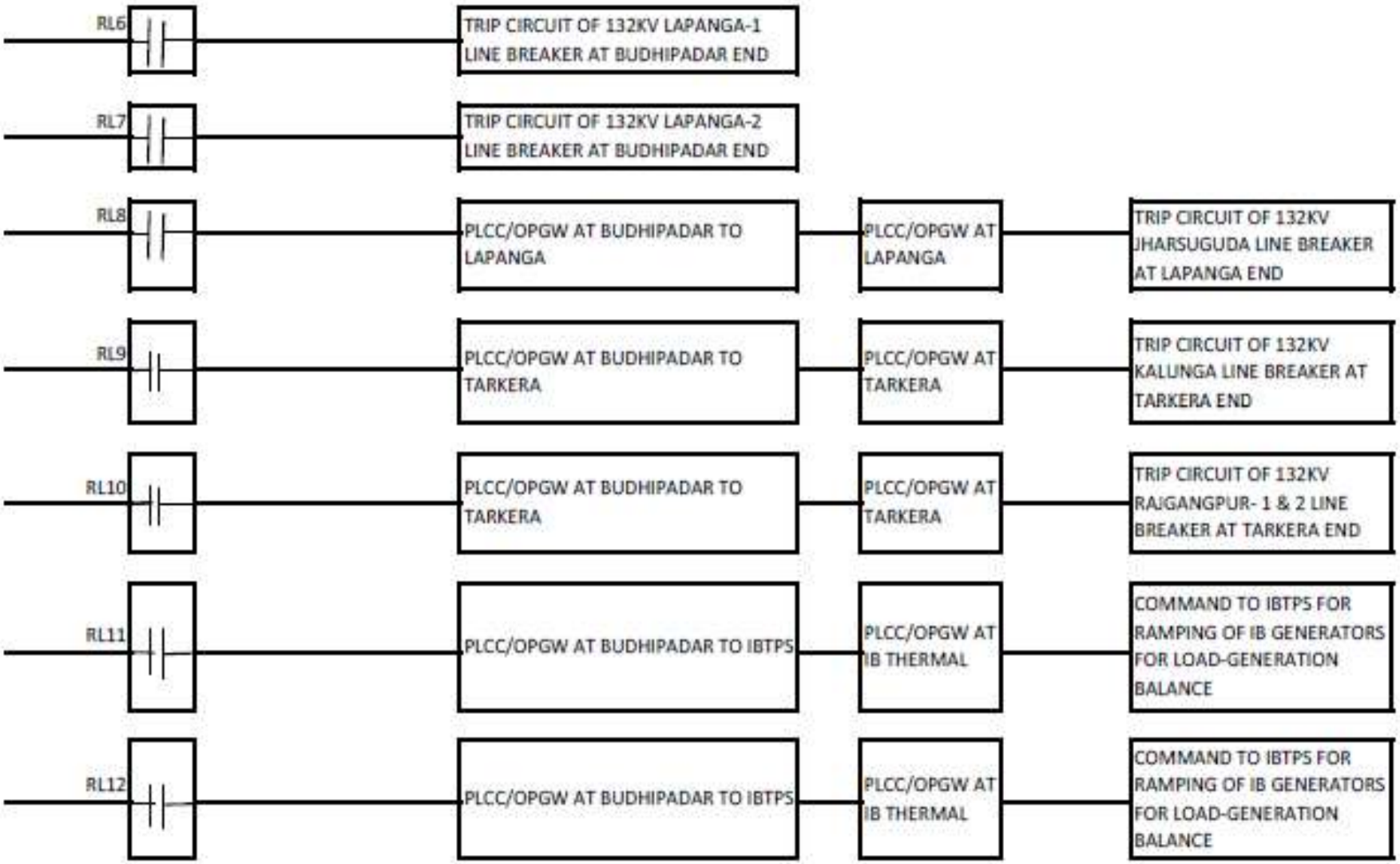
ISLANDING SCHEME OF IBTPS AT BUDHIPADAR

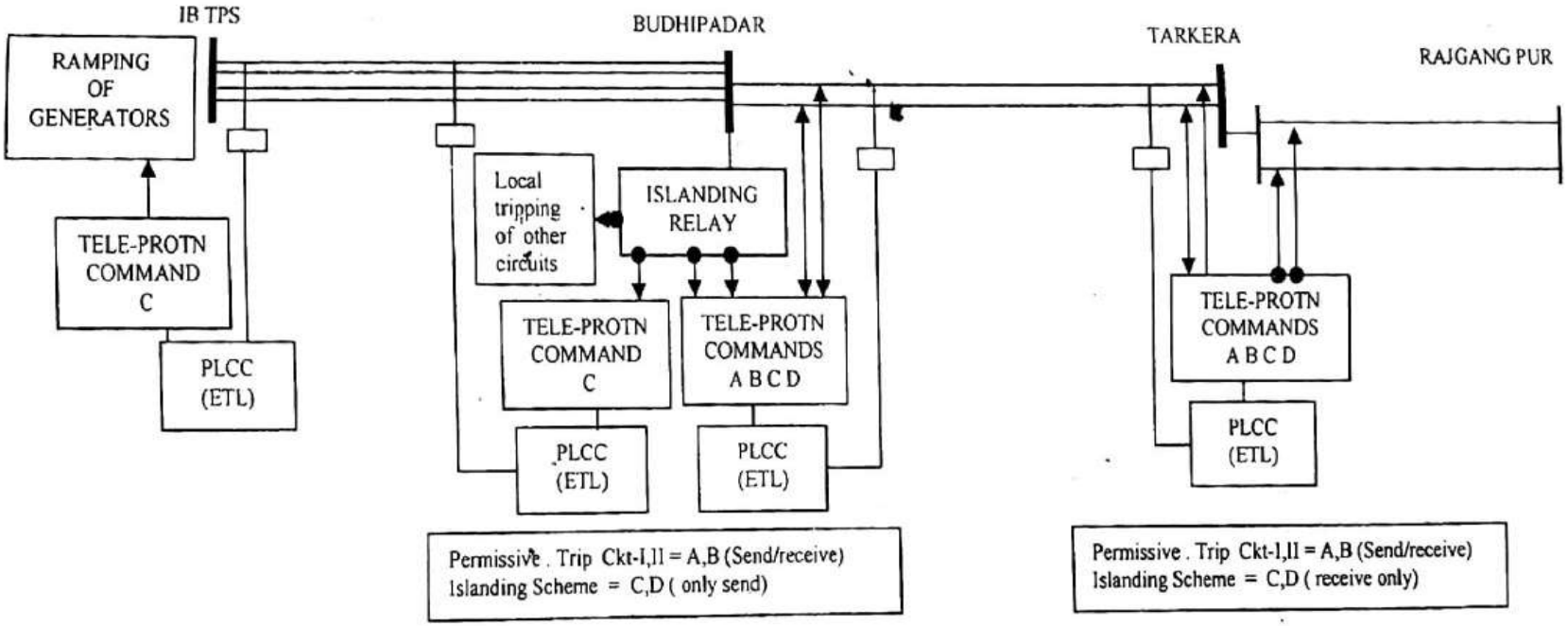


At Budhipadar grid, one 220KV BUS (**Islanding BUS**) shall be connected with local loads (AT 1 & 2, SPS/Concast, Basundhara) and two circuits of IBTPS. Other 220KV BUS (**Other BUS**) shall be connected with AAL, Vedanta, Tarkera, Korba, Raigarh, Bhusan, Lapanga and balance two ciccuits of IBTPS. Both 220KV BUS shall be interconnected through BUS Coupler Breaker. PT supply of **Islanding Bus** shall be fed to Islanding Relay through PT Supply Selection Switch (SS). In case of Islanding Relay operation, the **Islanding BUS** will get isolated with local load & IBTPS generation after tripping the Bus Coupler breaker (220KV) at Budhipadar, selected 132KV line Breakers and IBTPS line Breakers (220KV) connected to Other BUS at Budhipadar through respective Trip Selection Switch (SW1.....SW4).

132KV Local Loads for Islanding System- Budhipadar
132/33KV station load, MCL, MSP, Sundergarh, Jharsuguda, Brajrajnagar, Kalunga, Rajgangpur (with Kuchinda)

Minimum two nos. IBTPS circuits shall be kept connected to **Islanding BUS.** Respective Trip Selection Switch (SW1....SW4) of remaining two nos. IBTPS circuits connected to **Other BUS** shall be kept ON and get tripped in case of Islanding Relay operation. **NEVER KEEP THE TRIP SELECTION SWITCH OF ANY IBTPS LINE CONNECTED TO "ISLANDING BUS" IN "ON" CONDITION.**


RL6
TRIP CIRCUIT OF 132KV LAPANGA-1 LINE BREAKER AT BUDHIPADAR END
RL7
TRIP CIRCUIT OF 132KV LAPANGA-2 LINE BREAKER AT BUDHIPADAR END
RL8
PLCC/OPGW AT BUDHIPADAR TO LAPANGA
PLCC/OPGW AT LAPANGA
TRIP CIRCUIT OF 132KV JHARSUGUDA LINE BREAKER AT LAPANGA END
RL9
PLCC/OPGW AT BUDHIPADAR TO TARKERA
PLCC/OPGW AT TARKERA
TRIP CIRCUIT OF 132KV KALUNGA LINE BREAKER AT TARKERA END
RL10
PLCC/OPGW AT BUDHIPADAR TO TARKERA
PLCC/OPGW AT TARKERA
TRIP CIRCUIT OF 132KV RAIGANGPUR- 1 & 2 LINE BREAKER AT TARKERA END
RL11
PLCC/OPGW AT BUDHIPADAR TO IBTPS
PLCC/OPGW AT IB THERMAL
COMMAND TO IBTPS FOR RAMPING OF IB GENERATORS FOR LOAD-GENERATION BALANCE
RL12
PLCC/OPGW AT BUDHIPADAR TO IBTPS
PLCC/OPGW AT IB THERMAL
COMMAND TO IBTPS FOR RAMPING OF IB GENERATORS FOR LOAD-GENERATION BALANCE



Note: (1) At Tarkera, teleprotection command- C (receive) shall be used for direct tripping of 132kV Tarkera – Rajgangpur- Ckt-I.

(2) At Tarkera, teleprotection command-D (receive) shall be used for direct tripping of 132 kV Tarkera – Rajgangpur-II.

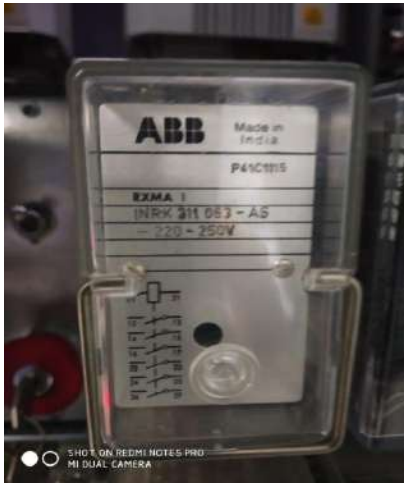
(3) At IB Thermal, Tele-protection command C shall be used for triggering ramping circuits of generators at IB TPS.

(4)Presently , as existing all the four circuits to IB thermal will work without carrier back up protection, it shall be provided as soon as digital protection coupler are procured very soon.

OFFICE OF THE GENERAL MANAGER		
Telecommunication Circle. OPTCL, Meramandali		
Drg No	Date	Apvd by
05	27.6.15	

ISLANDING MULTIPLICATION RELAY CONFIGURED IN IBTPS SWITCHYARD CONTROL ROOM

Hold ON Contact of X Relay



+220VDC

Reset Push Button

Islanding Channel-1 Command from Budhipadar

Islanding Channel-2 Command from Budhipadar

X

Islanding Multiplication Relay

-220VDC

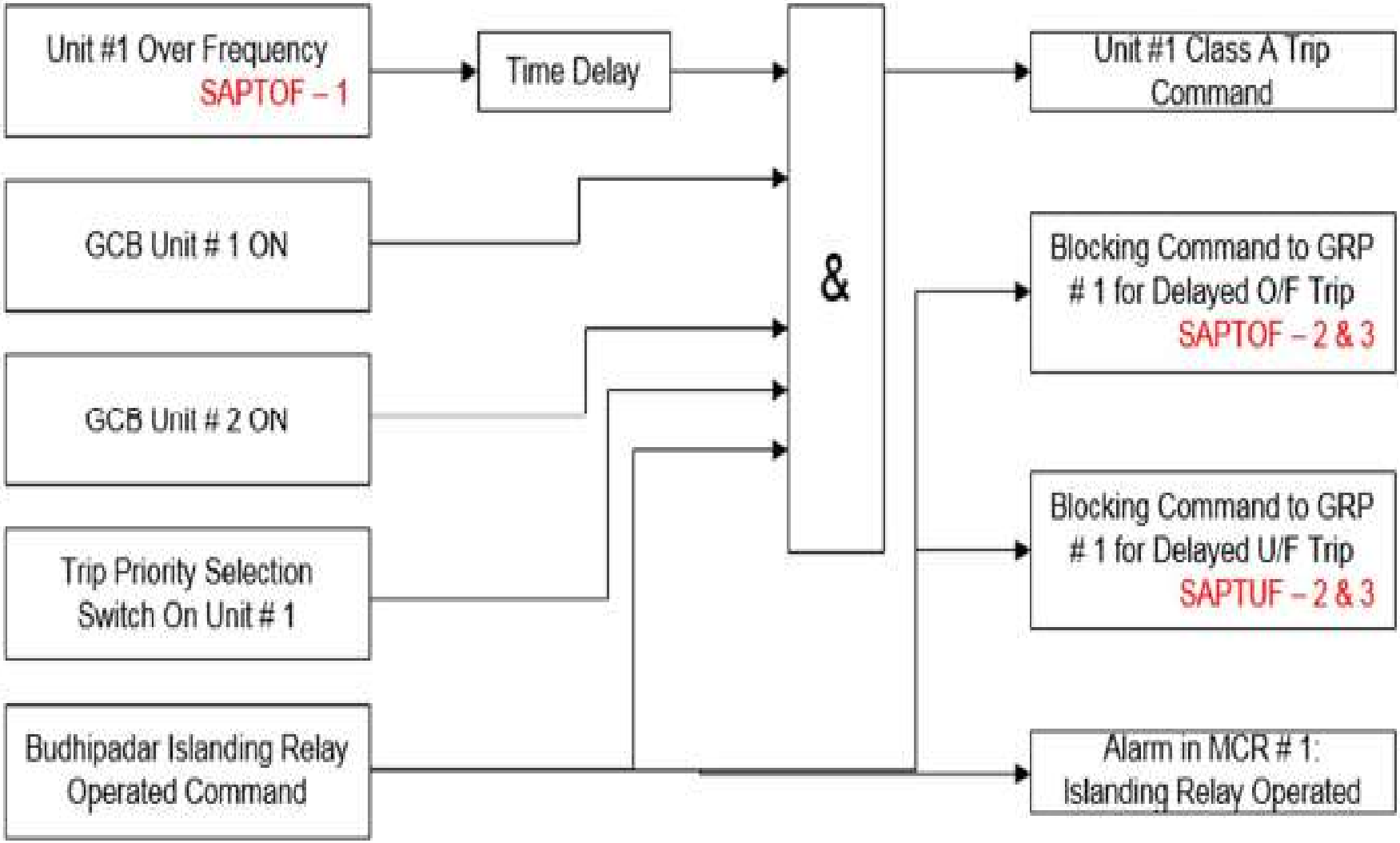
X1 — Budhipadar Islanding Relay Operated Command to Unit#1 GRP

X2 — Budhipadar Islanding Relay Operated Command to Unit#2 GRP

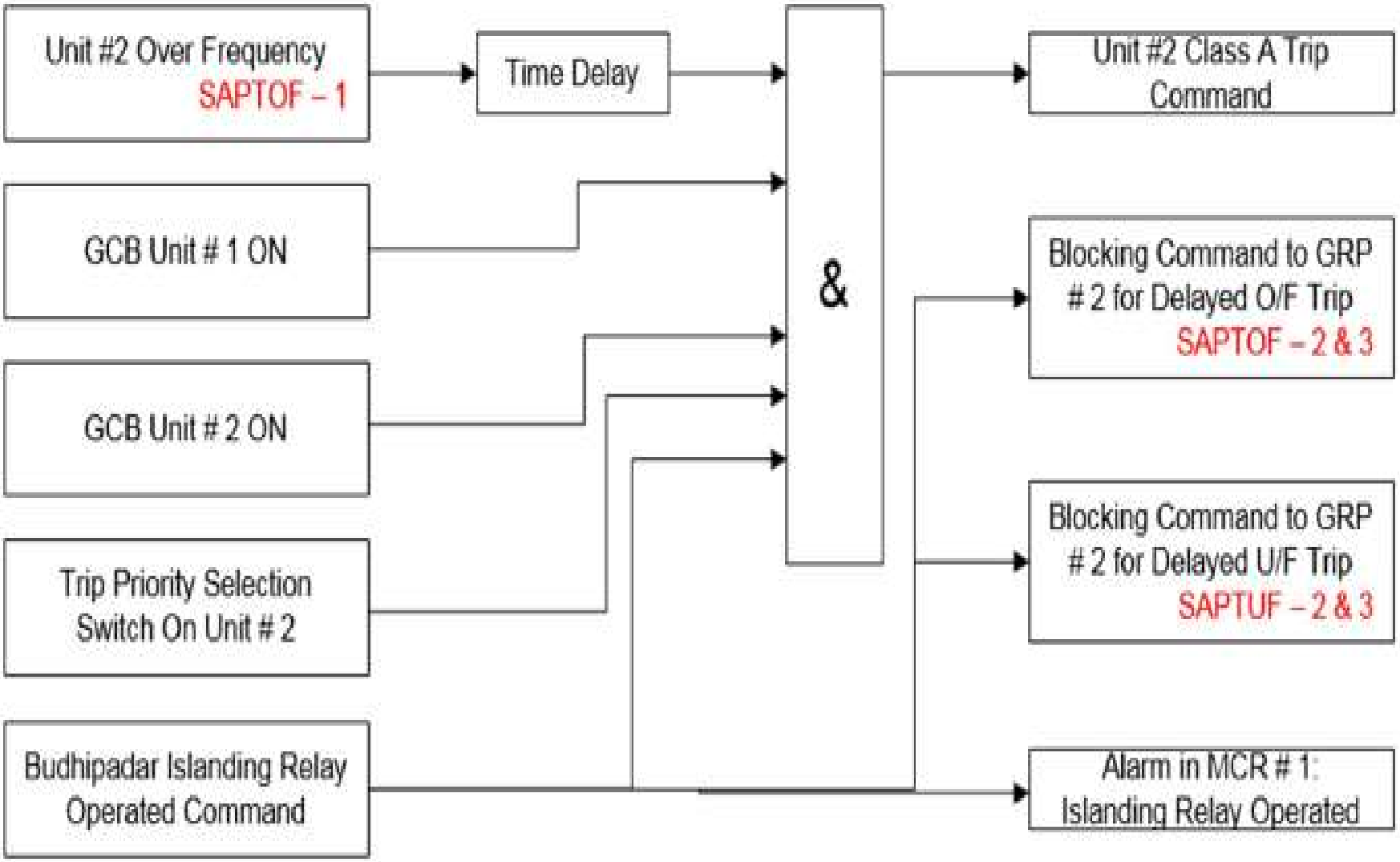
X3 — Budhipadar Islanding Relay Operated Command to Unit#1 maxDNA

X4 — Budhipadar Islanding Relay Operated Command to Unit#2 maxDNA

Logic configured in REG670 Relay for Islanding of Unit-I Generator



Logic configured in REG670 Relay for Islanding of Unit- 2 Generator

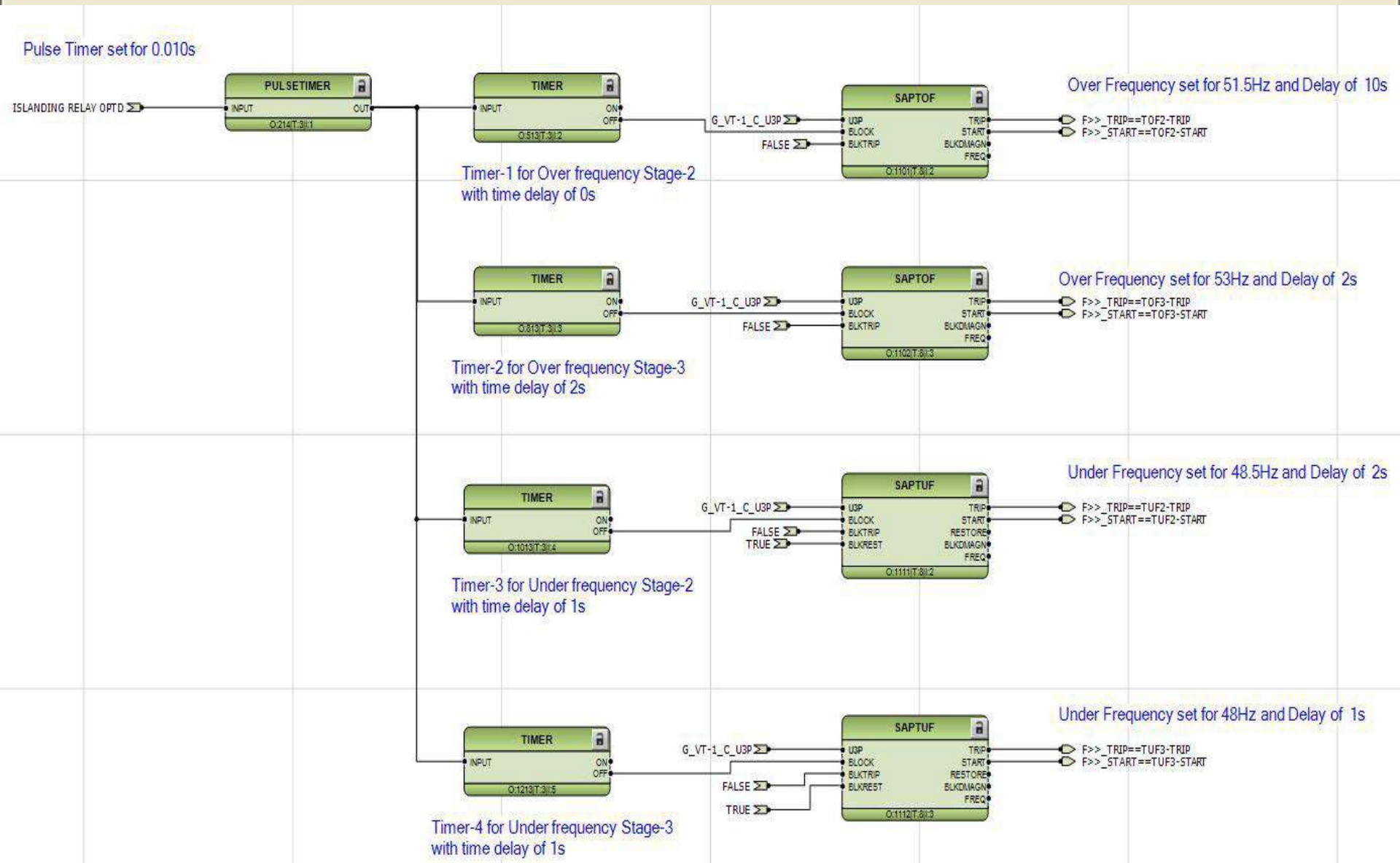


- The over – frequency protection is achieved using SAPTOF function block in Generator Protection relay REG670. There are 3 instances of SAPTOF function in REG670 relay, in which the 1st is used to confirm the disturbance in the system frequency (As shown in above figure- red colored), 2nd and 3rd instance is used for delayed operation of the over- frequency function in line with the logic shown above.

- Function Block and Parameter Settings of Over - Frequency Protection-1st Instance:

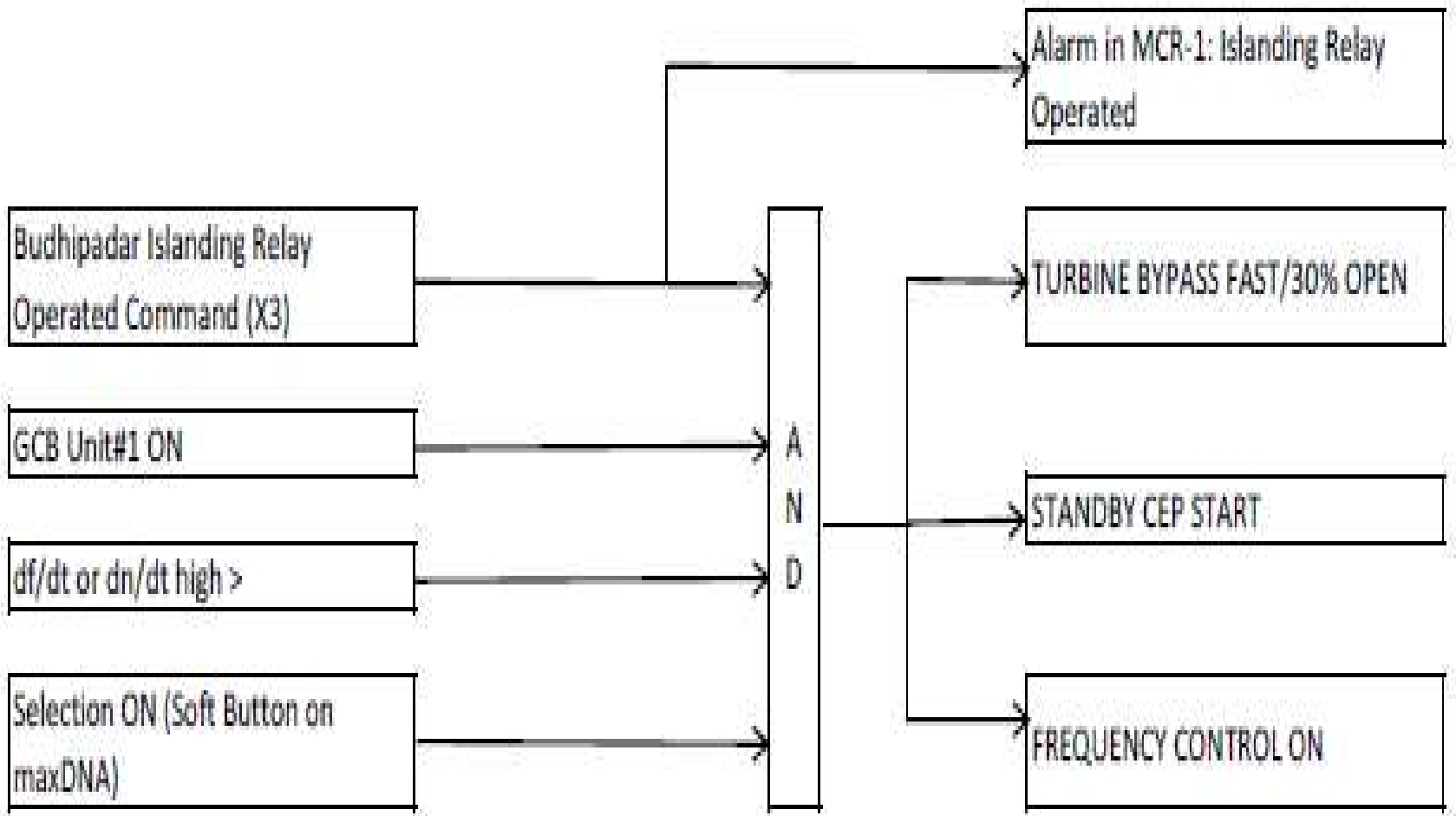
SAPTOF: 1				
Setting Group1				
Operation	On			
UBase	15.75	kV	0.05	2000.00
StartFrequency	51.50	Hz	35.00	75.00
IntBlockLevel	50	%UB	0	100
TimeDlyOperate	1.000	s	0.000	60.000
TimeDlyReset	0.050	s	0.000	60.000

Configuration of Delayed Over Frequency and Under Frequency Function

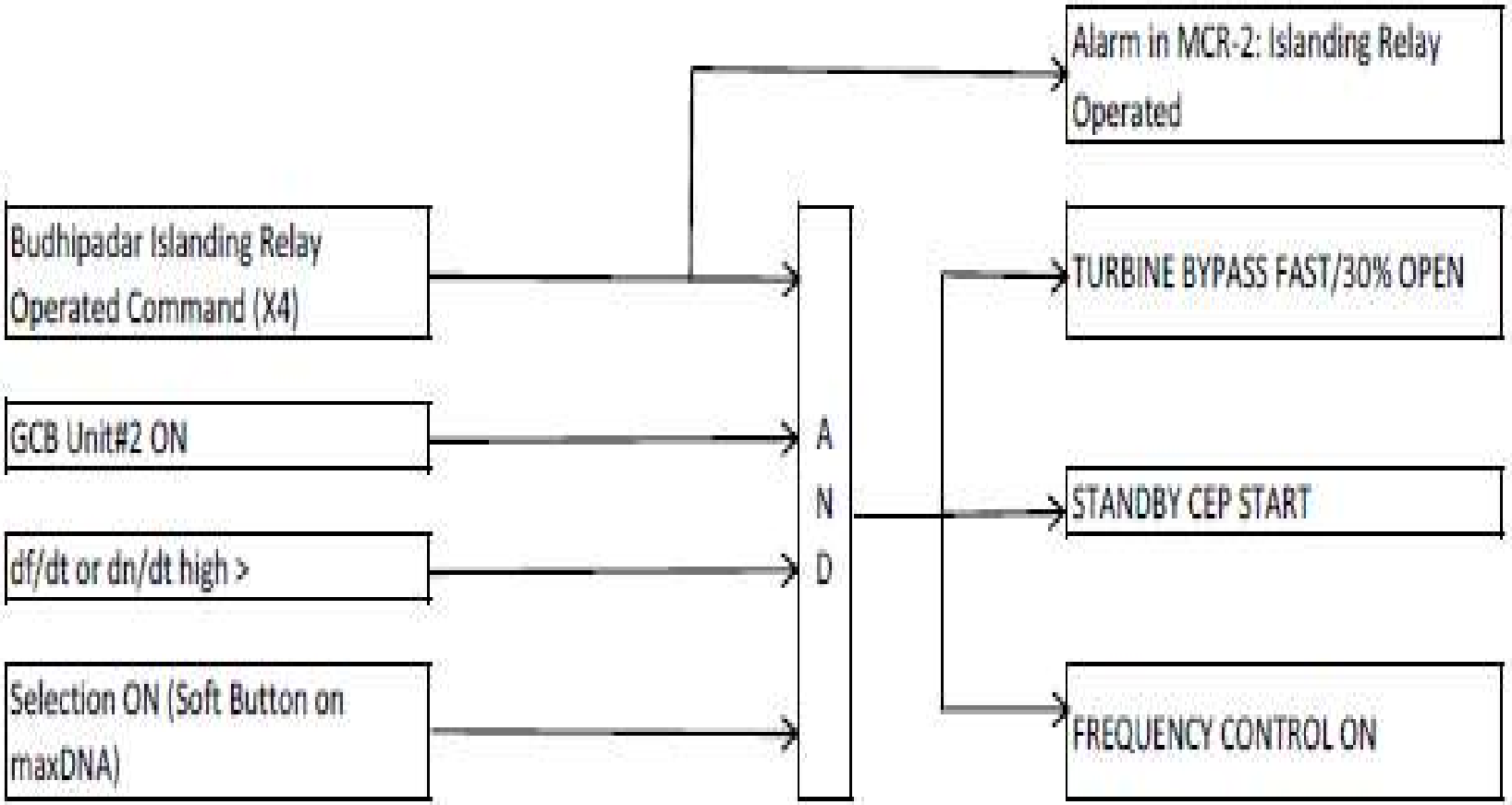


- Above timers are settable and can be adjusted as per requirement. If there is no trip from islanding relay, over and under frequency protections will operate as per the times shown without external timers (timer-1 to 4).
- If there is a trip from Islanding relay, over and under frequency protections are blocked till the time set in corresponding timers as per the above shown configuration. Hence total tripping time delay will be corresponding timer delay + over and under frequency protection function set time delay.

LOAD-GENERATION BALANCE SCHEME CONFIGURATION IN UNIT#1 MAXDNA CONTROL SYSTEM



LOAD-GENERATION BALANCE SCHEME CONFIGURATION IN UNIT#2 MAXDNA CONTROL SYSTEM



Islanding Operation	After islanding operation, IBTPS Generators shall cater to the demand of connected islanded load and maintain the frequency. In case of further extension of power to other loads if required, it may be done with close coordination of SLDC, IBTPS & Budhipadar S/S so that the islanded system shall not collapse and able to maintain at the desired frequency.
Normalisation / Resynchronisation	After system stabilization, islanded system may be synchronised with main grid at IBTPS end. Ensure that unloaded 220KV IB-Budhipadar lines are disconnected from both (IBTPS & Budhipadar) sides. Charge one of same lines from Budhipadar 220KV Other BUS connected to main system. The same line may be synchronized at IBTPS end after acheiving synchronisation permissive then connecting both systems. After this Budhipadar 220KV Bus Coupler breaker can be closed for normilazation. Alternatively both systems may be synnchronized through 220KV Budhipadar Bus Coupler breaker after acheiving required synnchronisation permissive.

THANK YOU

Protection Audit Report of 220/132/33 kV Lalmatia Substation

Date: 16-08-18

Introduction: Due to the multiple tripping of circuits from 220/132/33 kV Lalmatia substation and associated protection issues, Eastern Region Protection Committee has decided in the 69th PCC meeting to carry out the Protection Audit of Lalmatia substation. Accordingly, a team comprising of ERPC, ERLDC, NTPC, PGCIL and JUSNL visited the 220/132/33 kV Lalmatia substation on 16th August 2018 and performed the protection audit. The Team Members of the Protection Audit Group comprises of following members:

1. ERPC: Pranay P Jena, AEE
2. ERLDC: Chandan Kumar, Sr. Engineer and Laldhari Kumar, Engineer
3. NTPC: Rohit Agarwal, Manager, NTPC Farakka
4. PGCIL: Randhir Kumar Ranu, Engineer, Banka Substation
5. JUSNL: Vinod Gupta (JE), V. K. Bhoi (EEE)

Substation: Lalmatia substation is having a historical background. The substation was created in around 1989 for catering to the ECL coalmine load. It is 220/132/33 kV substation owned by ECL which was later being maintained by NTPC Farakka. However, subsequently, with the other distribution load coming up, the switchyard was extended by JUSNL with augmentation of 220/132 kV ICT, 132 kV lines and 132/33 kV transformers.

The substation is thus subdivided into two parts out of which one looked after by NTPC Farakka and other by JUSNL. NTPC Farakka is looking after the 220/132 kV switchyard consisting of 220 kV Farakka-Lalmatia ckt and 220/132 kV ICT. While the JUSNL looks after the 220/132 kV ICT 2 (Kanohar Make), 132 kV Kahalgaon(NTPC)-Lalmatia, 132 kV Kahalgaon (BSPTCL)-Lalmatia, 132 kV Kahalgaon (BSPTCL)-Sahebganj, 132 kV Lalmatia-Dumka 1 & 2, 2 X 50 MVA 132/33 kV ICTs and 33 kV switchyard with 6 33 kV feeders (Godda, Mahagama, Patahargaon, Meharama, Barijor and ECL) for JUSNL load. The 132 kV buses maintained by NTPC and JUSNL are coupled and having isolator arrangement decoupling.

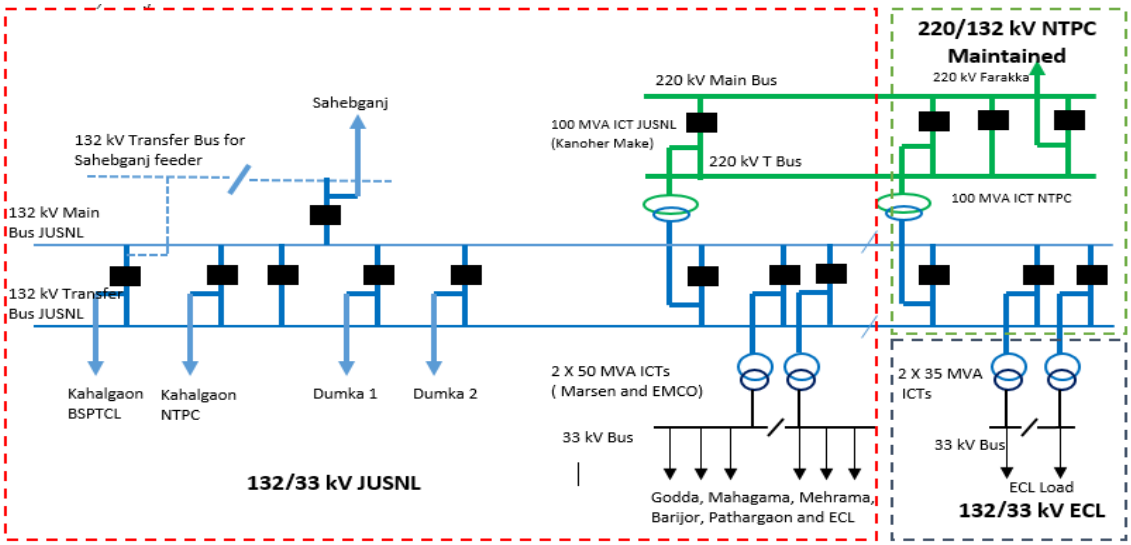


Fig: 220/132/33 kV Lalmatia Substation Single Line Diagram

The Protection Audit findings are thus subdivided into two parts i.e. One for 220/132 kV NTPC Maintained section and other 132/33 kV JUSNL owned section for this substation.

132/33 kV Lalmatia (JUSNL) Section

1. **Switchyard and its Maintenance:** The whole switchyard was in bad shape. As per the details, the JUSNL part switchyard was commissioned in 1991 (27 years old). Following were observed when switchyard inspection during protection audit was carried out:
    - **Old Equipment:** The switchyard equipment's (Isolator/CT/PT/LA/Breaker) are old and rusty and need immediate attention. Adequate spare management is also required for any emergency. The bays which has been commissioned in 2011 onwards were also found in bad shape due to lack of proper maintenance.
    - **PCC and Gravelling:** Long grasses and weeds were observed throughout the switchyard. Proper graveling was not observed in entire switchyard which may be hazardous to human safety, equipment health and can cause unwanted tripping. There is a need for proper PCC and Gravelling in switchyard along.
    - **132/33 kV Transformers:** Severe oil leakage in one of the 132/33 kV ICT was observed and its oil has also penetrated the panel box of OTI/WTI and can result in unwanted tripping. The ICT panel box also needs proper care as gasket was found to be missing and rainwater can ingress which may also result in unwanted tripping. Silica Gel in 132/33 kV ICTs was found pink and needs to be replaced or recovered by heating. 2 no's of the cooling fan in one of the 50 MVA ICT was not working due to non-replacement of the faulty connector.
    - **Bay Equipment Nomenclature:** Proper Bay equipment numbering and phase segregation for identification of equipment have not been done which may result in the wrong operation of equipment and can cause hazard to O & M Personnel.
    - **Earthing of LA:** Proper earthing was not provided to Las in the switchyard.
    - **O&M Activities:** There was no proper O&M for equipment at the substation. This is the major concern that was observed at the substation. No Records were available for the O&M at the substation level. Even the JUSNL Testing team were not able to tell regarding the O&M plan of the substation and its monitoring.
2. **Equipment O & M and Testing:** During the audit, records were asked for equipment(CT/PT/Breakers) testing and it was observed that:
    - Equipment and relay have been tested only at the time of Commissioning and after that, no routine test and maintenance has been done. Proper record of the pre-commissioning tests were also not available.
    - It was also observed that there was a lack of Testing equipment for Routine testing at the substation level.
    - Details of past equipment failure were also not available at the substation.
3. **Relay and Associated issues:**

- **132 kV Transmission Line Protection:** It was found that only one numerical relay has been provided whose Distance and O/C and E/F feature has been utilized to provide the Main as well as backup protection. Only in 132 kV Sahebganj Circuit, separate electromechanical type backup O/C and E/F protection have been provided.
    - **A.** 132 kV Kahalgaon NTPC(40.3 km)
    - **B.** 132 kV Kahalgaon BSPTCL (46.66 km)
    - **C.** 132 kV Sahebganj (48.45 km)
    - **D.** 132 kV Dumka 1 (95.88 km)
    - **E.** 132 kV Dumka 2 (96 km)

  The impedance setting for various zones along with time setting was found to be not in order in the line relays. Further, Power swing blocking philosophy was not found uniform.
- **100 MVA 220/132 kV Transformer (Kanoher Make):** Differential protection is Numerical relay while Backup protection is of Electromagnetic type. The REF protection for ICT is of static type and it is a combined REF for HV/LV rather than separate for 220 and 132 kV. Rest of the protection like OTI/WTI/OSR/ Buchholz were found for the ICTs. The over flux protection is not enabled in Numerical relay due to non-extension of CVT wiring from 220 kV adjacent relay panel room of NTPC to 132 kV relay panel room of JUSNL.
- **2 X 50 MVA 132/33 kV Transformers (EMCO and Marsen make):** Differential protections are Numerical relay while Backup protections are of Electromagnetic type. Rest of the protection like OTI/WTI/OSR/ Buchholz were found for the ICTs. The Overflux and REF protection is enabled for one transformer (Mersan) in its differential relay while the same is not done for EMCO make transformer where neutral bushing CT is not present.
- **LBB and Bus Bar Protection:** 132 kV LBB and Bus Bar Protection of static type has been provided in the substation but it has not operated till now as per the substation staff. The testing and checking has also not been done for both these protections. That's why its operational status is also of concern. The bus bar protection extension is possible or not was also not known to anyone.
- There was no proper record for testing and commissioning of relay along with any relay setting change done at the substation. The JUSNL team also could not provide the complete details for the substation.
- Two under frequency relays, one each for 132 KV Kahalgaon (BSPTCL) and 132 KV Kahalgaon (NTPC) feeder has been provided under the Islanding Scheme of Farakka. The relays have been set at 47.7 Hz without any time delay for tripping of these feeders to isolate 220/132 kV Lalmatia substation and its radial loads with 220 kV Farakka-Lalmatia feeder with Farakka's Unit. When enquired, the operators in the Control Room/ Testing team were not aware of this relay and in one of these, alarm was persisting.

4. AC Distribution Board:

- Overcurrent relay for ACDB protection and Alarm System were not operational.

- Changeover switch for one bus of the ACDB was found in broken condition. This is a serious concern in case of the failure of one of the AC supply as the operator will not be able to transfer the load on the alternate source by coupling of the ACDB buses.

5. **DCDB and Battery Bank:**
    - 220 V Battery Bank: Make: EXIDE Wet Type, Commissioned in 2016.
    - 48V Battery Bank: Make: EXIDE Wet type, Commissioned in 2016.
    - Alarm System was not operational so any failure of DCDB will not be immediately known to the operator.
    - Exhaust fan in Battery Room was not working and cable trench of Battery room was in damaged condition and not covered.
6. **DC System Healthiness**: No major DC earth fault was observed however DC Voltage measurement done during the audit are as follows:

Measurement	Battery	Nearest Feeder	Farthest Feeder
+ve to -ve	255 V	254 V	244 V
+ve to Earth	108 V	113 V	109 V
-ve to Earth	134 V	139 V	134 V

7. **Display Panel:**
    - Voltage difference was observed in 132 kV feeders connected to the same bus in the control room panel box. There is a need for CVT testing and metering equipment calibration at the substation so that correct data can be displayed to the operator.
    - For the 220/132 kV ICT, many of the digital display for current and voltage were found not working. One of the issue with voltage display was the non-availability of CVT extension from NTPC side to JUSNL side.
8. **UFR Relay:** As per the data available with ERPC, one UFR relay should have been on the 33 kV Mahagama feeder, however, the same was not found on Mahagama feeder (Max load 14 MW).
9. **Transmission Line Issues:** It was observed that the transmission lines from the substation is maintained by various utilities. 132 kV Kahalgaon NTPC and 132 kV Kahalgoan BSPTCL lines are being maintained by JUSNL and BSPTCL. While 220 kV Farakka feeder is being maintained by NTPC.

    It was intimated that maximum number of tripping has been observed in 132 kV Kahalgaon NTPC and 132 kV Kahalgoan BSPTCL which are on same towers. For these circuits, 1-48 Towers are maintained by BSPTCL while 49-123 towers are maintained by JUSNL. JUSNL intimated that most of the fault are observed in BSPTCL maintained section due to large trees and broken/poor condition for earth wire between 21-34 towers. JUSNL explained that they have recently carried out the complete line patrolling and cut the trees in BSPTCL section after which the number of faults has reduced.
10. **Other Observation:**

- 132/33 kV ICT II has been tripping on the differential for any 33 kV through fault on several occasion. This was also observed during the period of Audit. This also necessities the testing of relay and checking and review of its relay setting.
- It was found that whenever 220 kV Farakka -Lalmatia trips on fault, then 132 kV Kahalgaon (NTPC) Lalmatia feeder also trip from lalmatia end indicating that the line is tripping on through fault. This may be due to CT polarity, wrong zone protections setting, PSL logic etc. This also needs immediate action.
- This similar issue was also observed with 132 kV Kahalgaon BSPTCL-lalmatia feeder which trip for through fault on 132 kV Sahebganj, 132/33 kV ICTs. This indicates the need of checking of CT Polarity, relay setting, Zone 4 protections setting and time delay and relay testing.
- The JUSNL CRITIL team who were present during the audit were asked regarding the Disturbance recorder files for tripping however they have not extracted the same for any tripping in this year. This is a serious concern and violation of Grid code and Grid standards.

11. **Manpower Training:** Based on the various inputs received , the audit team observed that substation staff, as well as CRITIL Team of Jharkhand, do not have proper training on O&M, Testing etc. This is one major concern and there is a need of immediate action at this front.

220/132/33 kV Lalmatia (NTPC)

1. **Switchyard and its Maintenance:** The whole switchyard was in bad shape. As per the details the NTPC Maintained section of switchyard was commissioned in 1989 (29 years old). Following were observed when switchyard inspection during protection audit was carried out:
    - **Old Equipment:** The switchyard equipment's (Isolator/CT/PT/LA/Breaker) are old and rusty and need immediate attention. Adequate spare management is also required for any emergency. These were found in bad shape due to lack of proper maintenance. Severe oil leakage was found in one of the CT in the substation.
    - **PCC and Gravelling:** Long grasses and weeds were observed throughout the switchyard. Proper graveling was not observed in entire switchyard which may be hazardous to human safety, equipment health and can cause unwanted tripping. There is a need for proper PCC and Gravelling in switchyard along.
    - **100 MVA 220/132 kV Transformer (Maintained by NTPC):** Severe oil leakage was observed in the ICT. The ICT panel box also needs proper care as gasket was found to be missing and rainwater can ingress which may also result in unwanted tripping. Silica Gel in ICT was found pink and needs to be replaced or recovered by heating. 3 Fans of the ICT cooling system were not found in working condition.
    - **Bay Equipment Nomenclature:** Proper Bay equipment numbering and phase segregation for identification of equipment have not been done which may result in the wrong operation of equipment and can cause hazard to O & M Personnel.
    - **Earthing of LA:** Proper earthing was not provided to Las in the switchyard.

- **O&M Activities:** There was no proper O&M for equipment at the substation. This is the major concern that was observed at the substation. No Records were available for the O&M at the substation level. Even the NTPC Operating Staff were not able to tell regarding the O&M plan of the substation and its monitoring.

2. **Equipment O & M and Testing:** During the audit, records were asked for equipment(CT/PT/Breakers) testing and it was observed that:
    - Breaker Overhauling of 220 kV breakers was done last in 2009 and for 132 kV breakers in 2010. After that, no testing and overhauling has been done.
    - All 220 and 132 kV CTs have been tested in 2014 and after that, there has not been any routine test and maintenance.
    - It was also observed that there was a lack of Testing equipment for Routine testing at the substation level.
    - Details of past equipment failure were also not available at the substation.
3. **Relay and Associated issues:**
    - All the protection relay for lines and ICTs are of electro-mechanical in nature and are very old.
    - Last relay testing and setting have been done in the year 1999 and after that, it has not been done. Records for relay setting calculation were available in the substation.
    - **LBB and Bus Bar Protection:** 220 kV & 132 kV Differential as well as LBB is provided but has not operated till now. The Busbar protection Is combined scheme for both the switchyard, however, no details on its extension is known to the operator/testing person.
    - **2 X 50 MVA 132/33 kV Transformers and 100 MVA 220/132 kV Transformer:** There was no Differential relay, REF relay, over flux relay available for both 220/132 kV ICT and 2 X 50 MVA 132/33 kV ICTs.
    - **LBB and Bus Bar Protection:** 132 kV LBB and Bus Bar Protection of static type has been provided in the substation but it has not operated till now as per the substation staff. The testing and checking has also not been done for both these protections. That's why its operational status is also of concern. The bus bar protection extension is possible or not was also not known to anyone.
4. **AC Distribution Board:**
    - In Good Condition.
5. **DCDB and Battery Bank:**
    - 220 V Battery Bank and 50 V Battery Bank: Commissioned in 2011
    - Two sets of battery charger for 220 and 50 V are there out of which one set for each voltage level was found in faulty condition
6. **DC System Healthiness**: No major DC earth fault was observed however DC Voltage measurement done during the audit are as follows:

Measurement	Battery	Nearest Feeder 132 kV bay	Farthest Feeder 132v kv bay	220 kV bay
+ve to -ve	239.5 V	237.6 V	238.1 V	238.1 V

+ve to Earth	78.4 V	78 V	78.3 V	77.8 V
-ve to Earth	161.1 V	159.5 V	*160.5*V	160.3 V

7. **Control Room:** No AC were found in the control room and relay panel room which are adjoined.
8. **Manpower Training:** One person from NTPC has been stationed at Lalmatia along with outsourcing of remaining staff for substation maintenance. It was observed that no hourly record for voltage and various other parameters are being maintained at the substation by the operating control room staff.

Conclusion from Protection Audit:

1. The substation needs a complete renovation along with resolution of the ownership issue in order to improve the O & M. The impact due to the lack of O & M has been observed in the entire switchyard which is in shabby condition. The Human life working in the switchyard is also exposed to threat due to improper earthing, aging equipment, lack of graveling and PCC etc.
2. JUSNL who is presently owning the major portion of equipment has not done the maintenance leading to deterioration of newly constructed bays since 2006. Proper O & M practice need to be reinforced by JUSNL in its own portion to avoid unwanted tripping. **JUSNL may kindly take up the same at earliest.**
3. A complete check of equipment(CT/CVT/LA/Breakers) and their healthiness through testing need to be ensured for entire switchyard at earliest to avoid unwanted tripping. **JUSNL/NTPC may kindly take up the same at earliest.**
4. The old electromechanical relays in the substation need to be replaced with numerical relays and their coordinated setting also to be done subsequently. In the present relay, there is need setting review, wiring and logic check, CT polarity etc. to ensure there is no unwanted tripping as happening on daily basis. Further, the panels/relays which are not in use need to be removed to improve the space utilization. **JUSNL/NTPC may kindly take up the same at earliest.**
5. Existing Manpower need to be properly trained for proper O & M activities, daily operational activity, Record Maintenance, Extracting of DR for Events and others. **JUSNL/NTPC may kindly take up the same at earliest.**
6. AC and DC distribution system also need Maintenance at the substation. **JUSNL/NTPC may kindly take up the same at earliest.**

It may kindly be noted that 220/132/33 kV Lalmatia substation is of vital importance for NTPC Farakka, NTPC Kahalgaon and JUSNL. This substation will help in ensuring the proper coal supply as well as act as a path for the black start during emergency between these two large generating stations. So, there is a need for immediate attention in order to improve the condition of this substation at earliest.

Some Pictures from the substation






Annexure-C.6

Sl No.	Name of the incidence	PCC Recommendation	Latest status
71st PCC Meeting			
1.	Disturbance at 220/132 kV Chandil S/s on 08.08.18 at 05:49 hrs.	PCC advised JUSNL to check the details of tripping of 220kV Chandil – STPS S/C and also to review the zone-4 timer settings for all the lines as per PCC recommendations.	
2.	Disturbance at 220/132 kV Motipur(BSPTCL) S/s on 15.08.18 at 13:00 hrs.	PCC advised BSPTCL to check the disturbance recorders of all the lines in 220 kV Motipur S/s and communicate the findings to ERPC/ERLDC at the earliest.	
3.	Disturbance at 400 kV Farakka S/s on 19.08.18 at 15:26 hrs.	PCC advised NTPC to replace/divert Micom P437 relay to avoid unwanted tripping of such important transmission line. PCC also advised to check the reason for not sending carrier from Farakka to Kahalgaon and non-operation of Autorecloser.	
4.	Disturbance at 400 kV MPL S/s on 19.08.18 at 15:47 hrs.	PCC advised Powergrid to share the procedure/directives regarding implementation of the POP scheme with ERPC/ERLDC.	
5.	Disturbance at 400/132 kV Motihari(DMTCL) S/s on 22.08.18 at 14:59 hrs.	PCC observed that there is a need of SPS implementation to avoid the overloading of other ICT, in case of one ICT tripped. PCC advised Bihar to formulate a draft scheme of SPS and submit it to ERLDC/ERPC for further discussion.	The agenda will be discussed in the next TCC meeting to be held on 16.11.2018.
70th PCC Meeting			
1.	Tripping incidences in 400 kV Rangpo-Binaguri D/C line and subsequent operation of SPS-II on 10.07.18 & 30.07.18	PCC once again advised Dansenergy to review the relay settings at Dikchu end to avoid unwanted tripping. .	Dikchu informed that the issue can be attributed to saturation of HV side CT in Generating Transformer. Dikchu added that they are going to test the CT

			very soon and if required, it will be replaced with a new one.
3.	Repeated Grid Disturbances at 220kV Madhepura (BSPTCL) S/s on 19.07.18 at 13:31 hrs.	PCC advised BSPTCL to check healthiness of PLCC and enable the autoreclosure setting as well as the carrier tripping settings for both the lines and report to ERPC and ERLDC.	BSPTCL informed that the PLCC was in healthy condition. Regarding autoreclosure and carrier tripping scheme, they informed that they are under process of implementing the same.
69th PCC Meeting:			
5.	Total power failure at 220/132 kV Sipara S/s (BSPTCL) on 15.06.2018 at 10:58 hrs.	PCC advised BSPTCL to check & analyse the disturbance recorders of all the feeders along with the timing of relay operation and Circuit breaker opening time in order to ascertain the cause of busbar relay operation.	BSPTCL informed that the busbar protection is now out of service for Sipara S/s. A new busbar protection system is under implementation.
68th PCC Meeting			
7.	Issues related with Generation Backing down during Talcher-Kolar SPS operation on 16th May 2018.	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 advised NTPC also to explore for inclusion of pole block with ground return mode signal in the SPS logic.	Regarding inclusion of pole block with ground return mode signal in the SPS logic, Powergrid informed that the issue was referred to OEM.
8.	Issue of Protection Coordination Observed during Blackout of Tala on 23rd May 2018.	PCC advised Bhutan representatives to submit a detailed report on the above disturbance to ERPC and ERLDC at the earliest.	
9.	Non-Operation of 400 kV Binaguri-Rangpo D/C SPS	PCC advised Powergrid to ensure the	Regarding

	on 9th May 2018	relevant data availability of SPS operation to ERLDC through SCADA.	implementation of SPS through SAS, Powergrid informed that the installation and testing work have already been completed. The SPS through SAS will be in service after availing the next shutdown.
10.	Disturbance at 400/220 kV Biharshariff S/s on 28-03-2018 at 18:43 hrs and 19-03-2018 at 02:02 hrs.	PCC advised BSPTCL and Powergrid to ensure proper relay coordination between 400kV and 220 kV system including ICTs at Biharshariff S/s. 71st PCC advised BSPTCL to configure the zone-2 timings as 250-300 msec for the lines which do not have PLCC operational so that a proper relay coordination will be ensured between ICTs and the lines.	BSPTCL informed that they are in the process of implementing the revised settings.

Annexure C.12

Transient/Digital Fault Recorders (TFR or DFR)

The Contractor shall provide a digital fault recorder for each pole.

a. The TFR shall provide the means to provide a Comtrade file. The TFR will be connected to both A and B protection and control systems.
b. The TFR resolution shall allow AC and DC voltages and control and protection signals to be recorded with at least 100 measured points per cycle of fundamental frequency.
c. The TFR shall be synchronized to the station GPS clock.

The TFR of each pole shall record all necessary signals to enable troubleshooting and event analysis, including, as a minimum:

1. Valve group firing pulses, delay angle response, and extinction angle response (digital or analog pulse harp)

2. Valve group thyristor stack voltages and currents (wye and delta-connected valves)

3. DC line voltages

4. DC neutral bus voltages

5. DC line currents (Currents in each HV conductor and each DMR)

6. DC neutral bus currents

7. MRTB Currents

8. DC power

9. DC current order

10. AC bus voltages (phase – ground, 3 phases)

11. AC line currents (3 phases)

12. AC transformer primary currents (3 phases, wye & delta)

13. AC transformer secondary currents (3 phases, , wye & delta)

14. AC filter currents (3 phases, each filter individually)

15. Firing angle

16. Inverter valve group extinction angle

17. All trips and breaker statuses

18. All incoming AC line currents

19. DC control mode

20. AC bus frequency

21. AC reactive power

22. AC real power

23. Filter statuses

24. Metallic return current

25. Station ground current

26. Signals which modulate bipole power order, pole current order, or other controller references.

Triggering of the TFR shall include, but not be limited to the following inputs (any one or more of the following to initiate a trigger):

1. Pole block/ deblock

2. Pole commutation fail

3. Pole firing pulse loss

4. Pole DC Protection dv/dt trig.

5. Pole metallic return sequence initiated

6. AC overvoltage/ undervoltage

7. Telecommunication failure

8. Specified rate of change of key values (e.g. DC voltage and current)

9. Manual triggering

10. Breaker operations

11. Any activation of a runback or modulation

Individual triggering points shall be able to be deactivated