Agenda
for
71st PCC Meeting

Date: 19.09.2018
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 71ST PROTECTION SUB-COMMITTEE MEETING TO BE HELD AT ERPC, KOLKATA ON 19.09.2018 (WEDNESDAY) AT 10:30 HOURS

PART – A

ITEM NO. A.1: Confirmation of minutes of 70th Protection sub-Committee Meeting held on 21st August, 2018 at ERPC, Kolkata.

The minutes of 70th Protection Sub-Committee meeting held on 21.08.18 circulated vide letter dated 06.09.18.

Members may confirm the minutes of 70th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN AUGUST, 2018

ITEM NO. B.1: Tripping of 400 kV Rangpo-Binaguri-II and operation of SPS-II on 12.08.18 at 05:31 hrs.

400 kV Binaguri-Rangpo-II tripped on B-N fault at 05:31 hrs resulting operation of SPS - I which tripped all units except one unit at Teesta III, one unit at Tashiding, Dikchu, Chujachen and Jorethang. Even after successful operation of SPS-I, SPS - II operated at 05:52 hrs causing tripping of 400 kV Teesta III Rangpo S/C which led to black out of Teesta III and Dikchu generation complex. Detailed report is enclosed at **Annexure-B1**.

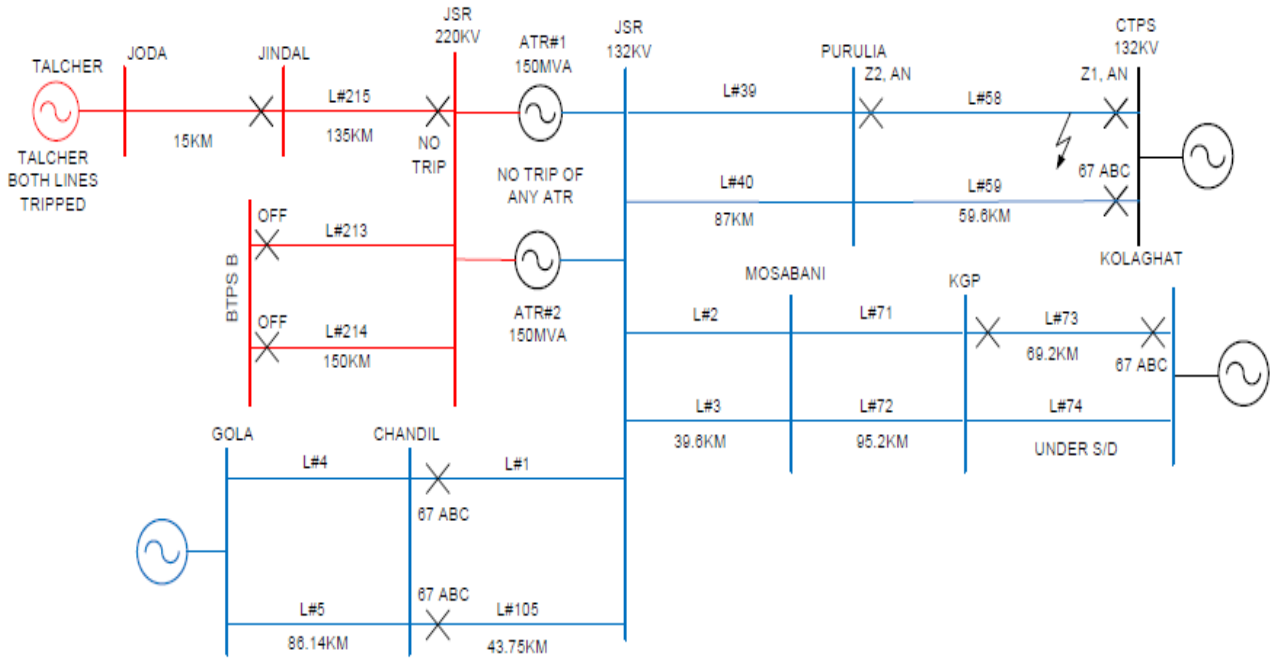
Load/Generation Loss: 1020 MW Generation loss with No Load loss.

Members may discuss.

ITEM NO. B.2: Disturbance at 220/132 kV Joda (OPTCL) Substation 0n 31.08.18 at 13:57 hrs.

220 kV Joda Ramchandrapur S/C and 220 kV Bokaro Jamshedpur were not in service. 220 kV Joda - TTPS D/C tripped on Y-B-N fault resulting increase in power flow through 220 kV Jamshedpur Jindal S/C. 132 kV Jamshedpur - Chandil D/C and 132 kV Purulia - CTPS D/C also tripped due to overload.

Load Loss: 450 MW.



OPTCL/DVC may explain.

ITEM NO. B.3: Disturbance at 220/132 kV Chandil S/s on 08.08.18 at 05:49 hrs.

At 05:49 hrs bus PT burst at Chandil. As per verbal information received, 220 kV STPS - Chandil S/C, 220 kV Ramchandrapur Chandil S/C & 220 kV Ranchi Chandil S/C were hand tripped resulting power interruption at 220/132 kV Chandil S/s.

Load Loss: 150 MW

Major elements tripped:

220 kV STPS - Chandil S/C
220 kV Ramchandrapur Chandil S/C
220 kV Ranchi Chandil S/C

JUSNL may explain.

ITEM NO. B.4: Disturbance at 220/132 kV Motipur(BSPTCL) S/s on 15.08.18 at 13:00 hrs.

The following elements tripped due to operation of busbar protection at Motipur substation.

- 220 kV Motipur – Darbhanga (DMTCL) D/C
- 220 kV Motipur – Musahari D/C
- 220 KV Motipur-MTPS-1
- All 220/132 KV ATR

As reported by BSPTCL, the relay wrongly operated for a thorough fault. Reason for tripping as analyzed by them was as follows:

a. CT ratio of Bus coupler bay was wrongly entered in the relay.
b. Incorrect isolator status of Bays 201-89B, 204-89B, 210-89B, 205-89A.
c. PSL configuration issues were found in relay.

As per PMU data, faults was seen in B phase around 13:00 hrs which got cleared within 100 ms.

Load/Generation Loss: 87 MW Load loss with negligible generation loss.

Discrepancy that need to be explained:

a. Wrong isolator status means wrong summation of the currents while calculating differential current and it will create differential current all the time. But Check zone element will not operate, so bus bar protection should not also operate.
b. Wrong CT ratio for bus coupler will also generate differential current during normal condition. But again as bus coupler is not included in check zone summation so bus bar should not operate.
c. What was the wrong logic incorporated through PSL need to be checked.
d. As fault persisted for almost 6 cycles then why no other distance protection operated need to be checked.

BSPTCL may explain.

ITEM NO. B.5: Total power failure at 220kV Darbhanga(BSPTCL) S/s on 15.08.18 at 01:35 hrs.

There is only one source for 220 kV Darbhanga (BSPTCL) S/S i.e. 220 kV Darbhanga – Darbhanga - I. At 13:35 hrs, 220 kV Darbhanga- Darbhanga-I tripped on B-N fault. After patrolling it was found that B-ph jumper was snapped at the distance of 2KM from 220KV Darbhanga (BSPTCL) GSS.

As per PMU data, B phase fault has been observed at 13:35 hrs which got cleared within 100 ms.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
220 kV Darbhanga – Darbhanga - I	Yet to be received	B-N, Z-I, 1.1 km from BSPTCL end.

Load Loss: 98 MW with negligible generation loss.

BSPTCL may explain.

ITEM NO. B.6: Disturbance at 400 kV Farakka S/s on 19.08.18 at 15:26 hrs.

400 kV Farakka - Kahalgaon I & II tripped from Farakka end only. At same time, 400 kV Farakka - Sagardighi II tripped from Sagardighi end.

As per PMU data, fault was cleared within 100 ms.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
400 KV Farakka-Kahalgaon-1	Zone-1, B-N fault, fault current-2.2KA, No Auto reclose , 3 phase tripping	Initially zone-2 picked up but no carrier received. Then finally zone-1 ,B-N and fault current 5.8 KA. Fault clearance time 120 ms. Successful A/R.
400 KV Farakka-Kahalgaon-2	Zone-1,R-N loop picked up in P437 relay, Zero sequence triggering and tripping of R phase	No tripping

400 KV Farakka-Sagardighi-2	No tripping	Zone-3,B-N fault, instantaneous tripping

Tripping of 400 kV Farakka Sagardighi II from Sagardighi end may be explained. Reason for non-operation of autoreclose for 400 kV Farakka - Kahalgaon D/C at Farakka may also be explained.

Generation/Load Loss: Nil

NTPC & WBPDCL may explain.

ITEM NO. B.7: Disturbance at 400 kV MPL S/s on 19.08.18 at 15:47 hrs.

400 kV MPL - Ranchi - II tripped from MPL end only. At same time, 400 kV MPL - Maithon D/C tripped from Maithon end.

Relay indications are as follows:

Name of the elements	End 1 Relay Indication	End 2 Relay Indication
400 KV MPL-Ranchi-2	Zone-1, Y-N fault, 22.3 Km and fault current-9.1KA, No Auto reclose due to air pressure low	Zone-1, Y-N fault, 182 Km and fault current-2.1KA. Fault was beyond 95% of the line still Main 2 REL 670 relay zone- 1 is operated and carrier is sent when only zone-2 is picked up. Successful auto reclose.
400 KV MPL-Maithon-1	No tripping	Zone-3,Y-N fault, instantaneous tripping
400 KV MPL-Maithon-2	No tripping	Zone-3,Y-N fault, instantaneous tripping

As per PMU data, fault was cleared within 100 ms.

Tripping of 400 kV MPL - Maithon D/C from Maithon end may be explained. MPL informed that A/R was not successful at MPL end for 400 kV MPL - Maithon D/C due to operation of air pressure switch.

Generation/Load Loss: Nil

Powergrid may explain.

ITEM NO. B.8: Disturbance at 400/220 kV Bolangir S/s on 21.08.18 at 18:13 hrs.

400 kV bus I was under shutdown for connecting new bays of 125 MVAr B/R. Both the 400 kV lines i.e. 400 kV Angul – Bolangir S/C and 400 kV Jeypore – Bolangir S/C were connected to bus II through Tie CB & main CB of 400/220 kV ICTs at Bolangir.

At 18:13 hrs 400/220 kV both ICT I & II tripped on OTI, WTI & Bucholtz trip relay resulting loss of

total power failure at 400 kV level.

As per PMU data, no fault has been observed.

Generation/Load Loss: Nil

Powergrid may explain.

ITEM NO. B.9: Disturbance at 400/132 kV Motihari(DMTCL) S/s on 22.08.18 at 14:59 hrs.

At 15:00 hrs, 400/132 kV ICT-II at Motihari tripped due to operation of OSR relay resulting tripping of ICT - I on overload current relay operation.

Load loss: 280 MW

DMTCL may explain.

ITEM NO. B.10: Tripping Incidences in the month of August, 2018.

Other tripping incidences occurred in the month of August 2018 which needs explanation from constituents of either of the end is given in **Annexure-B10**.

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.

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.

ERLDC & ERPC may update.

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 reduced 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 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.

JUSNL may explain.

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.

JUSNL and NTPC may update.

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 PCC as WBSEDCL representative was not present in the meeting.

Members may discuss.

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.

In 70th PCC all the constituents were advised to comply the above suggestion.

Members may discuss.

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.

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.

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 and in Bhubaneswar from 06.08.18 to 10.08.18

In 70th PCC it was decided to conduct the training at Ranchi, Jharkhand from 10th Septemebr 2018 to 14th September 2018.

PCC advised all the constituents of Jharkhand to attend the training.

Members may update.

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.

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		
20	220 KV FARAKKA-LALMATIA	03.08.16	B-N FAULT .	NTPC	JUNSL	Yes	Old Relay and not functional. 7-8 months

							required for auto re-close relay procurement.
23	220 KV MUZAFFARPUR - HAZIPUR - II	10.08.16	B-N FAULT	PGCIL	BSPTCL		Voice established. For carrier required shutdown
24	220 KV ROURKELA - TARKERA-II	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	Expected to install protection coupler by Jan 17
27	220 KV BIHARSARIF-TENUGHAT	07.09.16	B-N FAULT	BSPTCL	TVNL		
32	220KV Bidhannagar-Waria-II			WBSETCL	DVC		
33	220KV Jamshedpur-Jindal-SC						

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

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

OPTCL:

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

BSPTCL:

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

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

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

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

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

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.

ITEM NO. C.11: Non-Submission of Details of Alipurdwar 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 I 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.

Powergrid may kindly appraise on the issue.

ITEM NO. C.12: 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-C12**.

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

Constituents may note.

ITEM NO. C.13: ADDITIONAL AGENDA

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POWER SYSTEM OPERATION CORPORATION LIMITED
EASTERN REGIONAL LOAD DESPATCH CENTRE
14, GOLF CLUB ROAD, TOLLYGUNGE
KOLKATA – 700033

Report on 400 kV Rangpo-Binaguri 2 tripping followed by SPS-1 and SPS-2 Operation

1. **Date and time of the Incident:** 05:31 and 05:51 Hrs, 12-08-18
2. **Category :** GD-1
3. **Area Affected :** Tashiding, Jorethang, Dikchu, Chujachen, Teesta 3, Rangpo and Binaguri
4. **Antecedent Conditions:**
   a. **Frequency:** 50.04 Hz
   b. **Lines under shutdown:** 400 kV Dikchu-Rangpo under break-down

Element Name (Line /Unit)	Line Loading/ Generation Prior to the event (SCADA)
400 kV Rangpo-Binaguri D/C	838 MW + 833 MW
400 kV Teesta 3- Rangpo	886 MW
Teesta 5 Generation	501 MW
Teesta 3 Generation	794 MW
Dikchu Generation	100 MW
Jorethang Generation	95 MW
Tashiding Generation	97 MW
Chujachen Generation	111 MW

5. Details of tripping

Due to Bad Weather in the Sikkim, 400 kV Binaguri-Rangpo 2 tripped on B phase to earth fault at 05:31 Hrs. Auto-reclosure attempt was taken however line got tripped due to the persisting nature of fault during the event. The PMU plot of the fault is given in figure 1 . Immediately with this SPS-1 operated as line flow was more than 850 MW on other circuit. This in turn has tripped the all-running units of Teesta 3 (Except one Unit) and one unit each of Jorethang, Tashiding, Dikchu and Chujachen. However, it was observed that Dikchu unit 2 also tripped and it was intimated that the differential protection has operated for the unit.

In the meantime, line flow was well below 850 MW on 400 kV Rangpo-Binaguri circuit 1. . At 05:51 Hrs, Dikchu has synchronized both its unit one by one without any information to ERLDC Grid Operator. With this, the power flow on 400 kV Rangpo-Binaguri 1 exceeded 850 MW leading to operation of SPS-2. This led to tripping of 400 kV Teesta3-Ranpo circuit from Teesta end and blackout of Teesta3 and Dikchu generating plant.

Trial attempt was taken on 400 kV Rangpo-Binaguri 2 at 05:58 Hrs, however, the fault persisted. After this, 400 kV 400 kV Teesta3-Ranpo was charged at 06:19 Hrs and Teesta3-Dikchu at 06:27 Hrs. Subsequently, one unit of Teesta 3 and Dikchu were revived at 06:27 Hrs. The 400 kV Rangpo-Binaguri 2 circuit was finally revived by 17:53 Hrs and all generation were restored with its revival.

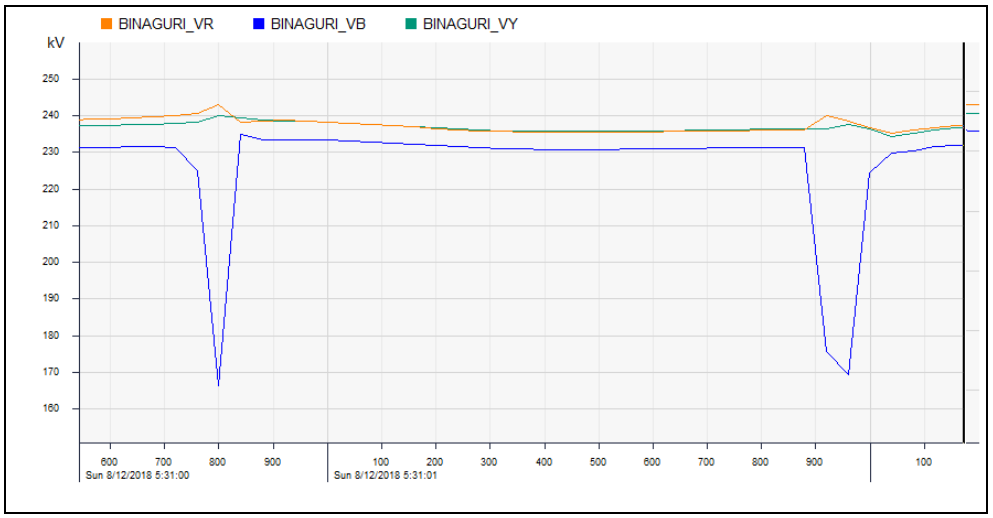


Fig 1: B phase to Earth fault on 400 kV Rangpo-Binaguri 2 at 05:31 Hrs

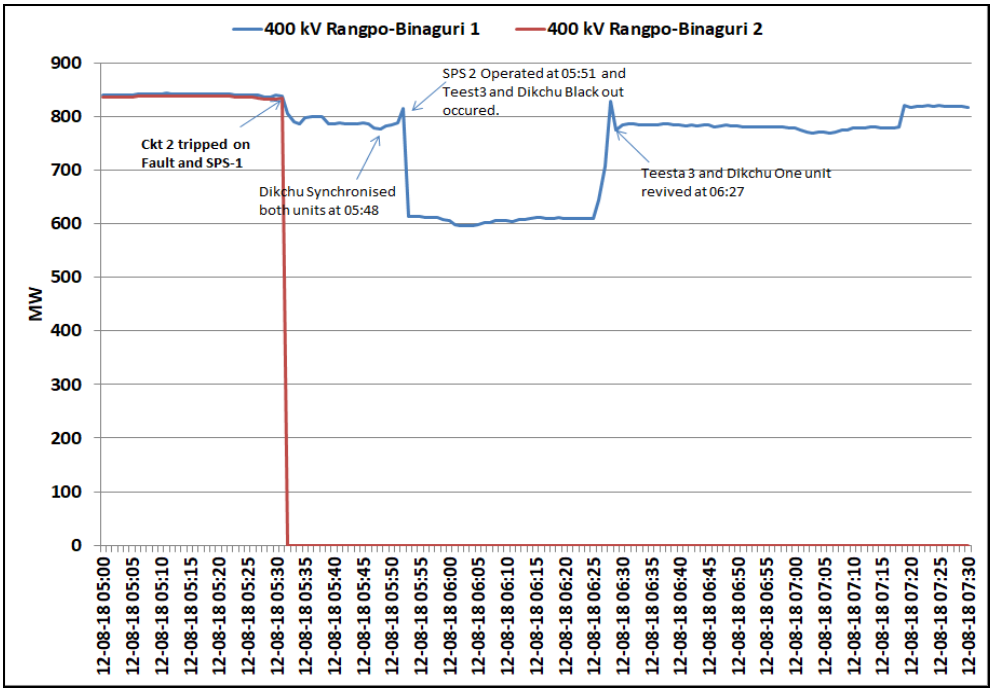


Fig 2: 400 kV Rangpo-Binaguri D/C during the evnet.

Total Generation Loss: 884 MW during SPS-1 operation at 05:31 Hrs and around 303 MW on SPS-2 operation at 05:51 Hrs.

Frequency Change: due to Generation Loss of 884 MW at 05:3 Hrs, frequency has dipped by 0.08 Hz (From 50.03 to 49.95 Hz). The frequency drop at SPS-2 operation was not high due to low generation loss.

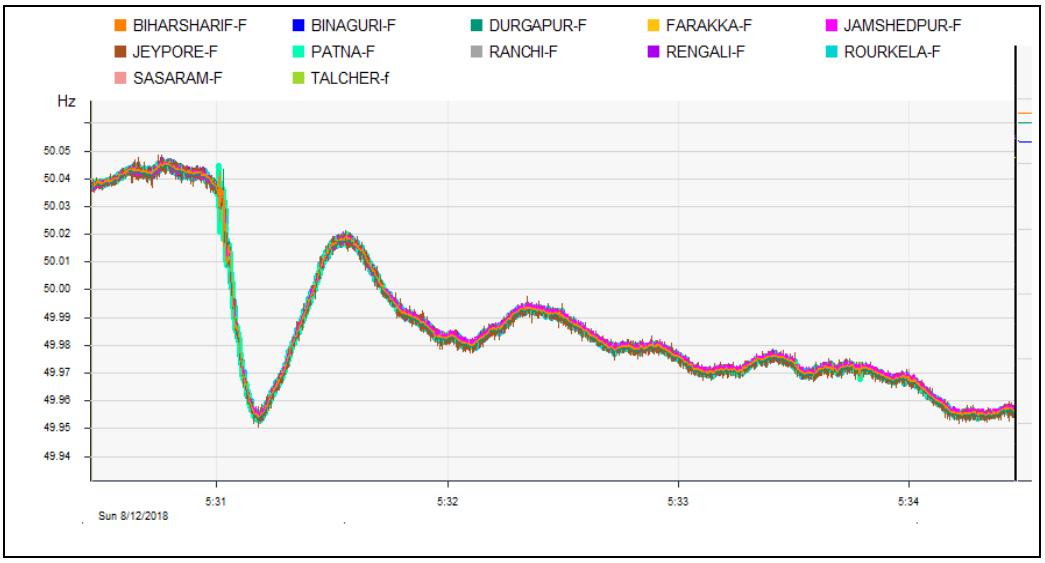


Fig: Frequency dip during the SPS 1 operation at 05:31 Hrs

6. Recommendation and Action to be taken:

A. Based on the discussion taken in 148th OCC and 70th PCC, SPS-2 value has been enhanced to 900 MW in order to provide operator with time to take manual action to reduce the line loading below 850 MW and avoid SPS-2 operation. (Implemented and confirmed by PGCIL on 13-09-18 through email)

B. Dikchu has been informed that after unit tripping on SPS operation, unit synchronization to be done with intimation to ERLDC to avoid any such unwanted operation of SPS.

C. All Small generators (Dikchu, Chujachen, Tashiding, Jorethang) have been instructed to keep one unit with higher generation and other with low generation and trip the higher generation unit to avoid SPS-2 operation as discussed in the last SPS meeting. In the last four occasion of SPS operation, it was observed they are keeping both units generating at same quantum or tripping the lower generating unit on SPS-1 operation which is not in line as discussed in the previous SPS meeting.

D. PGCIL ERTS-2 is advised to ensure the redundancy of this SPS as per the CERC order to enhance the reliability of the SPS.

Annexure-B10

List of line tripping in the month of August 2018 which may be discussed in PCC

LINE NAME	TRIP DATE	TRIP TIME	RESTORATION ON DATE	RESTORATION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Auto Recloser status	Remarks
Multiple tripping at the same time										
400KV JEERAT-SAGARDIGHI-I	14-08-2018	18:05	14-08-2018	19:15			No reason furnished	--		No fault observed in PMU
400KV JEERAT-NEW CHANDITALA-SC	14-08-2018	18:05	14-08-2018	18:15			No reason furnished	--		No fault observed in PMU
400KV FARAKKA-SAGARDIGHI-DC	19-08-2018	15:26			B-N , Z-3 , F/C-3KA , F/D 110 KM FROM	DID NOT TRIPPED FROM FSTPP	B-N Fault	<100 msec	No A/R operation	
400KV FSTPP-KhSTPP-I	19-08-2018	15:26	19-08-2018	17:00	TRIPPED FROM ONLY FSTPP END		TRIPPED FROM ONLY FSTPP END	<100 msec		
400KV FSTPP-KhSTPP-II	19-08-2018	15:26	19-08-2018	16:51	TRIPPED FROM ONLY FSTPP END		TRIPPED FROM ONLY FSTPP END	<100 msec		
400KV RANCHI-MAITHON RB-II	19-08-2018	15:47	19-08-2018	15:49	Y-N,Z-2 FRM RANCHI , F/D-177KM , F/C-3.2KA, A/R		Y-N Fault		No A/R operation	
400KV MAITHON-MAITHON RB-I	19-08-2018	15:47	19-08-2018	16:03	TRIPPED FROM ONLY MAITHON	Y-N,Z-3,F/D-145KM AT MAITHON	Y-N Fault		No A/R operation	
400KV MAITHON-MAITHON RB-II	19-08-2018	15:47	19-08-2018	16:00	TRIPPED FROM ONLY MAITHON	Y-N,Z-3,F/D-145KM AT MAITHON	Y-N Fault		No A/R operation	
Miscellaneous: Tripping on DT, No Fault observed in PMU										
400KV MAITHON-KhSTPP-I	06-08-2018	22:07	06-08-2018	22:48	Spurious , DT sent and reciept both		Spurious , DT sent and reciept both	--		No fault observed in PMU
400KV MAITHON-KhSTPP-I	06-08-2018	23:54	07-08-2018	0:49			No reason furnished	--		No fault observed in PMU
220KV BARIPADA-BALASORE-II	09-08-2018	19:18	09-08-2018	19:59	Tripped from Balasore end only		Tripped from Balasore end only	--		No fault observed in PMU
400KV MEERAMUNDALI-JSPL-II	18-08-2018	23:08	18-08-2018	23:39	DT received at Meramundali		DT received at Meramundali	--		No fault observed in PMU
400KV PUSAULI(PG)-VARANASI-1	19-08-2018	22:46	20-08-2018	0:06	O/V relay Operated. Voltage: 426 KV (North Bus) at Pusauli		Over Voltage	--		
400KV PUSAULI(PG)-VARANASI-1	20-08-2018	2:47	20-08-2018	11:51	O/V relay Operated. Voltage: 431 KV (North Bus) at Pusauli		Over Voltage	--		
220KV PUSAULI-SAHUPURI-SC	25-08-2018	11:01	25-08-2018	12:43	Tripped from Sahupuri end only.		Tripped from Sahupuri end only.	--		No fault observed in PMU
220KV DARBHANGA (DMTCL)-MOTIPUR-I	30-08-2018	12:39	30-08-2018	13:05	DT RECEIVED AT DMTCL	CB CLOSED AT MOTIPUR	DT RECEIVED AT DMTCL	--		No fault observed in PMU
220KV BUDHIPADAR-KORBA-I	31-08-2018	2:20	31-08-2018	3:30	DT RECEIVED AT BUDHIPADAR		DT RECEIVED AT BUDHIPADAR	--		No fault observed in PMU
Autoreclose related issues										
400KV MEERAMUNDALI-STERLITE-II	06-08-2018	17:01	06-08-2018	17:28	SUCCESSFUL A/R	Y-N FAULT, 2.2 KA, 129 KM,	Y-N Fault	< 100 msec	No A/R operation	
220KV BINAGURI-SILIGURI-I	08-08-2018	12:52	08-08-2018	13:05		B-N, 1.36KM, 4KA	B-N Fault	< 100 msec	No A/R operation	
400KV NEW DUBURI-MEERAMUNDALI-I	09-08-2018	9:40	09-08-2018	21:28	New Duburi z1 B-N IB 4.52 ka 77 km	did not trip from Meramundali end	B-N Fault	< 100 msec	No A/R operation	
220KV DARBHANGA (DMTCL)-MOTIPUR-I	09-08-2018	10:24			did not trip from Darbhanga End	Z1, 12 KM,R-N,IR 4.7 KA	R-N fault	< 100 msec	No A/R operation	
400KV KHARAGPUR-CHAIBASA-I	10-08-2018	10:27	10-08-2018	11:05	RN,Z1, 2.835 KA,7.9 KA	RN, Z2,181.3 KM,1.934 KA	R-N fault	< 100 msec	No A/R operation	
400KV ROURKELA-CHAIBASA-I	12-08-2018	15:58	12-08-2018	16:05	R-N,37.28KM ,6.9 KA A/R SUCCESSFUL	R-N,Z1,97.5KM,2.81 KA,NO A/R ATTEMPT	R-N fault	< 100 msec	No A/R operation	
400KV MEERAMUNDALI-STERLITE-II	13-08-2018	17:56	13-08-2018	18:38	Z1,B-N FAULT,15.84 KA,10 KM @ VEDANT	A/R successful	B-N Fault	< 100 msec	No A/R operation	
400KV TSTPP-MEERAMUNDALI-SC	14-08-2018	12:17	14-08-2018	13:08	A/R successful	B-N,FD 32.2 KM,FC 10.72 KA @ MRMDL	B-N Fault	< 100 msec	No A/R operation	

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	Remarks
220KV BARIPADA-BALASORE-I	14-08-2018	16:06	14-08-2018	16:41	R_N, 2.83 kA, 50 KM		R-N fault	< 100 msec	No A/R operation	
400KV KOLAGHAT-ARAMBAGH-SC	17-08-2018	13:47	17-08-2018	14:01	Y_N, 40.81 KM, 5.25 kA , A/R successful	Y_N, 22.54 KM, 6.91 kA	Y-N Fault	< 100 msec	No A/R operation	
400KV DARBHANGA (DMTCL)-MUZAFFARPUR-II	18-08-2018	11:09	18-08-2018	15:03	B-n, z1, 33.8 km, 3.58 kA	B-n, 40.09 km, 5.4 kA	B-N Fault	< 100 msec	No A/R operation	
400KV KOLAGHAT-ARAMBAGH-SC	22-08-2018	14:03	22-08-2018	14:18	A/r successful		R-N fault	< 100 msec	No A/R operation	
400KV JEERAT-SAGARDIGHI-SC	25-08-2018	6:26	25-08-2018	7:13	2.4 KA,B-N,Z-1,139 KM, A/R successful	B-N,Z-1,42.61KM	B-N Fault	< 100 msec	No A/R operation	
400KV KOLAGHAT-ARAMBAGH-SC	25-08-2018	11:11	25-08-2018	11:28	Y_N Fault, 35.2 KM, 5.5 kA	A/r successful	Y-N Fault	< 100 msec	No A/R operation	
400KV RANCHI-RAGHUNATHPUR-III	29-08-2018	20:31	29-08-2018	20:51	A/R successful at ranchi end			< 100 msec	No A/R operation	
220KV BUDHIPADAR-RAIGARH-I	31-08-2018	1:06	31-08-2018	2:20	R-N,1.9KA,83KM FRM RAGARH		R-N Fault	--	No A/R operation	No fault observed in PMU

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.

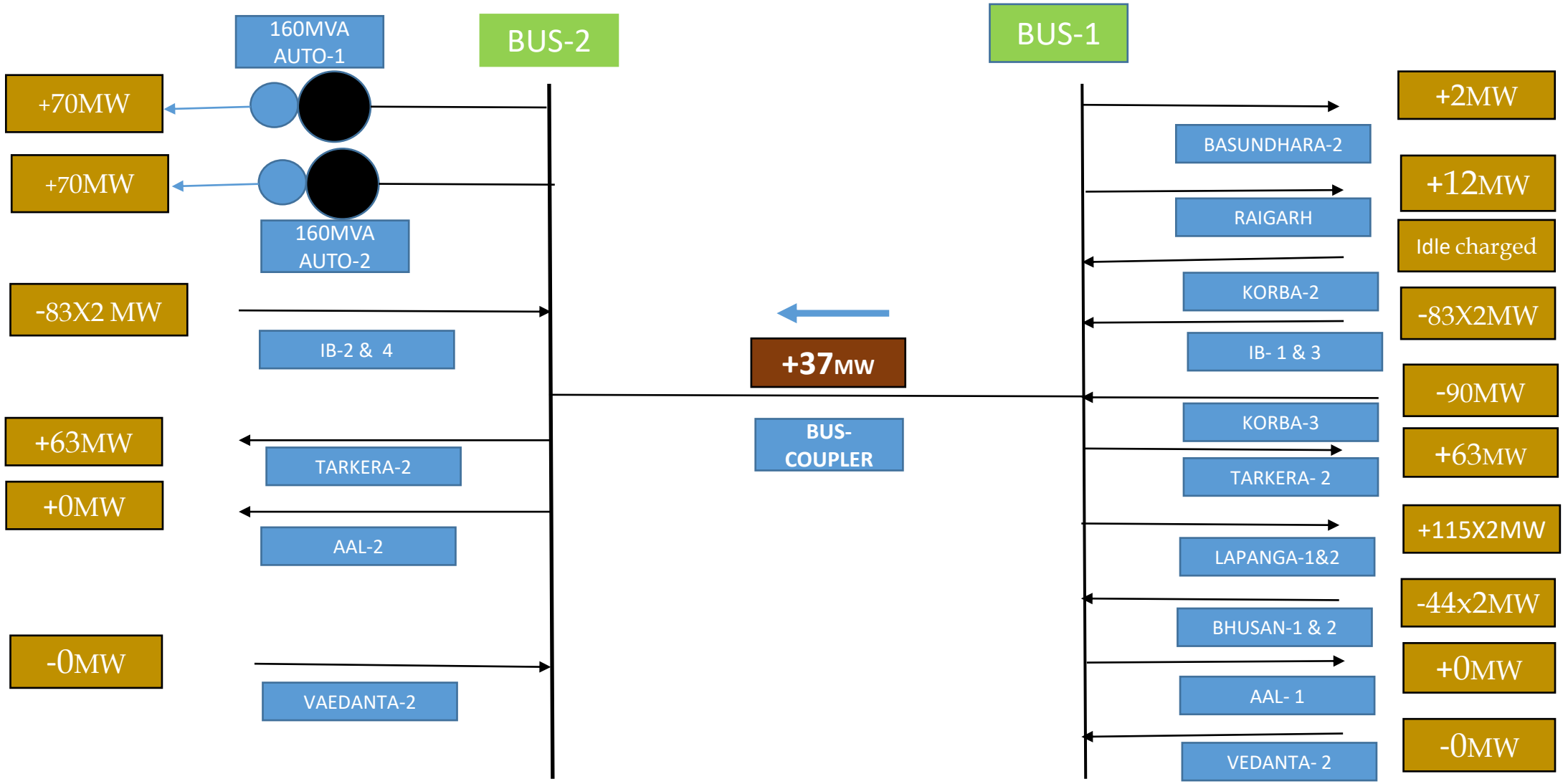
ISLANDING SCHEME DESCRIPTION

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

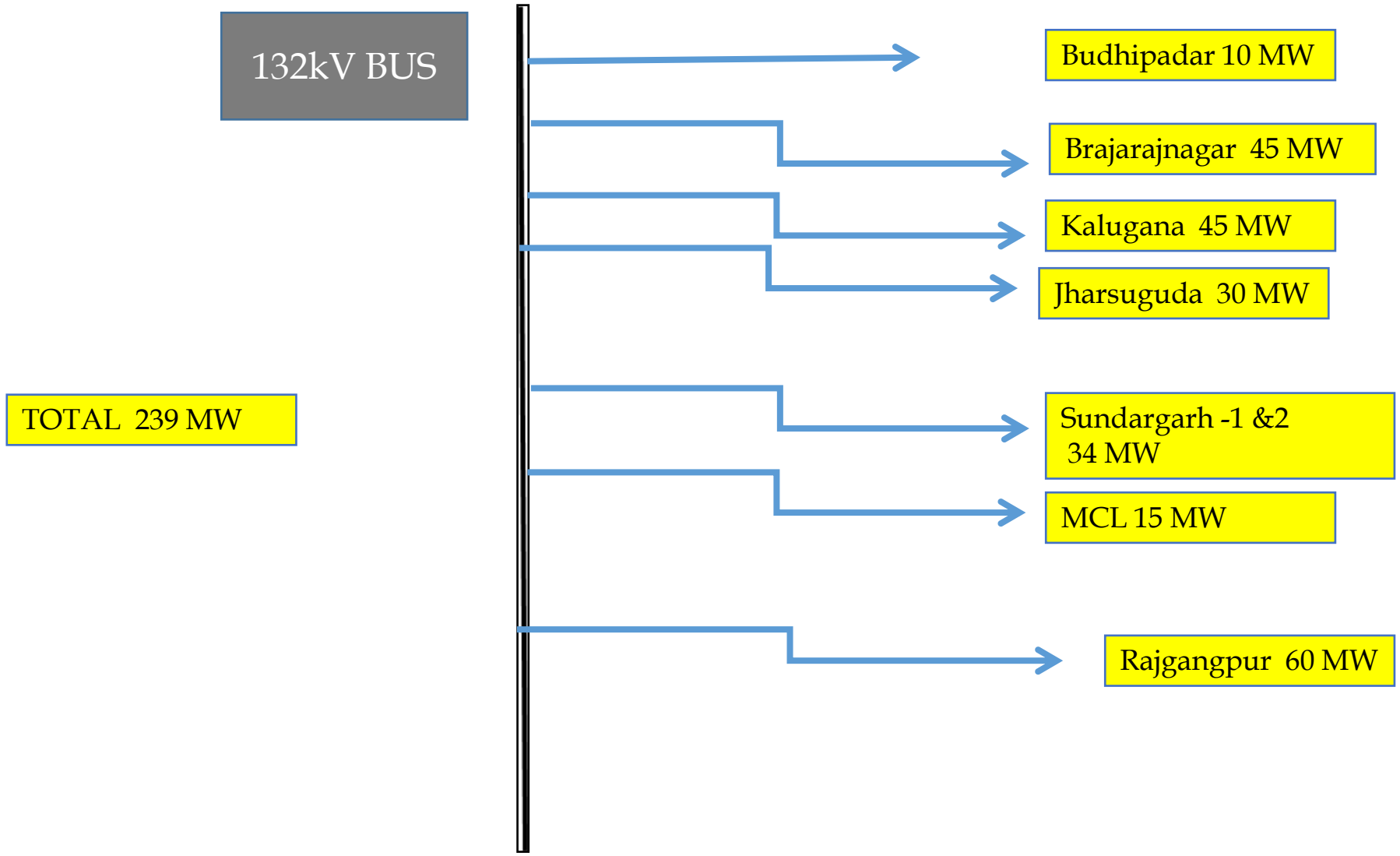
12. The general arrangement of 220kV feeder configuration, 132kV loads for islanding has shown in following slides.

POWER FLOW DETAILS OF 220KV SYSTEM

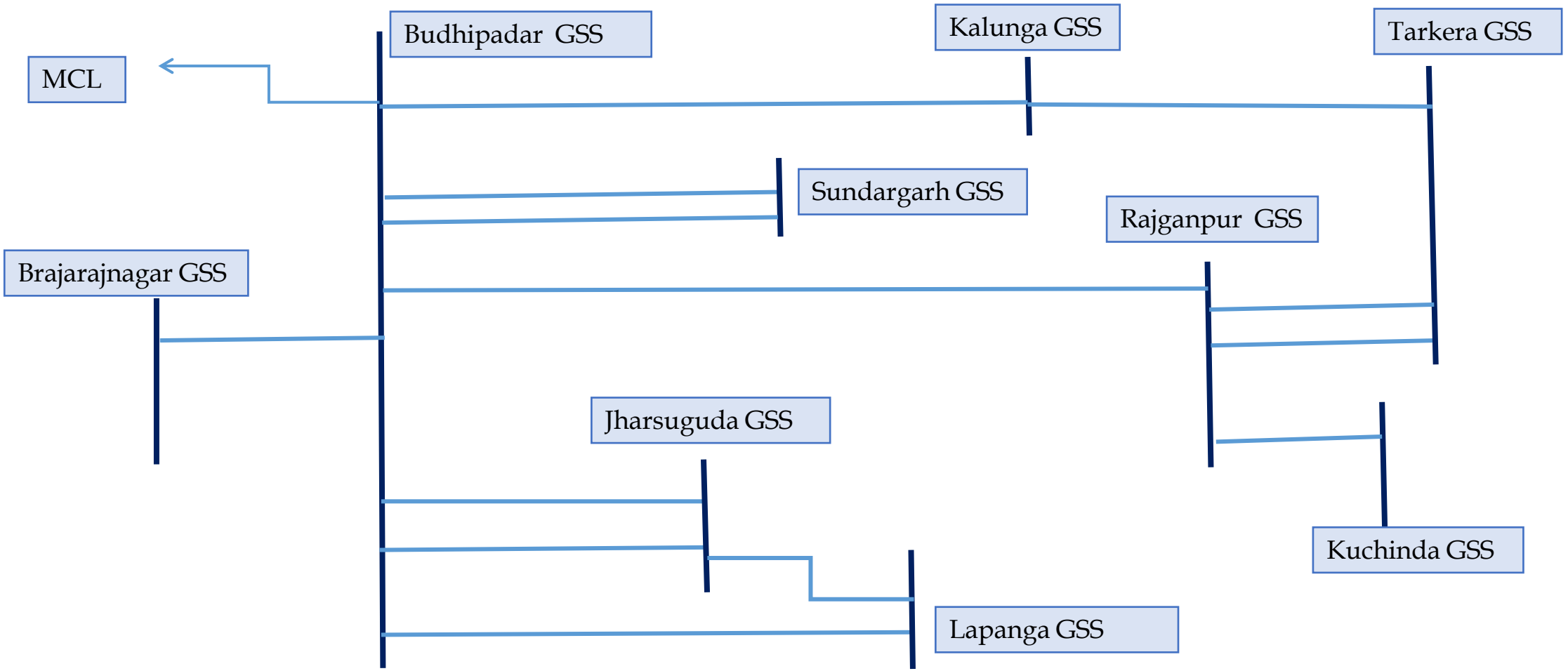
LOAD PATTERN OF DIFFERENT FEEDERS 12.07.2018 AT 12.00 HRS.

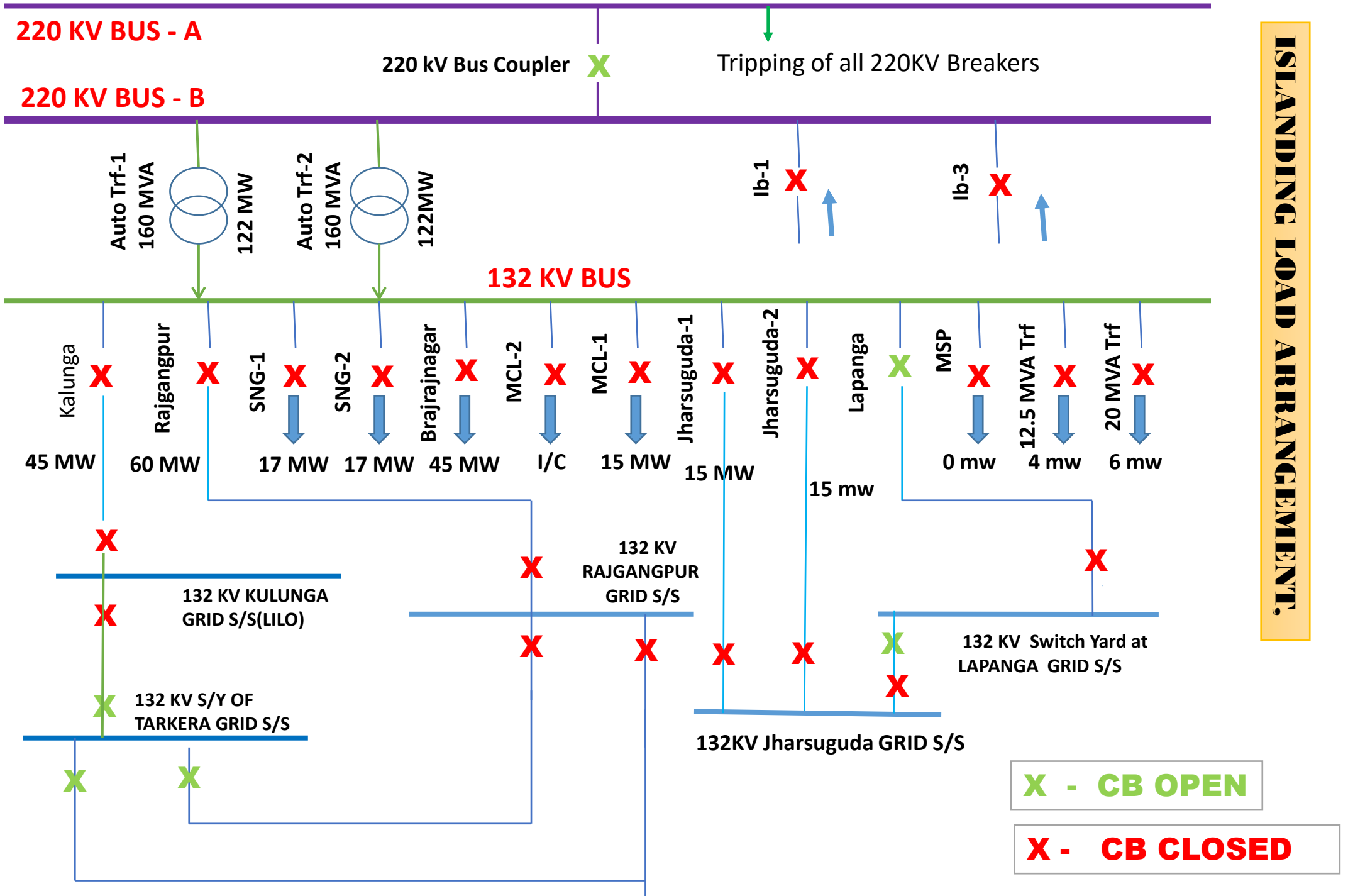


132kV RADIAL LOAD ARRANGEMENT FOR ISLAND SCHEME

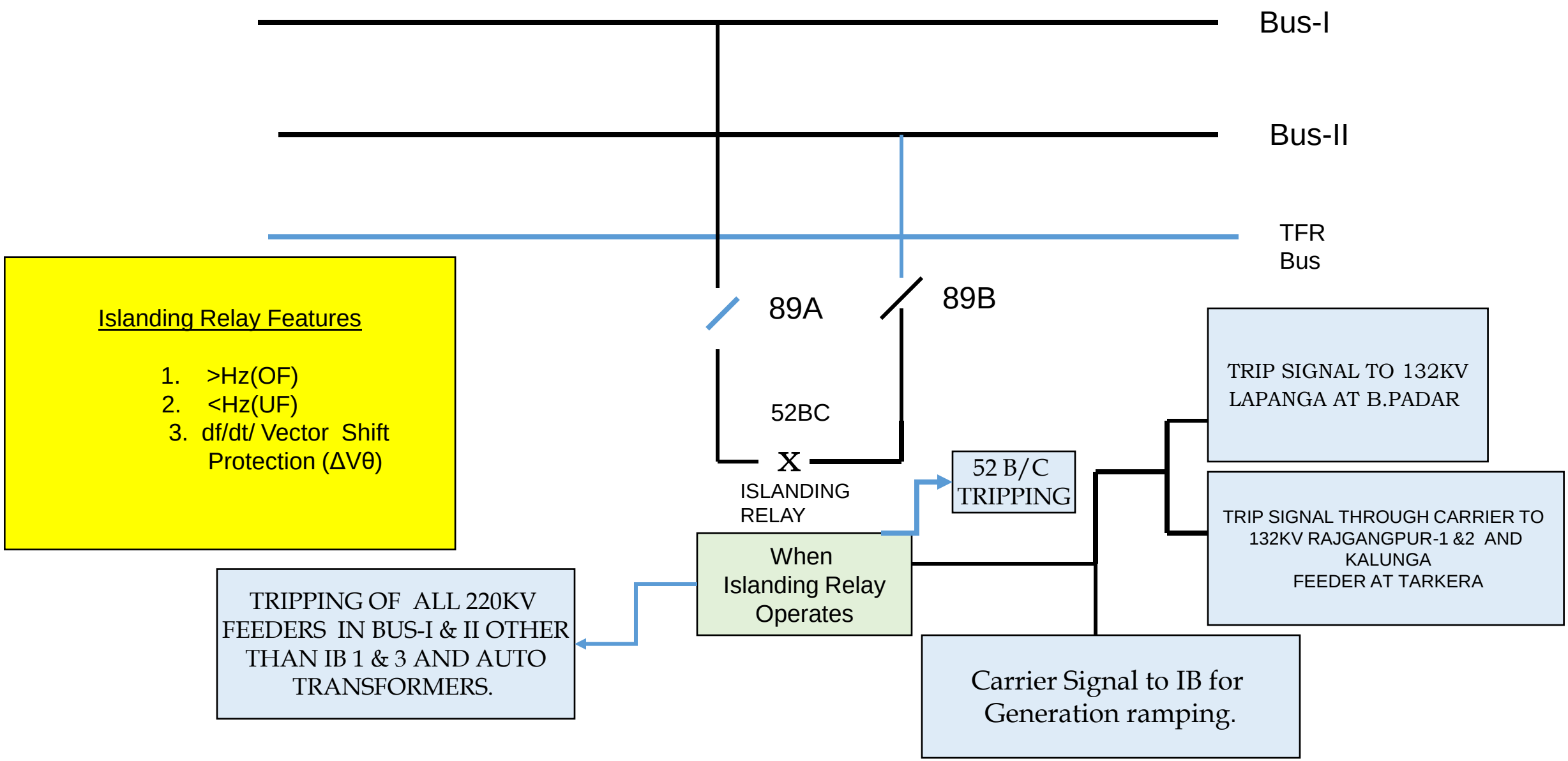


132KV Connectivity of Budhipadar GSS

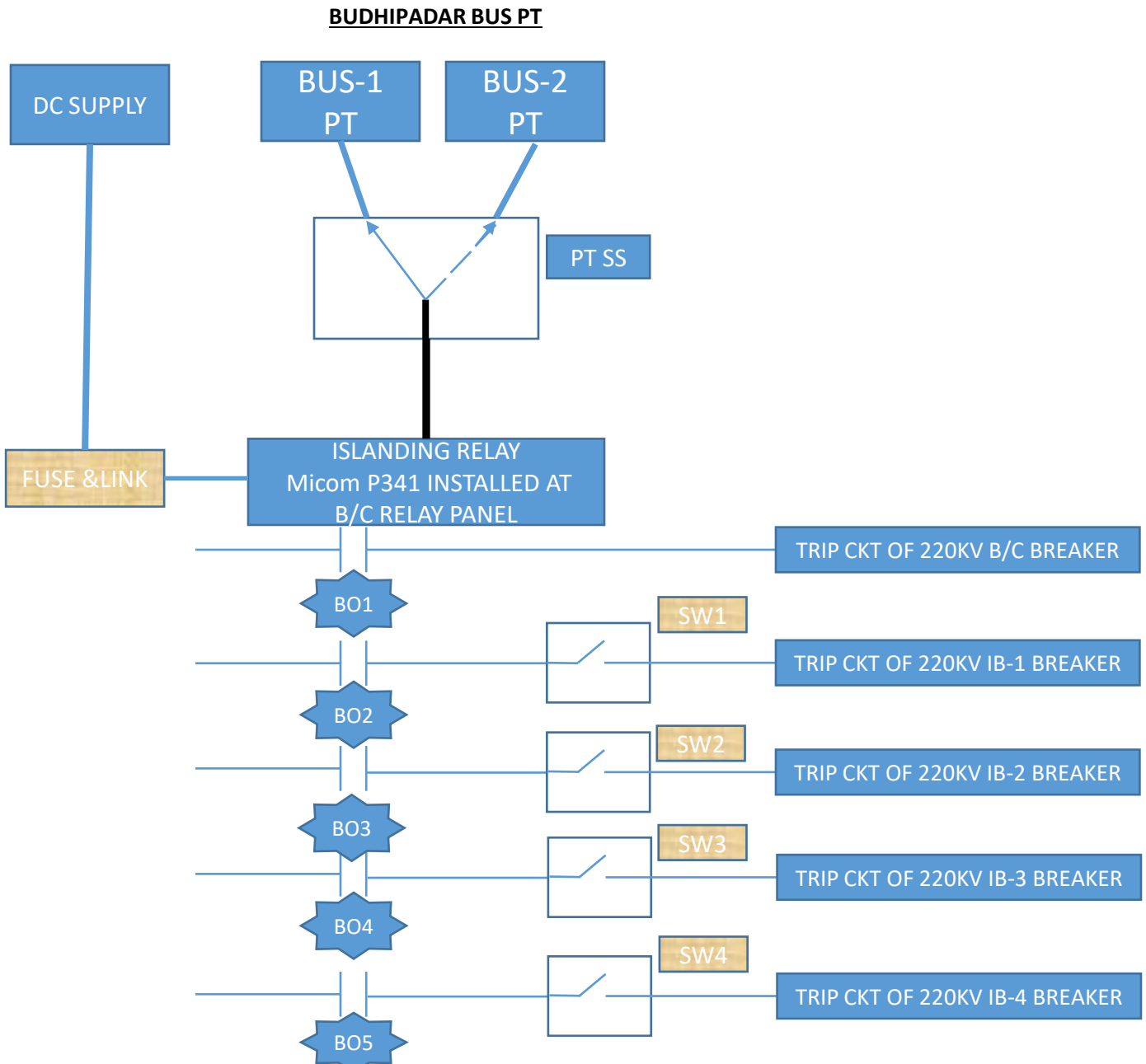


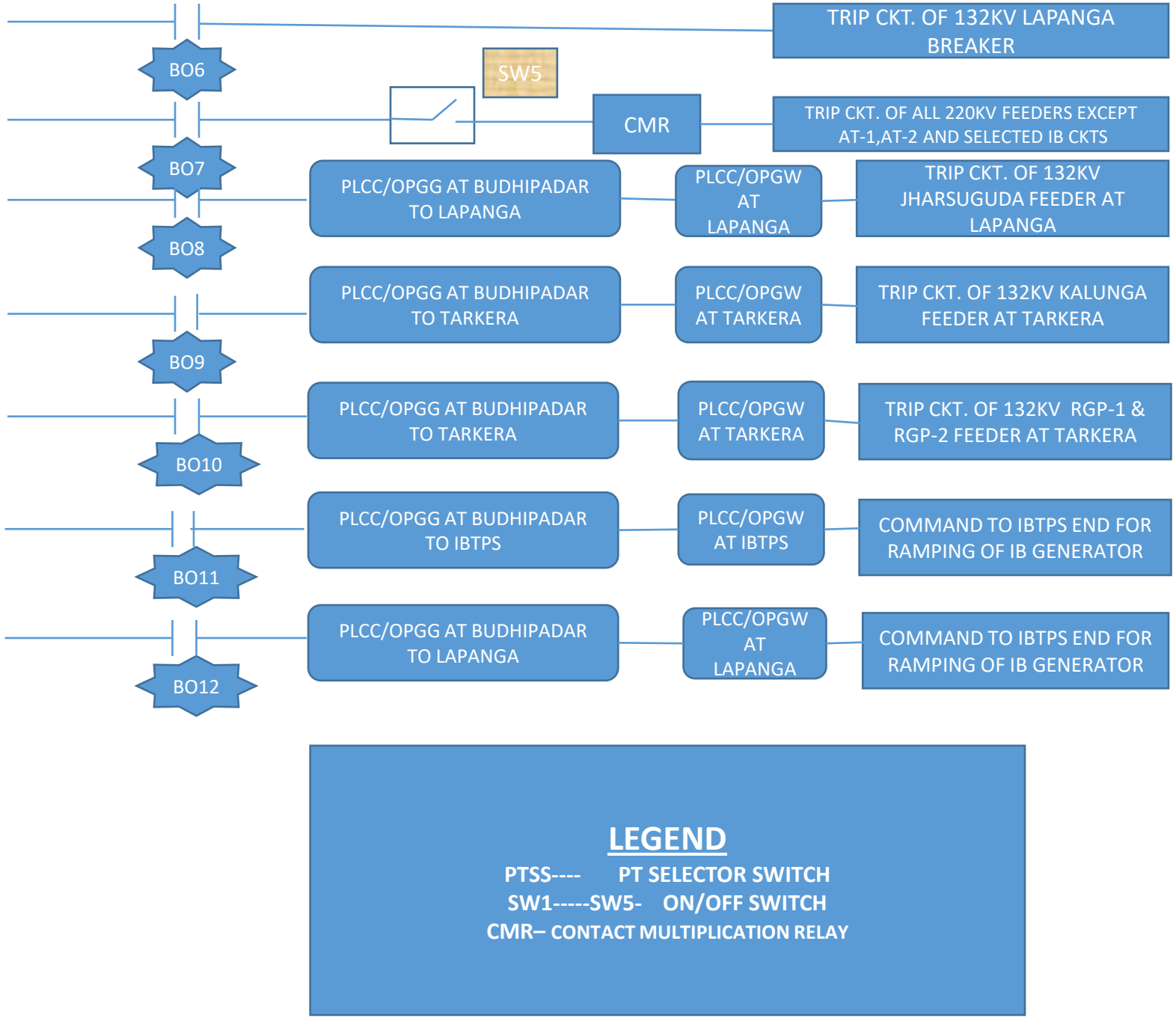

220 KV BUS - A
220 KV BUS - B
220 kV Bus Coupler
Tripping of all 220KV Breakers
Auto Trf-1 160 MVA
122 MW
Auto Trf-2 160 MVA
122MW
Ib-1
Ib-3
132 KV BUS
Kalunga
Rajgangpur
SNG-1
SNG-2
Brajrajnagar
MCL-2
MCL-1
Jharsuguda-1
Jharsuguda-2
Lapanga
MSP
12.5 MVA Trf
20 MVA Trf
45 MW
60 MW
17 MW
17 MW
45 MW
I/C
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

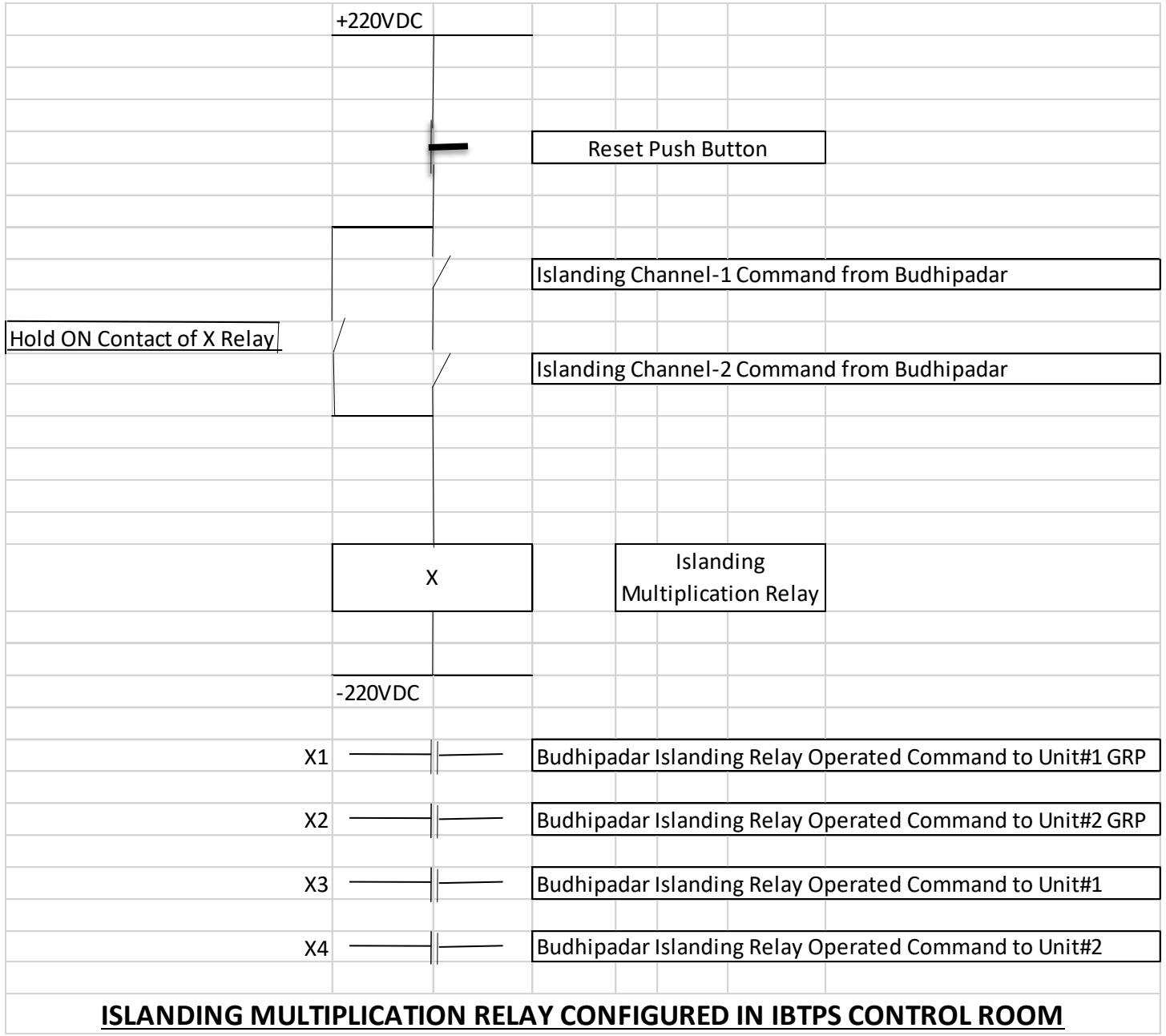
SCHEMATIC DRAWING OF ISLANDING RELAY INSTALLED IN B/C PANEL FOR TRIPPING OF DIFFERENT FEEDERS AT BUDHIPADAR GRID S/S.



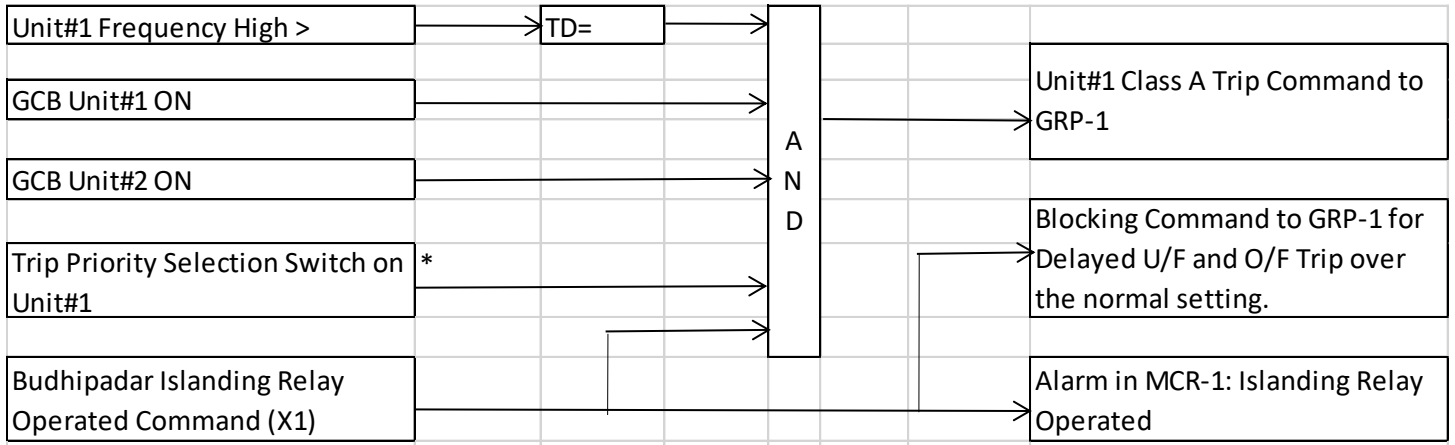
CONNECTION DIAGRAM OF ISLANDING RELAY (Micom P341) AT BUDHIPADAR SUB-STATION




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

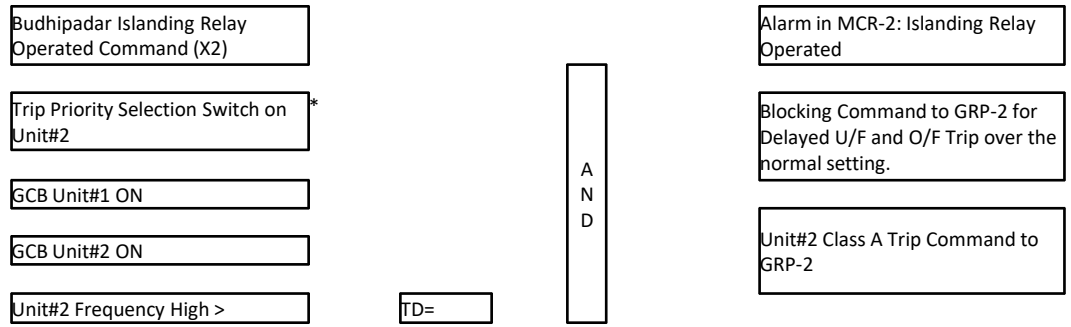


ISLANDING MULTIPLICATION RELAY CONFIGURED IN IBTPS CONTROL ROOM



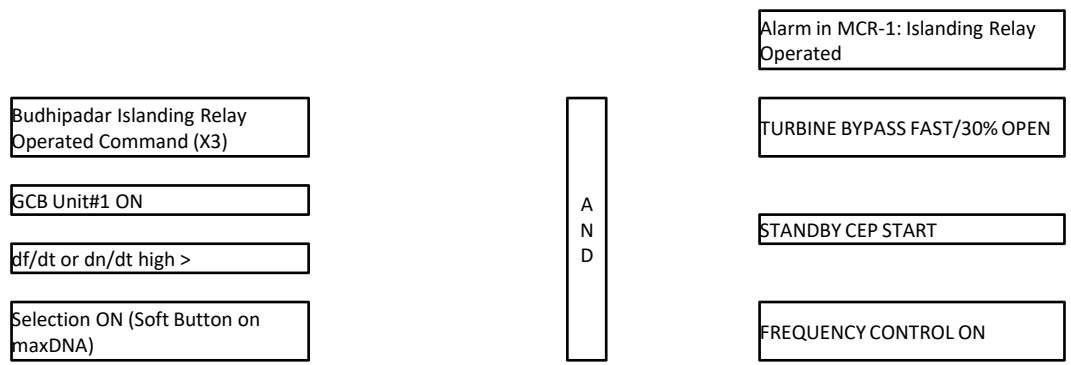
Hardware single selection switch (3 position: I, OFF, II) for both units installed on one GRP.

PRIORITY TRIPPING SCHEME CONFIGURED IN GRP-1 NUMERIC RELAY

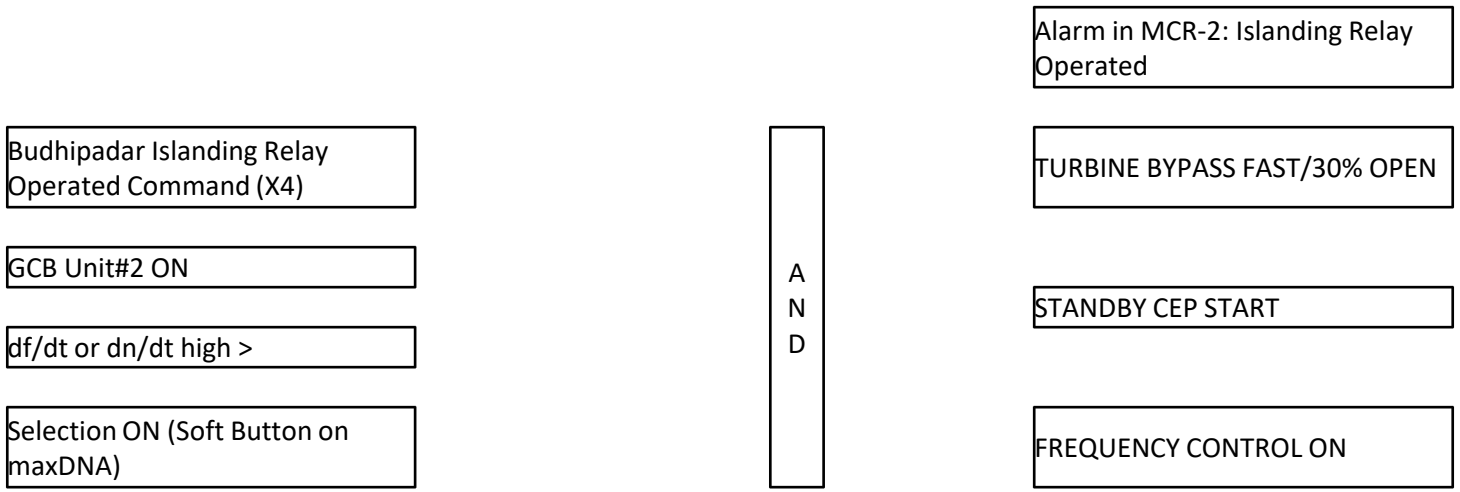


*Hardware single selection switch (3 position: I, OFF, II) for both units installed on one GRP.

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:

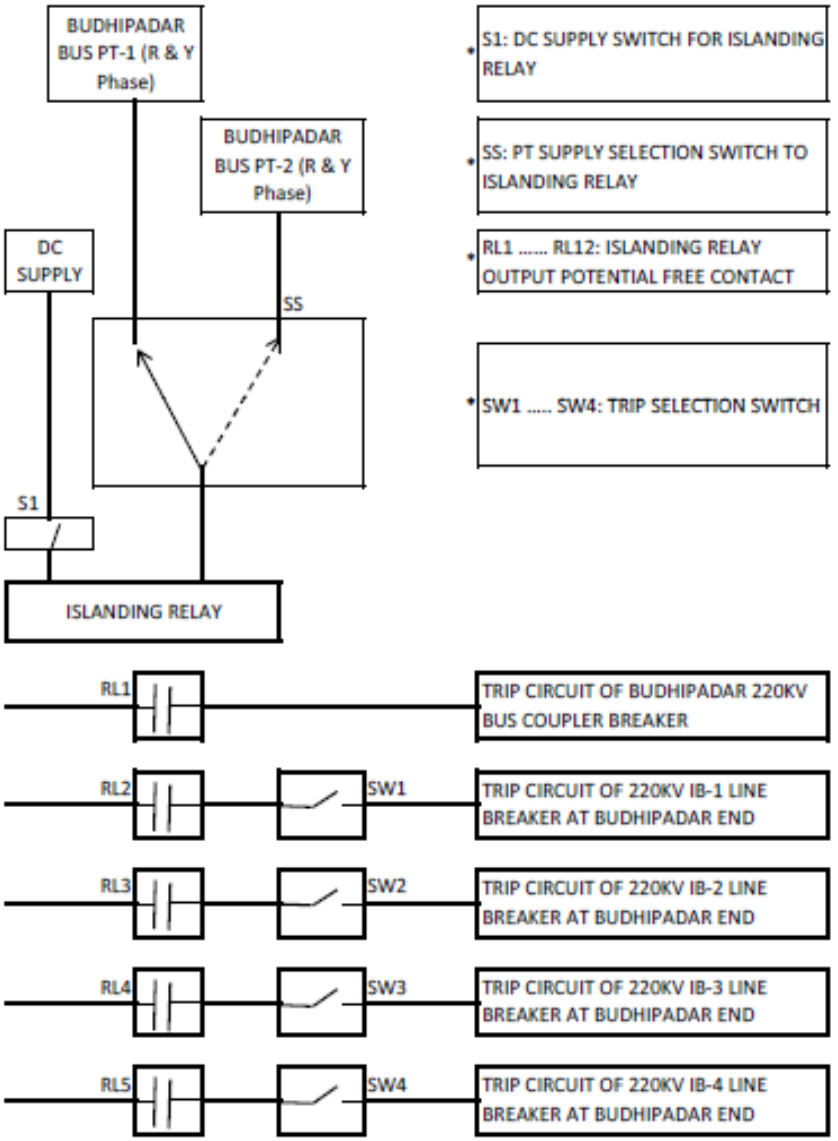
Presently there is no islanding scheme in operation in OPGCL.

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.

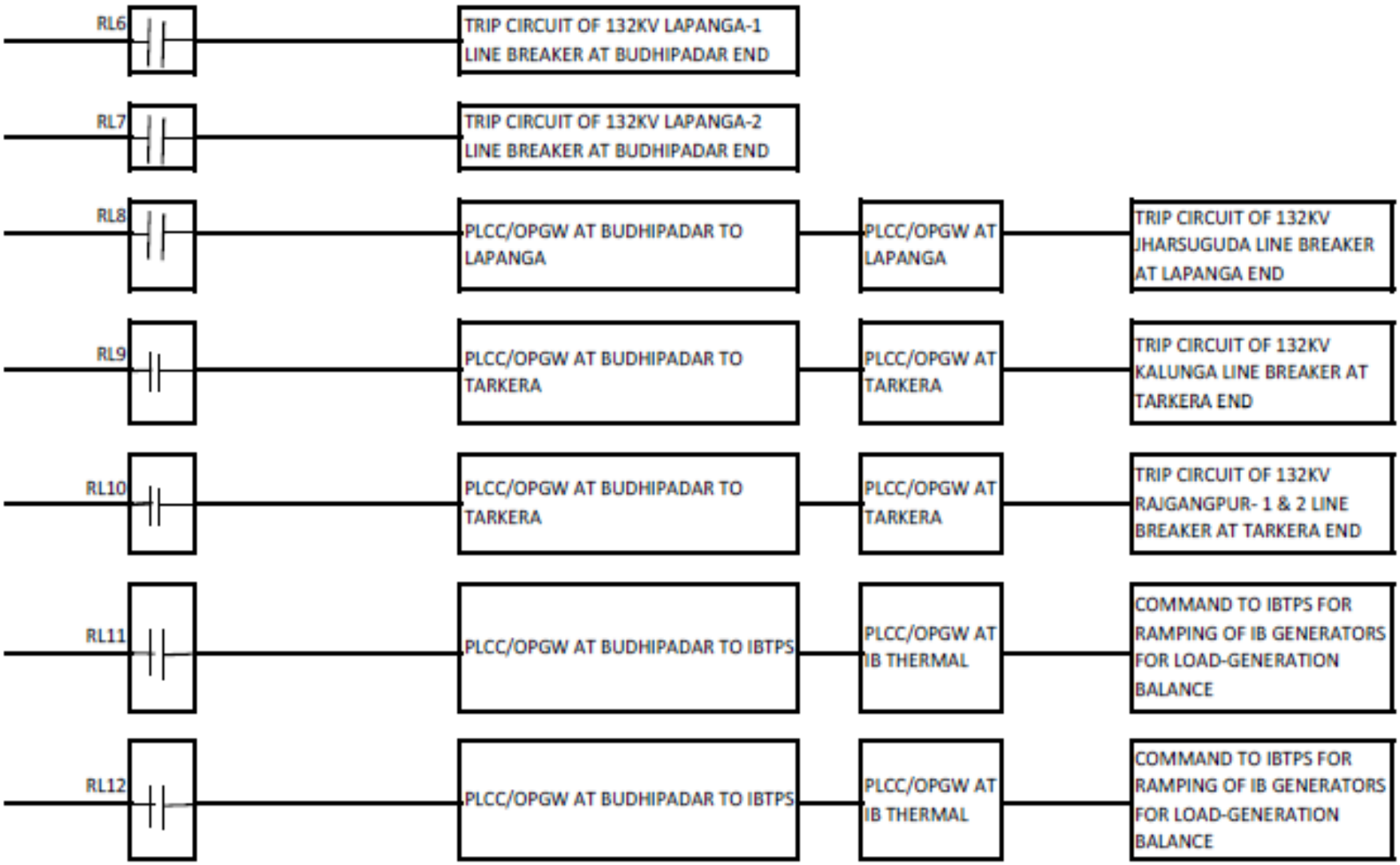
ISLANDING SCHEME OF IBTPS AT BUDHIPADAR

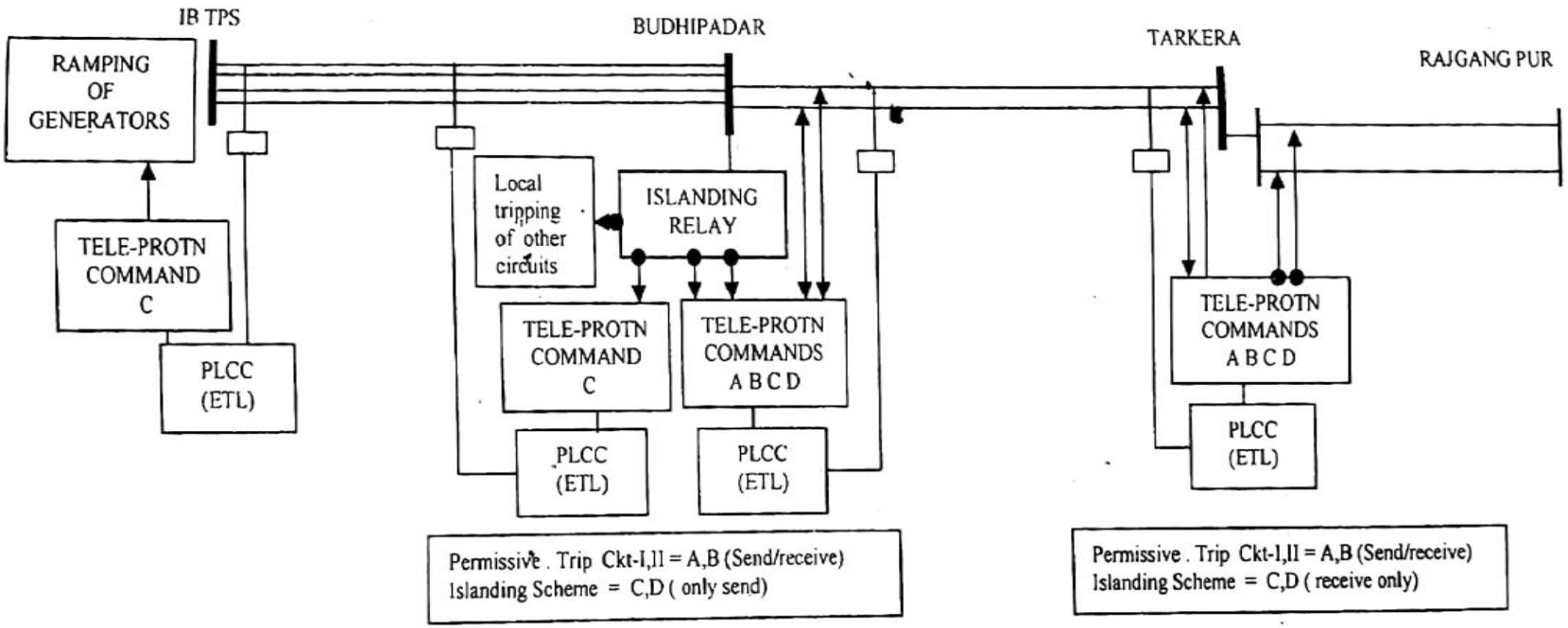


At Budhipadar grid, one 220KV BUS (**Islanding BUS**) shall be connected with local loads (AT 1 & 2, SPS/Concast, Basundhara) and two circuits of IBTPS. Other 220KV BUS (**Other BUS**) shall be connected with AAL, Vedanta, Tarkera, Korba, Raigarh, Bhusan, Lapanga and balance two ciccuits of IBTPS. Both 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 RAJGANGPUR- 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.

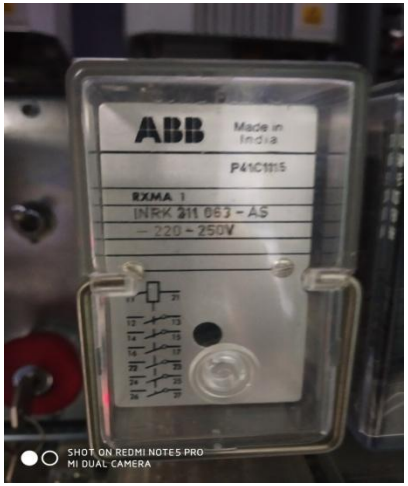
(3) At IB Thermal, Tele-protection command C shall be used for triggering ramping circuits of generators at IB TPS.

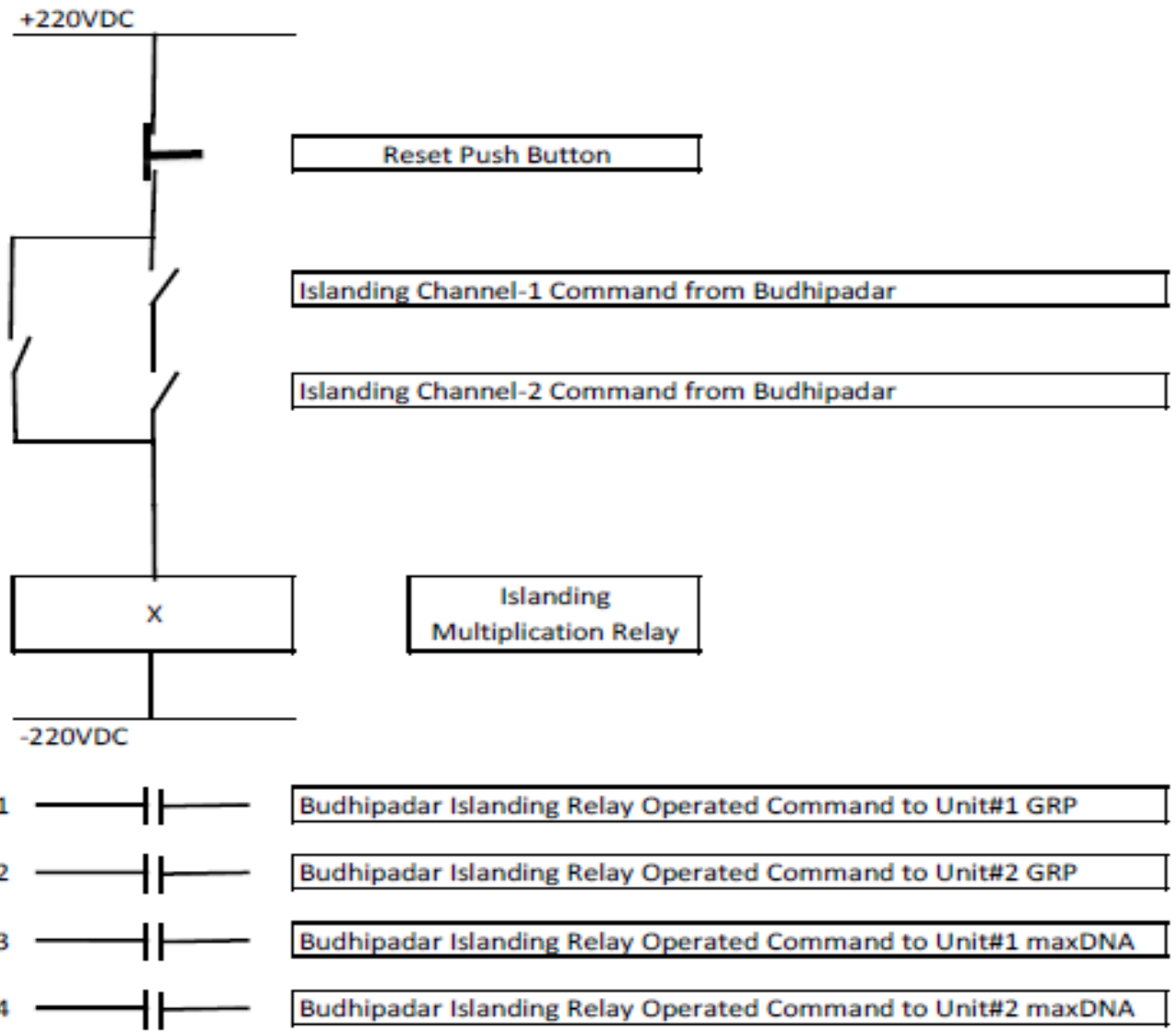
(4)Presently , as existing all the four circuits to IB thermal will work without carrier back up protection, it shall be provided as soon as digital protection coupler are procured very soon.

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

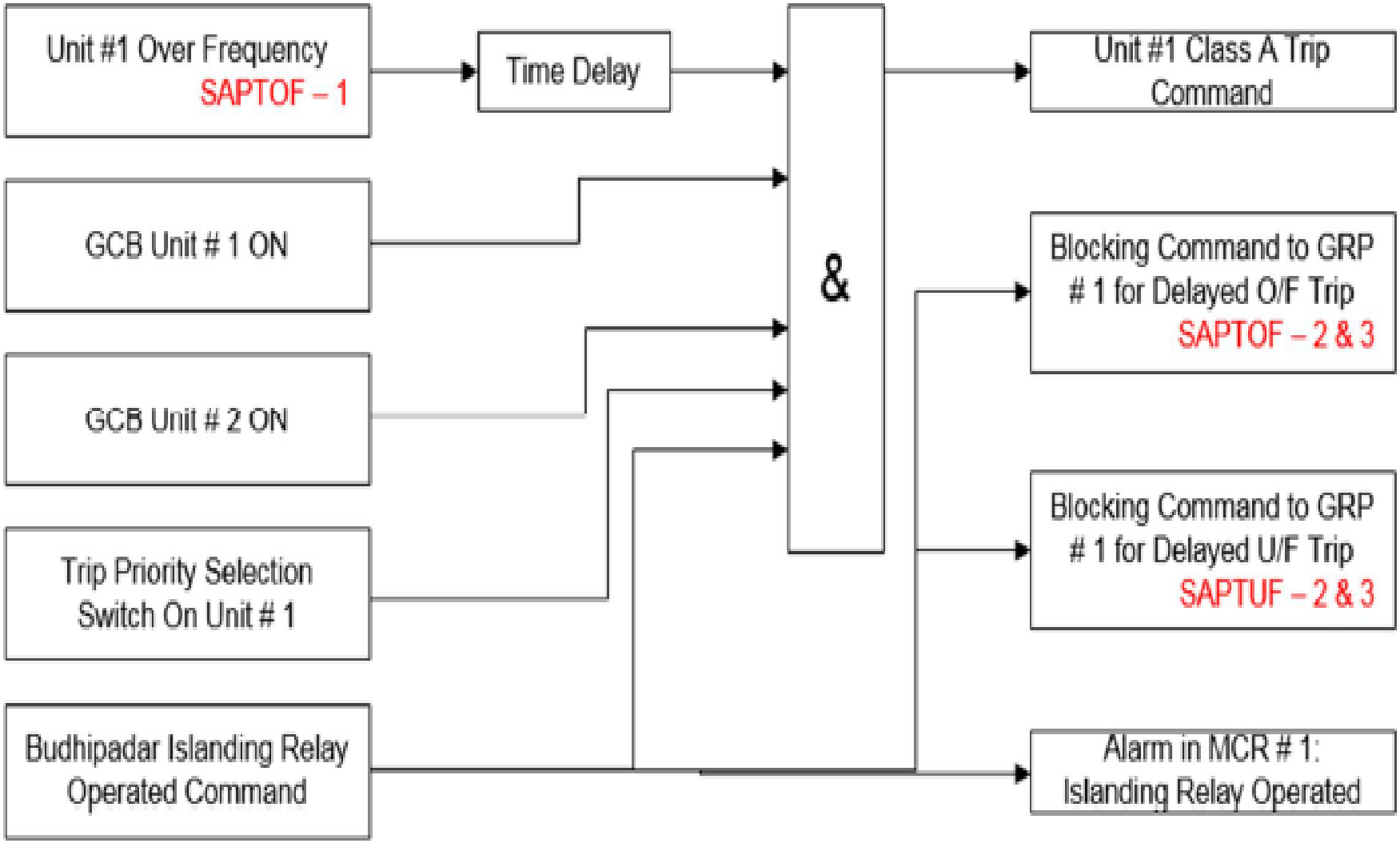
ISLANDING MULTIPLICATION RELAY CONFIGURED IN IBTPS SWITCHYARD CONTROL ROOM

Hold ON Contact of X Relay

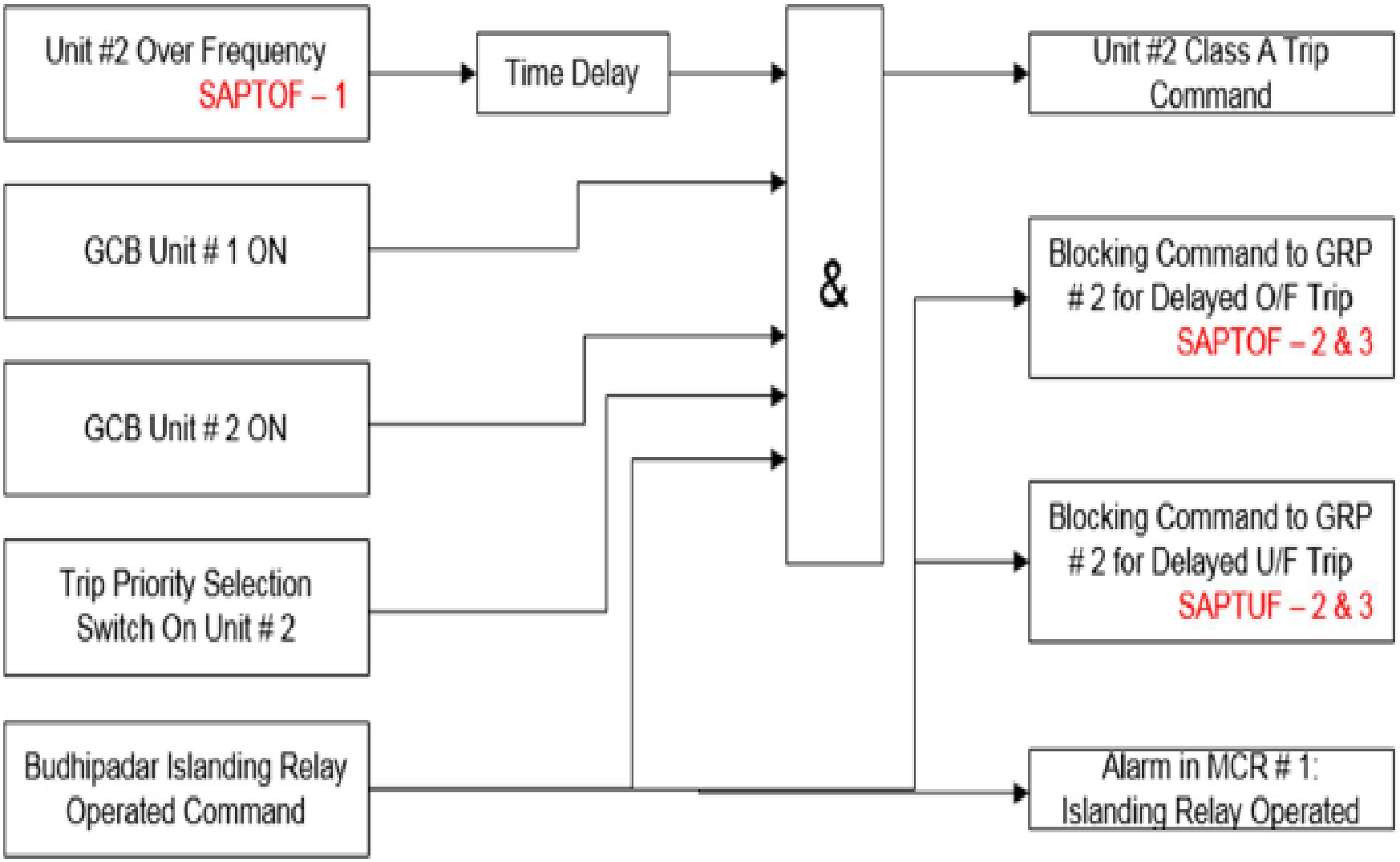




Logic configured in REG670 Relay for Islanding of Unit-I Generator



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

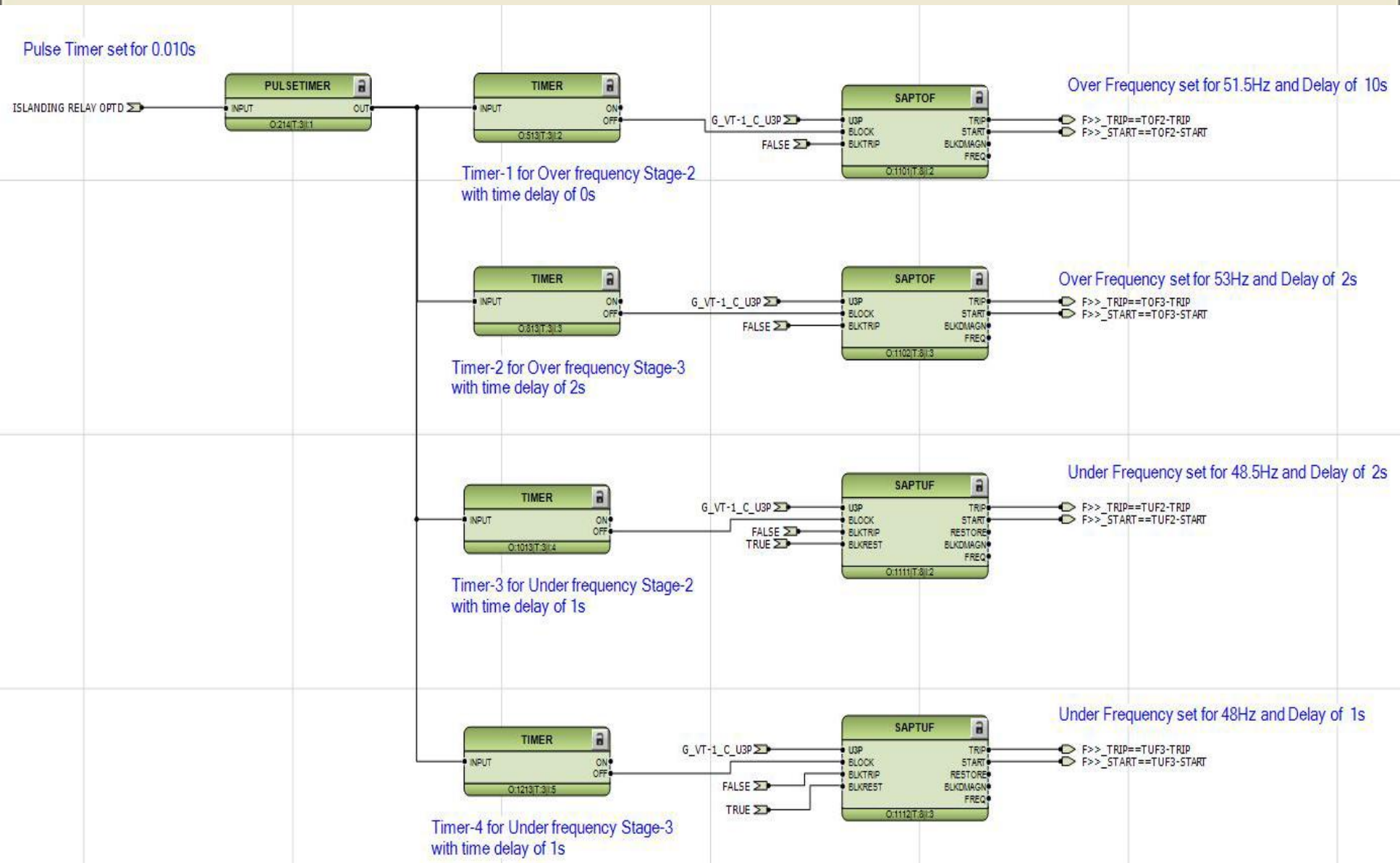


- The over – frequency protection is achieved using SAPTOF function block in Generator Protection relay REG670. There are 3 instances of SAPTOF function in REG670 relay, in which the 1st is used to confirm the disturbance in the system frequency (As shown in above figure- red colored), 2nd and 3rd instance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

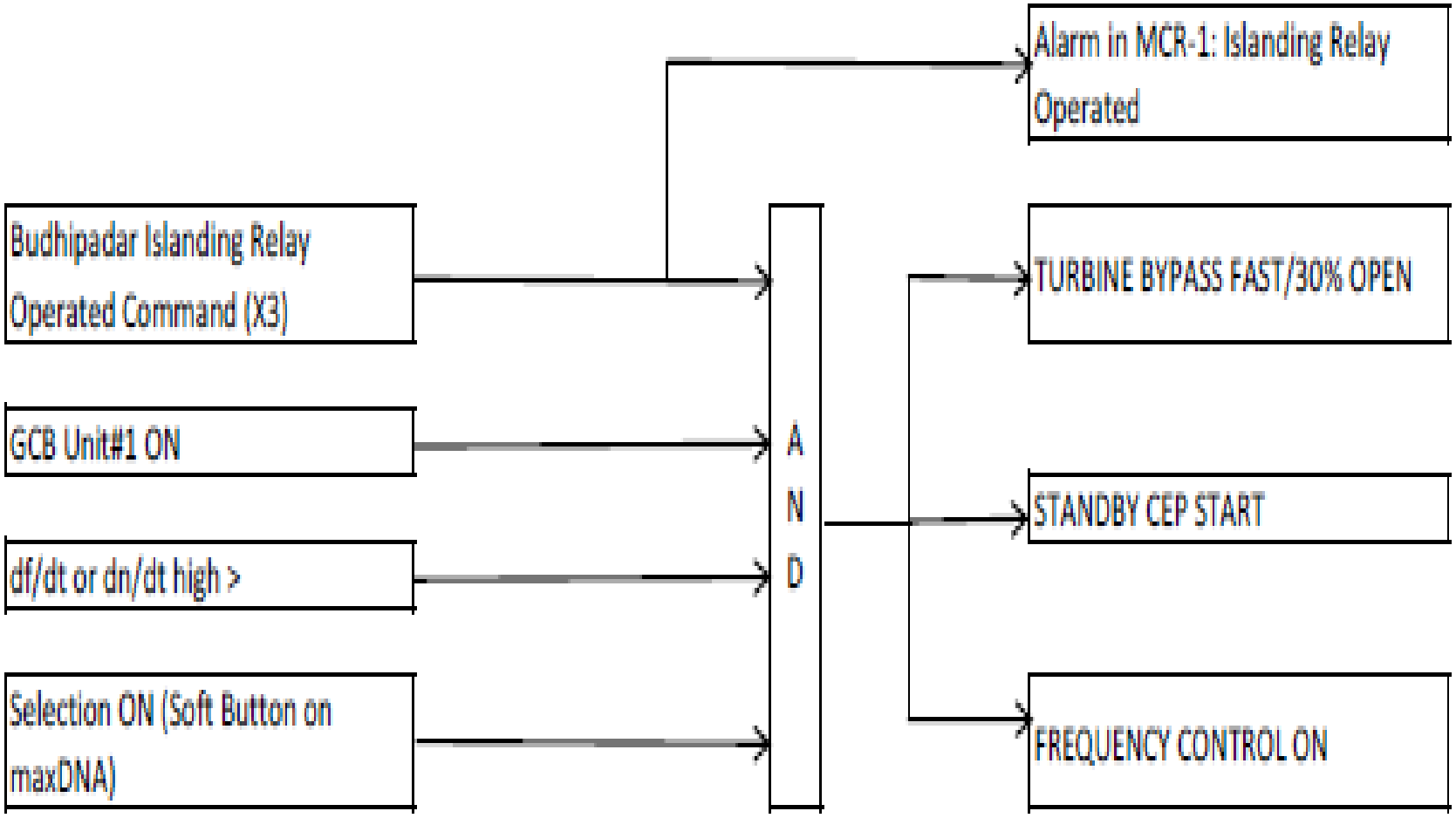
SAPTOF: 1				
Setting Group1				
Operation	On			
UBase	15.75	kV	0.05	2000.00
StartFrequency	51.50	Hz	35.00	75.00
IntBlockLevel	50	%UB	0	100
TimeDlyOperate	1.000	s	0.000	60.000
TimeDlyReset	0.050	s	0.000	60.000

Configuration of Delayed Over Frequency and Under Frequency Function

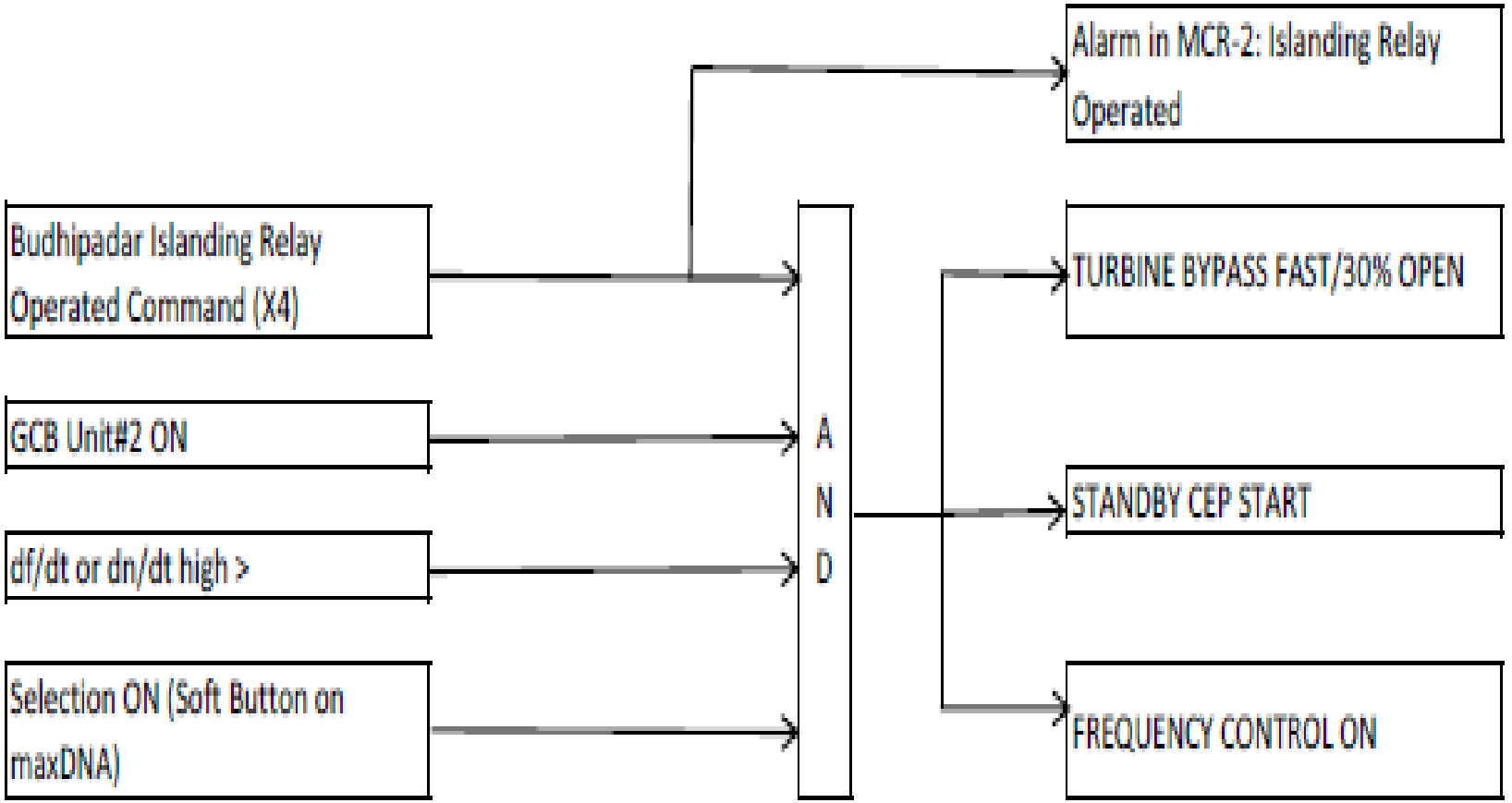


- Above timers are settable and can be adjusted as per requirement. If there is no trip from islanding relay, over and under frequency protections will operate as per the times shown without external timers (timer-1 to 4).
- If there is a trip from Islanding relay, over and under frequency protections 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.

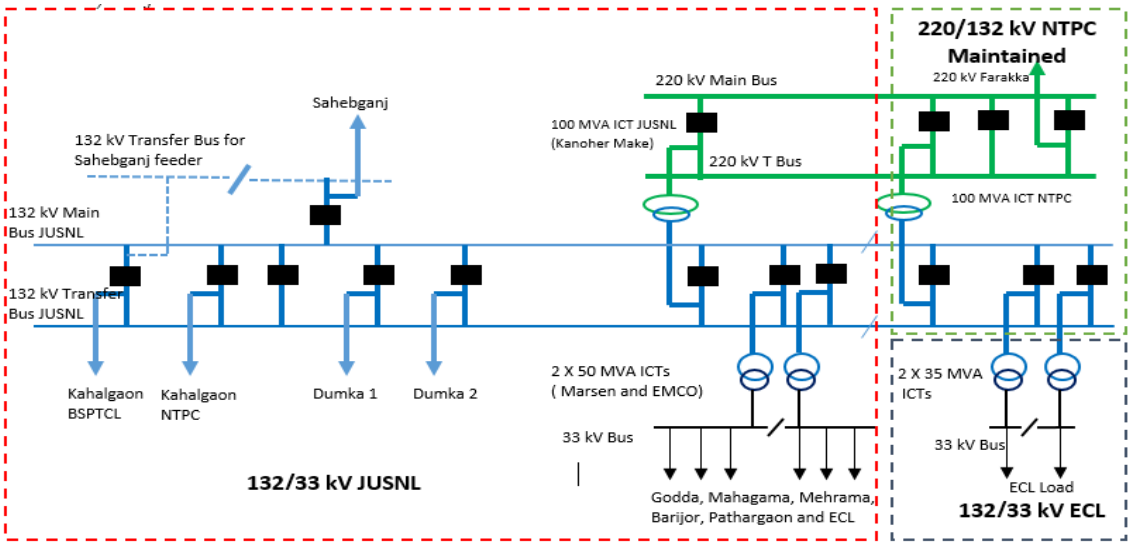


Fig: 220/132/33 kV Lalmatia Substation Single Line Diagram

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
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	It was decided to modify the logic for SPS-2 so that it operates at a line flow of 900 MW instead of at 850 MW. PCC once again advised Dansenergy to review the relay settings at Dikchu end to avoid unwanted tripping. PCC opined that the opening of breakers at Teesta III end can also be possible by sending DT signal from Rangpo end during the line breaker operation at Rangpo end. PCC advised Powergrid to configure the DT settings at Rangpo end accordingly.	
2.	Repeated Grid disturbances at 400/132 kV Motihari(DMTCL) Substation.	PCC advised DMTCL to contact OEM to avoid such type of unwanted tripping in future.	
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.	
69th PCC Meeting:			
4.	Repeated Grid Disturbances at Madhepura S/s.	PCC advised Powergrid and BSPTCL to take the following corrective actions: • Distance relay Zone 2 settings at New Purnea end should be set or incorporated as per the ERPC Protection philosophy • Healthiness of PLCC and inter tripping scheme at both the ends should be examined and report. • Since 220 KV Madhepura-Laukhi D/C lines were idle charged from Madhepura end, the timing of all forward zone settings including directional O/C & E/F settings should be revised to "Instantaneous"	

		immediately. • The line parameters of 220 KV Madhepura-Laukhi D/C lines should be measured. The zone reach settings should be revised as per the actual line parameters. • At the time of charging 220 KV Madhepura-Laukhi D/C lines from both ends, the timing of all forward zone settings including directional O/C & E/F settings should be revised as per ERPC protection philosophy to avoid mismatch regarding coordination with adjacent line protection relays.	
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.	
68th PCC Meeting			
6.	Disturbance at Hatia at 18:22 hrs on 30-05-2018	PCC advised JUSNL to rectify the CVT polarity connection as well as to test the CVT in normal condition and submit a report on this tripping within seven days.	
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 on 9th May 2018	PCC advised Powergrid to ensure the relevant data availability of SPS	Regarding implementation of SPS through SAS,

		operation to ERLDC through SCADA.	Powergrid informed that the implementation would complete by July 2018.
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.	BSPTCL informed that they are in the process of implementing the revised settings.
11.	Disturbance at 220/132 kV Patratu S/S on 09-02-2018 at 15:00 hrs	In 65th PCC, JUSNL was advised to take the following measures: • Check the healthiness of the DC system including end to end cables at 220/132kV Patratu S/s • Check the healthiness of all Circuit Breakers at 220/132kV Patratu S/s • Check the healthiness of all the relays installed at 220/132kV Patratu S/s including 220/132kV ATRs • Check Kanke end relay and CB of 132kV Patratu-Kanke line • Check the Directional feature of 132 kV Hatia I – Sikidri and 132 kV Namkum - Hatia I line relays at Hatia-I	
12.	Disturbance at 220 kV Budhipadar S/s on 01-10-17 at 09:25 hrs	OPTCL informed that Busbar protection maloperated and tripped all the elements connected 220kV bus 1 at Budhipadar. OPTCL added that the issue has been referred to OEM (Siemens) for rectification.	