



# Minutes of 75<sup>th</sup> PCC Meeting

**Date: 06.02.2019**  
**Eastern Regional Power Committee**  
**14, Golf Club Road, Tollygunge**  
**Kolkata: 700 033**

## EASTERN REGIONAL POWER COMMITTEE

### **MINUTES OF 75<sup>TH</sup> PROTECTION SUB-COMMITTEE MEETING HELD AT ERPC, KOLKATA ON 22.01.2019 (TUESDAY) AT 11:00 HOURS**

List of participants is attached in **Annexure-A**.

#### **PART – A**

##### **ITEM NO. A.1: Confirmation of minutes of 74<sup>th</sup> Protection sub-Committee Meeting held on 19<sup>th</sup> December, 2018 at ERPC, Kolkata.**

The minutes of 74<sup>th</sup> Protection Sub-Committee meeting held on 19.12.18 circulated vide letter dated 02.01.19.

Members may confirm the minutes of 74<sup>th</sup> PCC meeting.

##### **Deliberation in the meeting**

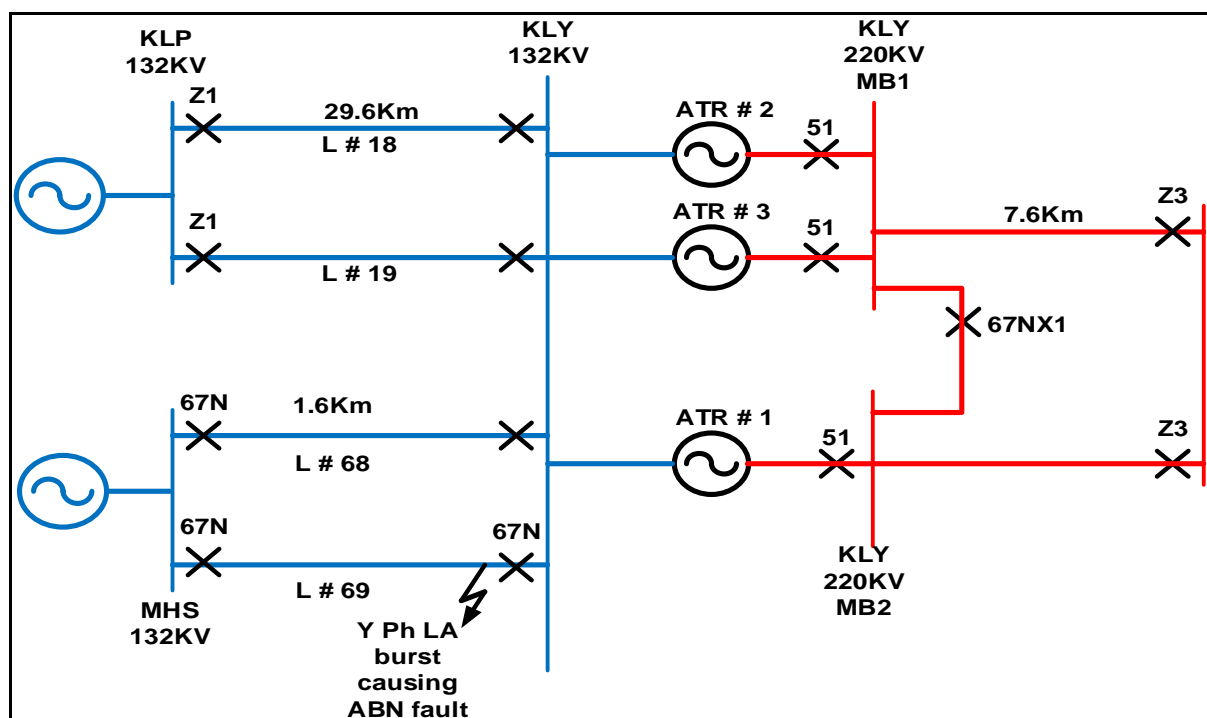
*Members confirmed the minutes of 74<sup>th</sup> PCC meeting.*

#### **PART – B**

##### **ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN DECEMBER, 2018**

##### **ITEM NO. B.1: Total Power Failure at 132 kV Kalyansweri (DVC) S/s on 18.12.2018 at 02:57 hrs.**

Due to burst of Y phase LA of 132 kV Kalyaneswari - Maithon - II at Kalyaneswari end, 220 kV bus tie breaker, 220/132 kV ATR I, II & III at Kalyansweri end got tripped. In addition to this 132 kV Kalyaneswari - Kalipahari D/C, 132 kV Kalyaneswari - Maithon D/C also got tripped resulting total power failure at Kalyaneswari S/S.



**Load Loss: 250 MW**

DVC may explain.

### **Deliberation in the meeting**

*The detailed report submitted by DVC is enclosed at **Annexure B.1**.*

*DVC informed that the fault was initiated due to burst of Y-phase LA in 132 kV Kalyaneswari - Maithon - II at Kalyaneswari end.*

*They informed that main protection for the line 132 kV Kalyaneswari - Maithon – II was line differential protection which is out of service due to “communication failure”. The backup E/F protection from both the end picked up and operated correctly. 132 kV Maithon end successfully cleared the fault whereas 132kV Kalyanswari end could not clear the fault as breakers at Kalyanswari end did not open.*

*As a result following elements tripped from remote end to clear the fault. DVC added that there was no LBB protection for their 132 kV substations.*

Name of the line	Local end	Remote end
132 kV Kalyaneswari - Maithon - I	No tripping	Directional E/F
132 kV Kalyaneswari - Kalapahari - I	No Tripping	Zone-1
132 kV Kalyaneswari - Kalapahari - II	No Tripping	Zone-1
220/132 kV ATR I, II, III	Tripped on O/C from HV side.(tripping time-1.1 sec)	
220 kV Kalyansweri-Maithon-I	No Tripping	Zone-3
220 kV Kalyansweri-Maithon-II	No Tripping	Zone-3

*DVC informed that all the breakers of 132 kV kalyansweri S/s were tested after this incident and found in good condition. The damaged LA was replaced with a new LA.*

*PCC observed that 220 kV Kalyansweri-Maithon-I & II should not trip in this case and proper relay coordination between 220 kV Kalyansweri-Maithon-I & II at Maithon(PG) and 220/132 kV ATR I, II, III is required to be done to avoid such unwanted tripping.*

*During deliberation, it was informed that zone-3 timer settings of main-I relay for 220 kV Kalyansweri-Maithon D/C lines at Maithon end was set as 800 msec. PCC advised Powergrid to increase the zone-3 timer settings to 1msec.*

*DVC informed that no back up E/F protection is available for 220/132 kV ATRs. PCC advised DVC to implement backup E/F protection in all ATRs and coordinate the ATRs settings with 220 kV Kalyansweri-Maithon D/C line relays to avoid unwanted tripping of 220kV lines for a fault in 132kV system.*

*DVC informed that protection system upgradation at 132 kV Kalyansweri S/s is under PSDF proposal.*

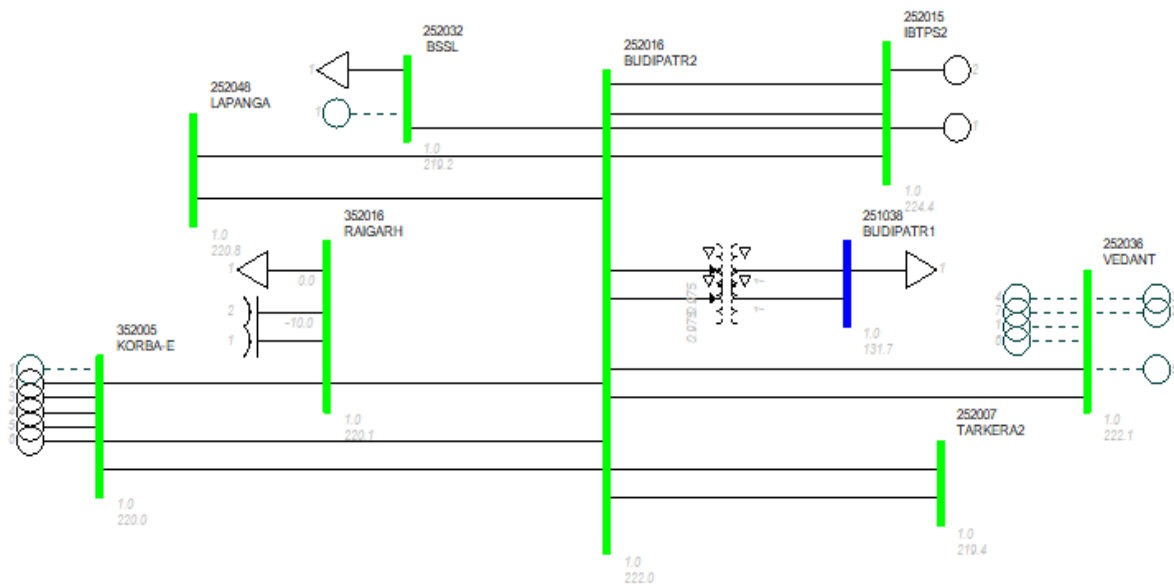
### **ITEM NO. B.2: Disturbance at 220 kV Budhipadar S/s & at 220 kV IBTPS system.**

#### **A. Disturbance at 220 kV Budhipadar (OPTCL) S/s on 25.12.18 at 12:46 Hrs.**

At 12:46 hrs, disk insulator of y phase transfer bus snapped and fell on 220 kV Budhipadhar - Lapanga - II resulting tripping of all lines emanating from 220 kV Budhipadhar system. Due to loss of evacuation path, all units of IBTPS got tripped in over frequency.

**Generation Loss: 370 MW**

**Load Loss: 30 MW**



OPTCL may explain.

### **Deliberation in the meeting**

OPTCL explained with a presentation. The presentation is enclosed at **Annexure B2**.

OPTCL informed that on 25.12.18, all the feeders of 220 kV Budhipadar S/s including 220/132 kV ATRs are in bus-I as bus-II was under planned shutdown for maintenance work.

At 12:46 hrs, the Y-phase transfer bus conductor snapped and fell on 220 kV Budhipadar-Lapanga feeders due to material failure. This causes a bus fault in 220kV Budhipadar s/s.

All the 220 kV feeders tripped from remote end in zone-2 of distance protection to clear the fault. The 220/132 kV ATR I & II tripped on Directional O/C protection from LV side and the HV side tripped on receipt of intertrip signal. OPTCL informed that due to some discrepancy in isolator status in busbar relay, the busbar relay was in off condition.

OPTCL informed that Aditya Aluminum successfully islanded but islanding schemes at Bhushan and Vedanta were failed to islanded.

PCC advised OPTCL to check the condition of bus conductor, jumpers, insulators and other relevant equipments in order to avoid outage due to material failures. PCC also advised OPTCL to collect the details of reason for failure of islanding schemes from CPPs during this disturbance and submit to ERPC and ERLDC.

### **B. Disturbance at 220 kV IBTPS system on 01.01.2019 at 04:32 hrs.**

At 04:32 hrs, high voltage jerk observed in 220 kV IBTPS-Budhipadar feeders. Phase voltage of R & Y phase dropped from 135 kV to 71 kV, which initiated zone-3 distance protection in all feeders. As a result some of the auxiliaries got tripped in IBTPS.

OPTCL & IBTPS may explain.

### **Deliberation in the meeting**

OPTCL informed that there was a fault in 220 kV Budhipadar-Lapanga-II feeder due to snapping of conductor in the line. Both the end cleared the fault in zone-I of distance protection.

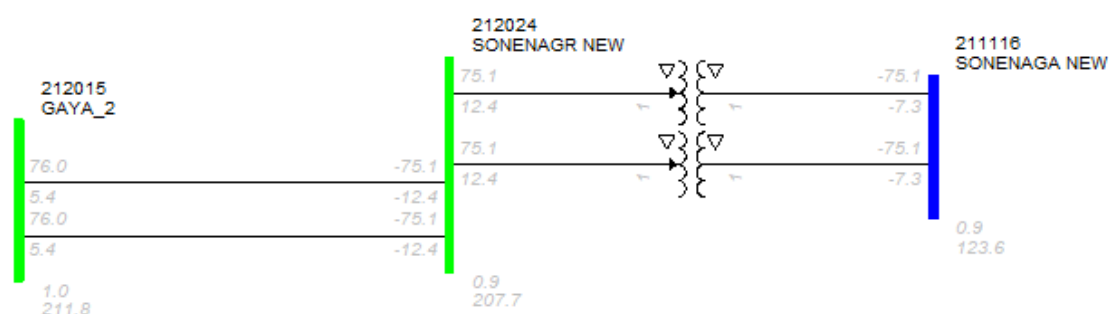
PCC observed that the initiation of zone-3 distance protection at IBTPS end is in order and as per the philosophy. Regarding tripping of some of the auxiliaries at IBTPS, PCC observed that the trippings are not desirable and advised IBTPS to check and review the protection settings of the auxiliaries.

OPGC requested OPTCL to another connectivity from IBTPS to Lapanga to improve the reliability.

**ITEM NO. B.3: Total Power Failure at 220/132 kV Sonenagar(BSPTCL) S/s on 24.12.2018 at 23:28 Hrs.**

220 kV Gaya Sonenagar D/C tripped on R-N fault leading to a load loss at Sonenagar and its nearby area.

**Load Loss: 115 MW**



BSPTCL may explain.

**Deliberation in the meeting**

BSPTCL informed that there was a transient R-N fault in 220 kV Sonenagar-Gaya-II circuit. Sonenagar end cleared the fault in zone-I protection but the autorecloser was not successful whereas autorecloser was successful at 220 kV Gaya end.

BSPTCL informed that at the same time 220 kV Sonenagar-Gaya-I circuit also tripped only from Sonenagar end.

During analysis of the disturbance, it was noticed that before opening of all the breakers of 220 kV Sonenagar-Gaya-I at Sonenagar end, the R-pole has been opened. The opening of R pole breaker could not be explained.

PCC advised BSPTCL to submit the PSL logic to ERPC.

Regarding tripping of 220 kV Sonenagar-Gaya-I, the relay settings were verified using PDMS and found that O/C highset setting was enabled for the circuit which caused tripping of the feeder instantaneously.

PCC advised BSPTCL to disable the highset settings immediately and also advised to disable the highset protection in all the transmission lines of BSPTCL system.

**ITEM NO. B.4: Disturbance at 400 kV Jeypore(Powergrid) S/s on 06.12.18 at 13:27 Hrs.**

At 13:27 hrs, Bus-I at 400 kV Jeypore S/s got tripped due to operation of LBB of main bay of 125 MVar bus reactor (409 Bay). At the same time ICT II also tripped due to nonavailability of its tie bay as 63 MVar bus reactor was out of service.

## **Generation/Load Loss: Nil**

Powergrid may explain.

### **Deliberation in the meeting**

*Powergrid informed that during changing of IP address in the LBB relay, the communication with the relay was lost which caused triggering of LBB protection for Bus-I. Because of non availability of its tie bay, 400/220 kV ICT-II got tripped during the incident.*

*PCC observed that the tripping of ICT-II is not possible without operation of master trip relay in addition to LBB initiation. PCC advised Powergrid to submit a report explaining the reason for operation of master trip relay during the incident.*

*PCC also advised Powergrid to follow a practice of disabling the relay while doing any major changes in the relay and rebooting the relay in order to avoid such type of unwanted relay operation.*

## **ITEM NO. B.5: Disturbance at 400/220 kV Alipurduar (Powergrid) S/s on 05.12.18 at 10:29 hrs.**

400 kV Alipurduar-Bongaigaon D/C and 220 kV Alipurduar-Salakati D/C tripped along with pole-III of HVDC Alipurduar during a disturbance occurred in 400 kV Bongaigaon S/s. HVDC Alipurduar pole IV was under shutdown.

## **Generation/Load Loss: Nil**

Powergrid may explain.

### **Deliberation in the meeting**

*It was informed that there was a fault in 400 kV Bongaigaon S/s which was not cleared from the local end. 400 kV Alipurduar-Bongaigaon D/C tripped from Alipurduar end in zone-II of distance protection clearing the fault successfully from Alipurduar end.*

*Powergrid informed that 220 kV Alipurduar-Salakati D/C did not trip during the incident and remain in charged condition.*

*ERLDC had placed a report along with their observations which is enclosed at **Annexure-B5**.*

*Regarding tripping of pole-III of HVDC Alipurduar, Powergrid informed that as the BNC-Alipurduar-Agra is multilink HVDC, BNC and Alipurduar stations are interlinked with each other. The tripping of all the poles at BNC station due to complete blackout at 400 kV Bongaigaon s/s, subsequently caused the tripping of pole-III in Alipurduar HVDC link.*

*Powergrid informed that they have referred the issue to OEM i.e. M/s ABB for change of scheme in multilink operation so that incase of complete blackout in BNC or in Alipurduar, the other station will remain functional.*

## **ITEM NO. B.6: Tripping Incidences in the month of December, 2018.**

Other tripping incidences occurred in the month of December 2018 which needs explanation from constituents of either of the end is given in Annexure-B.6.

In 36<sup>th</sup> 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.

In 74<sup>th</sup> PCC, all the constituents were requested to submit the disturbance report along with DR through the new version of on-line portal which was implemented from 01<sup>st</sup> Jan. 2019.

Members may discuss.

#### **Deliberation in the meeting**

*Members explained the tripping incidences. Updated status is enclosed at **Annexure-B6**.*

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

## **PART- C:: OTHER ITEMS**

### **ITEM NO. C.1: Protection Audit and checking of relay settings in transmission system/distribution system within States.**

CERC vide its order dated 26<sup>th</sup> March, 2018 in petition no. 09/SM/2015 directed RPCs to take up the issue of protection audit and relay settings in transmission system/distribution system within states.

Members may discuss.

#### **Deliberation in the meeting**

*PCC advised all the states to submit the present practice which is being followed to carry out protection audit and checking of relay settings in transmission system/distribution system within the states.*

### **ITEM NO. C.2: Disturbance at 400 kV BRBCL S/s on 25.11.18 at 16:31 hrs.**

At 16:31 hrs, 400 kV bus-II at BRBCL tripped due to mal-operation of bus bar protection. At the same time, tie CB between 400/132 kV ICT – I & GT – I tripped on master trip signal due to logic error from Bus bar relay of Bus II ,which again led to erroneous LBB re trip signal to main CB no. 401 connected to GT I leading to tripping of unit I.

In 74<sup>th</sup> PCC, BRBCL representative was not present in the meeting. Based on preliminary report submitted, PCC could not conclude the disturbance and advised BRBCL to submit a report explaining the following issues.

- Reason for mal operation of Busbar Relay which tripped 400 kV Bus-II.
- Reason for tripping of tie circuit Breaker between 400/132 kV ICT – I & GT – I at the same time.
- Reason for tripping of main circuit breaker of GT-I connected to 400 kV Bus-I.
- Reason for tripping of 400 kV BRBCL-Sasaram-I line.

BRBCL/NTPC may explain.

#### **Deliberation in the meeting**

*NTPC explained with a detailed presentation. The presentation is enclosed at **Annexure C.2**.*

*BRBCL informed that there was no fault in the substation on that day. The disturbance was started due to mal operation of busbar relay which tripped all the feeders of bus-II.*

*It was informed that various binary outputs of busbar relay of bus-II got sorted leading to actuation of tripping relays(96) of bus-II. They added that the busbar has been replaced and they have sent the old relay to M/s ABB for analyzing the cause of relay failure.*

*NTPC explained that the tripping of circuit breaker between 400/132 kV ICT – I & GT – I and tripping of main breaker of GT-I was due to the actuation of master trip class A unit protection by the faulty LBB/busbar relay during the above incident.*

*Regarding tripping of 400 kV BRBCL-Sasaram-I line, NTPC informed that the tripping was due to some wiring issue which they have identified and rectified after the incident.*

*NTPC informed that they have checked thoroughly the protection system of 400 kV BRBCL S/s including all the logics, wiring of all the relays etc. after the incident in order to avoid such type of incident in future.*



**ITEM NO. C.3: Disturbance at 400 kV Dikchu S/s on 14.11.18 at 16:31 hrs.**

At 16:30 hrs, 400/132 kV ICT at Dikchu tripped along with 400 kV Teesta III – Dikchu S/C from Teesta end resulting tripping of all running units of Dikchu due to loss of evacuation path.

As per DR received, ICT tripped in E/F protection. At the same time, 400 kV Teesta III – Dikchu S/C tripped from Teesta-III end due to operation of cable directional O/C protection.

In 74<sup>th</sup> PCC, Dikchu representative was not present in the meeting.

PCC advised Dikchu to submit a detail report on the disturbance (including the location of fault and status of line tripping at Dikchu end) and to rectify the time synchronization issue in the relays.

Dikchu may explain.

**Deliberation in the meeting**

*Dikchu explained that the location of the fault could not be found out as the line protection relay at Dikchu end did not operate whereas the Teesta-III end tripped on E/F protection from Teesta-III end.*

*It was informed that both the 132/400 kV ICTs tripped from 132 kV side at Dikchu end on backup E/F protection. They added that the E/F relay settings of transformers were checked after the disturbance and it was found that the earth fault relay has much lower settings. They informed that the setting will be changed in consultation with the OEM and their design team.*

*Regarding time synchronization issue, they informed that the issue was due to time stamping in the clock which has been referred to OEM( M/s GE).*

**ITEM NO. C.4: Disturbance at 400 kV Sasaram S/s on 27.11.18 at 13:26 hrs.**

On 27th Nov 2018, at 13:26 Hrs 400 kV Sasaram-Allahabad & 400 kV Sasaram-Varanasi tripped due to Y-B phase fault. At the same time HVDC Sasaram also got blocked due to operation of inter-zone protection of Northern converter transformer.

In 74th PCC, Powergrid was advised to submit a detailed report explaining the reason for tripping of the 400 kV Sasaram-Allahabad line by Main-I relay and reason for zone-2 pick up by Main-II relay. PCC also advised Powergrid to configure the digital channels properly in the disturbance recorders.

Powergrid may explain.

**Deliberation in the meeting**

*Powergrid informed that 400 kV Sasaram-Varanasi got tripped first on B-N fault. The fault was cleared from both the ends in zone-I of distance protection.*

*At the same time, 400 kV Sasaram-Allahabad line also got tripped on Y-N fault. The fault was cleared from both the ends in zone-I of distance protection. Powergrid added that it is a multi ckt tower the Y-phase of 400 kV Sasaram-Allahabad S/C line and B-phase of Sasaram-Varanasi S/C line are top most phases.*

*They informed that HVDC Sasaram got tripped due to commutation failure after tripping of above two lines.*

## **ITEM NO. C.5: FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)**

The decisions of previous PCC Meetings are given at **Annexure-C5**.

In 73<sup>rd</sup> PCC, it was observed that latest status on the implementation of the previous PCC recommendations were not updated by the constituents regularly. All the constituents were advised to update the latest status of the recommendations as per the list given in Annexure.

Members may update the latest status.

### **Deliberation in the meeting**

*The updated status was given in **Annexure-C5**.*

## **ITEM NO. C.6: Schedule of training program to be conducted by PRDC**

PRDC, as per the AMC, is going to conduct 2<sup>nd</sup> training programme on PDMS and PSCT in state utility premises of Eastern Region. The tentative schedule is given below:

SI no.	State	Location	Date	Training
1.	West Bengal	NJP	04.02.2019-05.02.2019	on PDMS
		Durgapur	07.02.2019-08.02.2019	
2.	Bihar	North Bihar	08.04.2019-09.04.2019	
		South Bihar	11.04.2019-12.04.2019	
3.	Sikkim	-	03.06.2019-04.06.2019	
4.	Odisha	-	08.07.2019-09.07.2019	
5.	Jharkhand	-	05.08.2019-06.08.2019	on PSCT
6.	For All States	ERPC	02.09.2019-06.09.2019	

Members may discuss.

### **Deliberation in the meeting**

*Members noted.*

*PCC advised WBSETCL, WBPDC, Powergrid & DVC to attend the training programme scheduled to be held on 04.02.19.*

*PCC advised WBSETCL to do the needful for arranging the training programme.*

## **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 67<sup>th</sup> PCC, PRDC presented the list of ISTS lines where they observed the discrepancy in zone-3 setting.

In 73<sup>rd</sup> PCC, It was informed that Powergrid ER-I had verified the settings. Powergrid ER-II and Powergrid odisha will verify the settings at the earliest.

In 74<sup>th</sup> PCC, Powergrid & DVC informed that they will submit the details at the earliest.

75<sup>th</sup> PCC Minutes

DVC has submitted the zone settings data vide mail dated 16.01.19.

Members may update.

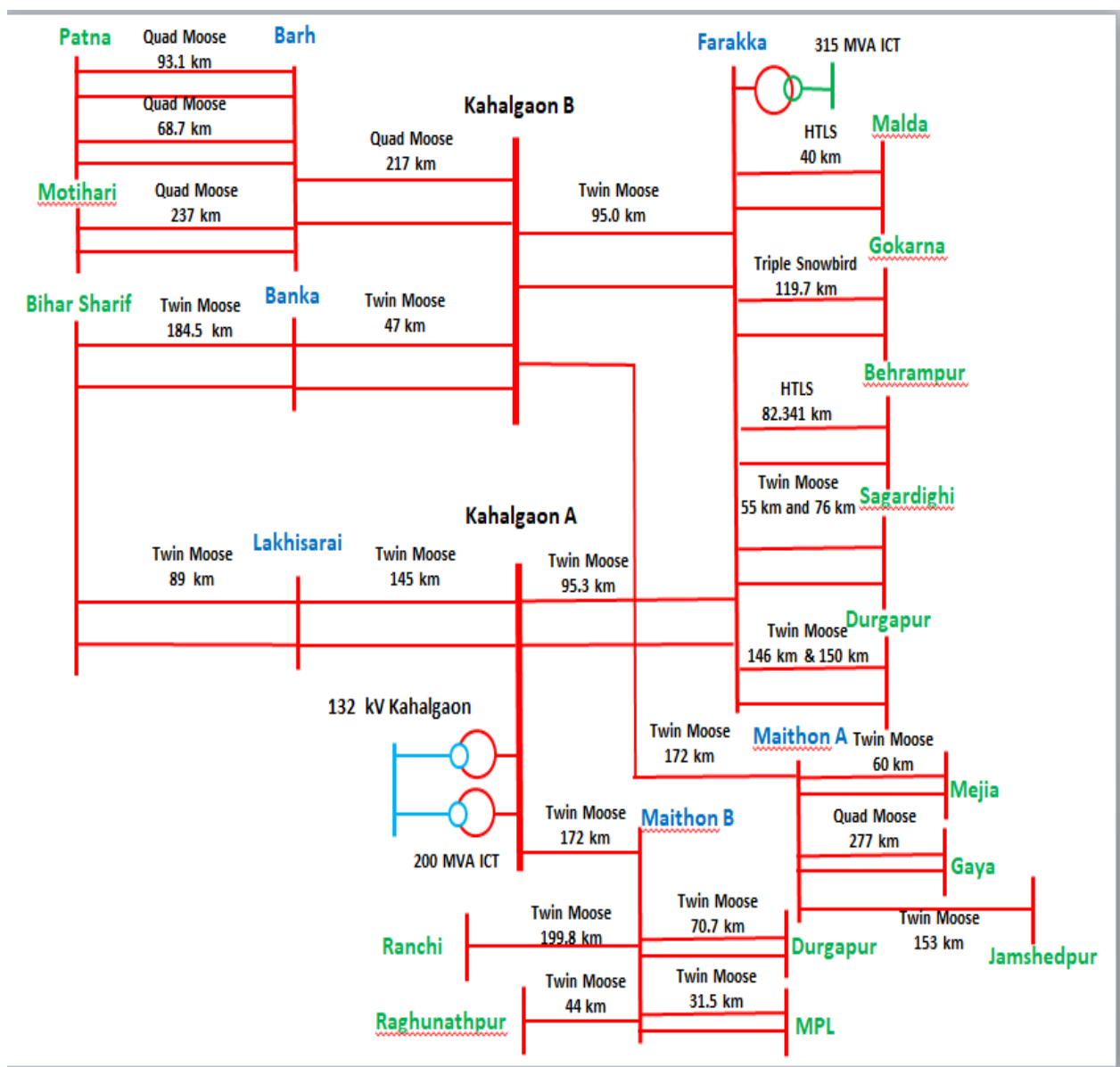
### Deliberation in the meeting

*It was informed that the data would be reviewed and placed in next PCC Meeting.*

### **ITEM NO. C.8: Revision in protection settings due to Bus splitting operation in 400 kV Kahalgaon S/s**

As per the CTU planning Bus splitting activity at 400 kV Kahalgaon S/s is completed for reducing the fault level. As this is a generating station, so before operating the system in bus split mode proper protection coordination is very much essential to avoid any unwanted tripping.

SLD with line length is attached for the convenience of the concerned utilities.



After split of the bus the selection of longest and shortest remote end line have to be revisited by all the concerned utilities. Accordingly changes in protection setting have to be done. Also in

some operating condition it may be required to operate the system by coupling all the buses. So preserving the existing setting is also essential for quickly changing the setting in those conditions.

**In view of the above, all concerned utilities are requested to keep two setting group ready in the relay itself for two different operating conditions.**

Members may discuss.

#### **Deliberation in the meeting**

*PCC advised concerned constituents to review their protection settings as per the configuration given in above single line diagram.*

*DVC requested ERLDC to share the revised SLD of 400kV Maithon S/s.*

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

The compliance status of 1<sup>st</sup> 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/P LCC Link available	AR facility functional
13	<u>220KV BUDIPADAR-KORBA-II</u>	23.06.16	Y-N FAULT	OPTCL	CSEB	PLCC available	will be activated in consultation with Korba
17	<u>220 KV TSTPP-RENGALI</u>	17.07.16	EARTH FAULT	NTPC	OPTCL		by March 2018
18	<u>220KV BUDIPADAR-RAIGARH</u>	21.07.16	EARTH FAULT	OPTCL	PGCIL	PLCC defective	
20	<u>220 KV FARAKKA-LALMATIA</u>	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	<u>220 KV MUZAFFARPUR - HAZIPUR - II</u>	10.08.16	B-N FAULT	PGCIL	BSPTCL		Voice established. For carrier required shutdown
24	<u>220 KV ROURKELA - TARKERA-II</u>	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	Expected to install protection coupler by Jan 17
27	<u>220 KV BIHARSARIF-TENUGHAT</u>	07.09.16	B-N FAULT	BSPTCL	TVNL		
33	220KV Jamshedpur-Jindal-SC						

34<sup>th</sup> 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:

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

#### BSPTCL:

- 220kV Purnea (PG)-Madhepura line
  - 220 kV Biharshariff- Begusarai line
  - 220 kV Biharshariff- Bodhgaya line
- } *Work is in progress expected to be commissioned by December 2017.*

- |    |                                    |  |
|----|------------------------------------|--|
| 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 Khagaul   |

In 74<sup>th</sup> PCC, it was observed that there was no progress in implementation of PLCC and Autorecloser in BSPTCL system. BSPTCL was advised to take up the issue with the implementation agency and expedite for early commission of PLCC and Autorecloser.

Members may update.

### **Deliberation in the meeting**

*BSPTCL updated the status of PLCC in lines as follows:*

<b>SI No.</b>	<b>Lines</b>	<b>Status</b>
<b>1</b>	<i>220 kV Purnea(PG)-Madhepura</i>	<i>Protection through PLCC is working properly</i>
<b>2</b>	<i>220 kV Biharsharif-BTPS new</i>	<i>Commissioning of PLCC is under progress.</i>
<b>3</b>	<i>220 kV BTPS new- Begusarai</i>	<i>Commissioning of PLCC is under progress.</i>
<b>4</b>	<i>220 kV Biharshariff-Bodhgaya line LILO at Khizersarai</i>	<i>OPGW is present. Protection is done through DPC.</i>
<b>5</b>	<i>220kV MTPS-Motiari line</i>	<i>OPGW is installed.</i>
<b>6</b>	<i>220KV Madhepura-New Purnea D/C</i>	<i>Protection through PLCC is working properly</i>
<b>7</b>	<i>220KV Muzaffarpur-Hajipur D/C line</i>	<i>Protection through PLCC is working properly</i>
<b>8</b>	<i>220KV Patna-Khagaul-SC</i>	<i>PLCC Panel working properly.</i>

### **ITEM NO. C.11: 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

In 74<sup>th</sup> PCC, all the constituents were advised to submit their comments/observations relating to the draft standard which is enclosed at **Annexure-C11**.

PCC also decided similar kind of standard would be prepared for Transformer Protection and Busbar Protection.

Members may update.

#### **Deliberation in the meeting**

*PRDC presented the draft standard for Transformer Protection and Busbar Protection. Draft standard is enclosed at Annexure-C11.*

*PCC advised all the constituents to submit their comments to ERPC and ERLDC.*

#### **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.

#### **Deliberation in the meeting**

*Members noted.*

#### **ITEM NO. C.13: Additional Agenda**

##### **1. Installation of back-up distance relay in 220KV Bus-sectionaliser at Binaguri SS-- Powergrid**

400/220KV Binaguri (New-Siliguri ) substation having extended 220KV Bus to 220KV WBSETCL (NJP) substation and both buses are isolated by 220KV bus-sectionaliser breaker. Separate bus-bar protections are installed at both end i.e. POWERGRID & WBSETCL to trip the sectionaliser CB in case of bus fault only.

There is no directional relay installed in either end to isolate the faulty section in case of through fault occurred at remote station. Therefore if any of the protection fails to operate in downstream may cause 220KV Bus dead at POWERGRID end.

Therefore, Powergrid is planning to install Distance protection relay as a back-up protection in 220KV Sectionaliser bay to take care remote end fault if primary protection fails to clear.

#### **Deliberation in the meeting**

*PCC advised WBSETCL to send their comments to Powergrid on implementation of distance protection at 220kV Bus sectionaliser as a back-up protection.*

75<sup>th</sup> PCC Minutes

## 2. Implementation of differential protection for short distance lines in different substation of ER-II --Powergrid

The Lines where line differential protection are to be implemented are as follows:

Sl. No.	Substation name	Name of the Line	Line length	Line owned by
1	Durgapur	220KV DGP (PG) - DVC Ckt.-I	1	DVC
2		220KV DGP (PG) - DVC Ckt.-II	1	DVC
3		220KV DGP (PG) - Bidhan Nagar (WBSETCL) Ckt.-I	11	WBSETCL
4		220KV DGP (PG) - Bidhan Nagar (WBSETCL) Ckt.-II	11	WBSETCL
5	Malda	132KV MLD (PG) - MLD (WBSETCL) Ckt.-I	5.94	WBSEDCL
6		132KV MLD (PG) - MLD (WBSETCL) Ckt.-II	5.94	WBSEDCL
7	Alipurduar	220KV ALPD (PG) - ALPD (WBSETCL) Ckt.-I	6.377	WBSETCL
8		220KV ALPD (PG) - ALPD (WBSETCL) Ckt.-II	6.377	WBSETCL
9	Birpara	132KV BRP (PG) - BRP (WBSETCL) Ckt.-I	0.3	WBSETCL
10		132KV BRP (PG) - BRP (WBSETCL) Ckt.-II	0.3	WBSETCL
11	Sliguri	132KV SLG (PG) - NJP (WBSETCL) Ckt.	10	WBSETCL
12		132KV SLG (PG) - NBU (WBSETCL) Ckt.	10	WBSETCL

In 68<sup>th</sup> PCC meeting, it was opined that differential protection should be implemented for all short lines (<20KM) to overcome relay co-ordination issues with respect to distance and overt current protection.

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

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

*In 38<sup>th</sup> TCC Meeting, it was decided in the meeting that the cost relating to implementation of fiber based differential protection scheme for both ends shall be borne by concerned utilities owning the line.*

Therefore for retrofitting of the old relays budgetary offer has been collected from M/s GE Ltd. Vide ref. no.-SPT001/PGCIL dated 22.05.2018. A BOQ has been prepared and the total financial implication comes to **Rs. 1,30,27,200/-** (One crore thirty lacs twenty seven thousands two hundreds only) including GST and other term & condition.

Powergrid placed the proposal for

- Technical & administrative approval,
- Financial concurrence for Rs. 1,30,27,200/- (inclusive of GST),
- Execution of work through open tender basis

### **Deliberation in the meeting**

*PCC in principle agreed to the proposal and referred to Commercial Sub-Committee Meeting for discussion.*

\*\*\*\*\*



**Participants in 75<sup>th</sup> PCC Meeting of ERPC**

Venue: ERPC Conference Hall, Kolkata

Time: 11:00 hrs

Date: 22.01.2019 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
1	J. Bandyopadhyay	Member Secretary ERPC	9432326351	mserpc-power@gov.in	
2	D. K. Jain	Executive Director, ERLDC	9910344127	dk.jain@posoco.in	
3	S. KEJRIWAL	SE, ERPC	9831919509	shyam.kejriwal@gov.in	
4	P. P. Jena	AEE, ERPC	9776198991	ppjena.erp@gov.in	
5	ALKA RANI	AEE, BSPTCL	7992459501	aikarani1349@gmail.com	
6	VIBHA SINGH	JEE, BSPTCL	7033298253	vibhasingh31@gmail.com	
7	DEEPAK KR, THAKUR	AEE, CRITL, BSPTCL	7033092545	deepak.aashish@gmail.com	
8	VINOD KUMAR GUPTA	JEE, CRITL JUSNL	9801876504	cecritl.jusnl@rediffmail.com	
9	SHIV SHANKAR MARDI	AEE, CRITL JUSNL	6202991413	cecritl.jusnl@rediffmail.com	
10	JAYANTA KANJILAL	A.C.E WBSETCL	9434910189	K_JAYANTA12@REDIFFMAIL.COM	
11	MALAY SARKAR	SM, Testing KTPS, WBPDCL	8336904087	m.sarkar@wbpdcl.co.in	
12	Sudipta Ghosh	Mgr., WBPDCL	8336914005	sghosh04@wbpdcl.co.in	
13	Sucharit Mondal	Asst. Mang, CESC	7595956952	Sucharit.mondal@rp-29.in	
14	D.P. Kar	AGM, SLDC, OPTCL	9438907416	ele.dpkar@sldc 00f88a.009.cn	
15	S S Nanda	DGM EAMRDm OPTCL, Burla	9438907803	ele.ssnanda@optcl.co.in	
16	H.P. Mahapatra	GM, OAPC	7328840015	hpm.oapc@gmail.com	
17	D.N. Gune	DGM OPGC (Exec)	933875934	dhirendra.gune@opgc.co.in	
18	Rajendrakumar	TVNL	9030104991	rp.kumar@gmail.com	
19	Chiranjib Bhattacharya	HDC	9163321587	chiranjib.bhattacharya@rp-29.in	
20	S.P. Datta	AGM, ERPC	943306702	sp.datta@rediffmail.com	

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



### Participants in 75<sup>th</sup> PCC Meeting of ERPC

Venue: ERPC Conference Hall, Kolkata

Time: 11:00 hrs

Date: 22.01.2019 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
21	Shri Mohan Jha	Consultant ERPC	9874738913		
22	SURATIT BANERJEE	ERLDC	9433041823		
23	चंदन कुमार	उप प्रबंधक बृ.सं.भा.प्रा.सं.	9869251460	chandane@posoco.in	चंदन कुमार
24	AVINASH M. PAUGD.	उ.स.प. (प.म.)	9910378086	apaugd@powergridindia.com	
25	ANURAG ROY	Dy. Manager NTPC Patna	9434028245	Anuragroy@ntpc.co.in	
26	S.K. SAHU	DCM, POWERGRID Odisha Projects	9078883643	SKSahu@Powergridindia.com	
27	Sukder Bal	Ch. Mgr. POWERGRID ER-II.	9903180042	Sukderbal@powergridindia.com	
28	Yogesh Dwangan	Asst. Mgr/ Dikchu HEP	9713400877	yogeshkumar.d@greenkoenergyprojects.com	
29	Arjunava Das.	Lead Engg. - Testing	9234000579	arjunava@tatapower.com	
30	JERIN JACOB	Asst. Manager, NERLDC, POSOCO	9402120113	jerinjacob@posoco.in	
31	Chitra Bahadur Thapa	Asst. Manager NERLDC, POSOCO	8135989964	chitra.thapa99@posoco.in	
32	Devendra Yadav	TM/TUL, Sikkim	7119017653	devendranitjog@gmail.com	
33	B.D. Kumar	TUL	9800940836	devendu.b@techtom	
34	S. NANTI	DVC, S.D.E	7545867453	sudiptananti@gmail.com	
35	RAS PROTIM	ERLDC, DY Mgr.	9903329591	rasprotim@posoco.in	
36	Madhab Mueherjee	Engineer PRDC	7980594471	madhab.mueherjee@brdeinfotech.com	
37	Deepak Vinnakota	As. Engg. PRDC	9966912284	deepak.v@psdcinfotech.com	
38	Sudeep Kumar	Manager, POWERGRID Patna	9431820338	sudeepkumar@powergridindia.com	
39	RAJDEEP BHATTACHARJEE	RE, BSPHCL	9830380689	rekolbsphcl@gmail.com	
40	B. SARKHEL	Consultant ERPC	9433065774	buddha@nahan.com	

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

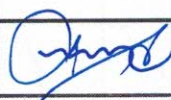


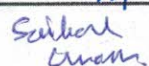


### Participants in 75<sup>th</sup> PCC Meeting of ERPC

Venue: ERPC Conference Hall, Kolkata

Time: 11:00 hrs

Date: 22.01.2019 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
41	Lenin. B	AEE, ERPC	833530543	lenin.cea@gmail.in	
42	A. K. Basak	Dy. Manager, ERLDC	9007059569	akbasak@posoco.in	
43	J. G. Rao	EE, ERPC	9547891352	eseb_cea@yahoo.co.in	
44	Saibul Chon	ERLDC, Asst Manager	858507070	Saibul@posoco.in	
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					

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

**BRIEF HISTORY:** At about 03:01 hrs of 18/12/2018 power failed in Kalyaneshwary 132KV bus due to tripping of all 132KV lines and all 3 ATRs at Kalyaneshwary S/S.

**BUS DISTRIBUTION AT THE TIME OF FAULT:**

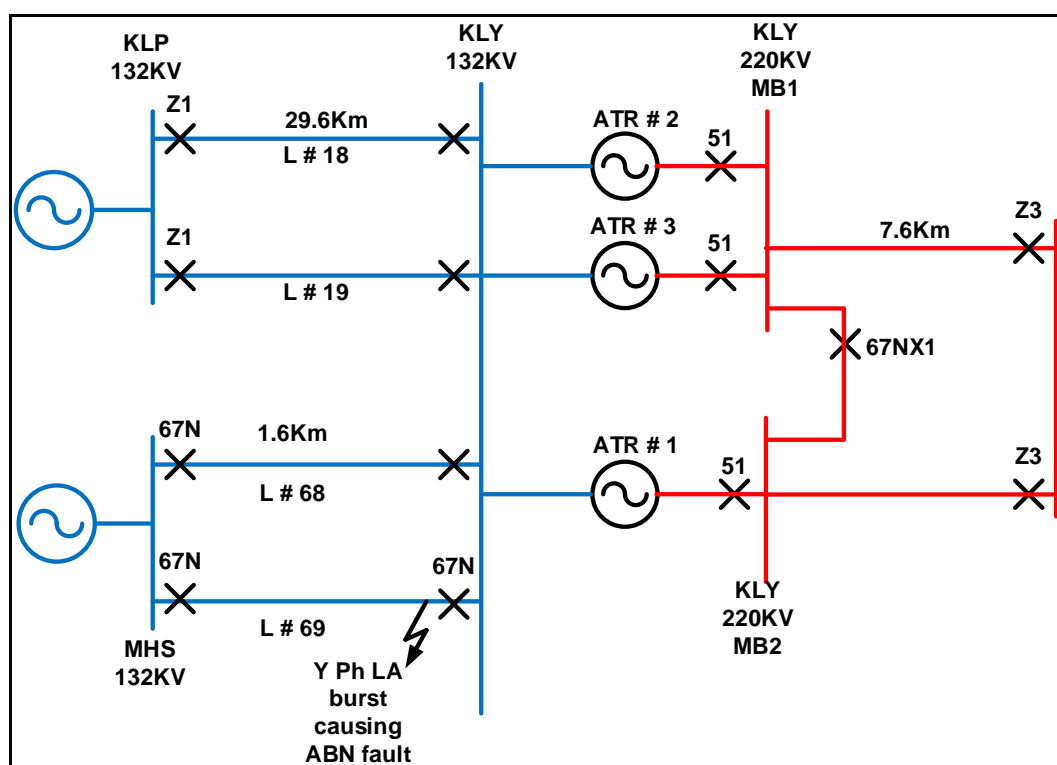
**MB1:** L # 202, L # 229, L # 237, L # 239, ATR1.

**MB2:** L # 201, L # 228, L # 238, L # 240, ATR 2, 3.

**TRIPPING DETAILS:**

Sl. No.	Bay	R/I at Local End	R/I at Remote End
1.	Kly MHS L # 69	D/E/F	D/E/F
2.	Kly MHS L # 68	No Trip	D/E/F
3.	Kly Kalipahari L # 18	No Trip	Zone 1
4.	Kly Kalipahari L # 19	No Trip	Zone 1
5.	ATR 1, 2, 3	HV O/C	
6.	50MVA Tr 1, 2	HV E/F	

**SLD OF RELEVANT AREA:**



**FAULT DETAILS:** Y Phase LA was found bursted in L # 69 at Kly End. There was marks of damage in R Phase LA too.

**ANALYSIS OF TRIPPINGS:**

1. The fault started as bursting of Y Phase LA of L # 69 at Kly End but at around 230ms after fault inception R Phase had also participated in the fault as depicted by all picked up DR in various relays. As Line Differential of the said line was out of service at that moment due to 'Communication Failure' the Back Up E/F Protection at both ends operated to clear the

fault. But the CB L # 69 Kly end failed to trip and as LBB protection is not present in our 132KV system, the fault was cleared by tripping of all remote ends.

2. At Kalipahari End both lines read the initial BN fault outside its zone. During transition of the fault from B-N to A-B-N at 230ms both L 18 & 19 at Kalipahari end trip in Zone 1. The measured impedance as per conventional algorithms was above Z2 settings and after the fault transition it again was above Zone 1 and within Zone 2 reach but during the transition somehow the relay read this impedance within Z1 and tripped. The Z1 settings are at 85% of LL.
3. The MHS end B/U protection took around 800ms to issue trip pulse as the fault was resistive in nature with fault resistance of about 9 – 10  $\Omega$ . DR shows the fault current to be varying between 1-1.5kA (at MHS end per line) whereas for a zero impedance fault the current should have been about 4615A per line as shown in S/C studies.
4. The ATRs tripped next from HV side in around 1.2 sec. They were set to trip in about 1.0 – 1.05sec for LV bus fault but as the fault current was lesser than dead bus fault it took longer to trip. In the meantime But Tie E/F had operated, the two power transformers tripped through E/F and both PGCIL lines through Distance Zone 3.

#### **TESTS AND FIELD CHECKS DONE:**

1. The distance relays of L # 18, 19 at Kalipahari End were tested in minute details for reach accuracy and found perfectly healthy. The CTR, PTR, Zone setting values as existing in relay, setting calculation basis of all these three relays were checked and found O.K.
2. The DR of Kalipahari lines were transplayed on the respective relays and both relays were found to behave in a similar manner as on the day of fault i.e. trip in Zone 1 during the fault transition. The software version of all 3 relays are 35 and the firmware version is C3.0. When the same DR was transplayed on a P442 relay of AREVA of S/W Version 55, and P444 of S/W Version 55, the relays were not tripping in Zone 1 during the fault transition and was correctly discriminating the impedance in Zone 2.
3. In non tripped CB of L # 69, trip and close time tests, Reduced Voltage tests and DCRM were done and all results found O.K.

**RESTORATION:** All Lines, Transformers, ATRs were normalized within 1 hr except L # 69.

#### **REMEDIAL MEASURES:**

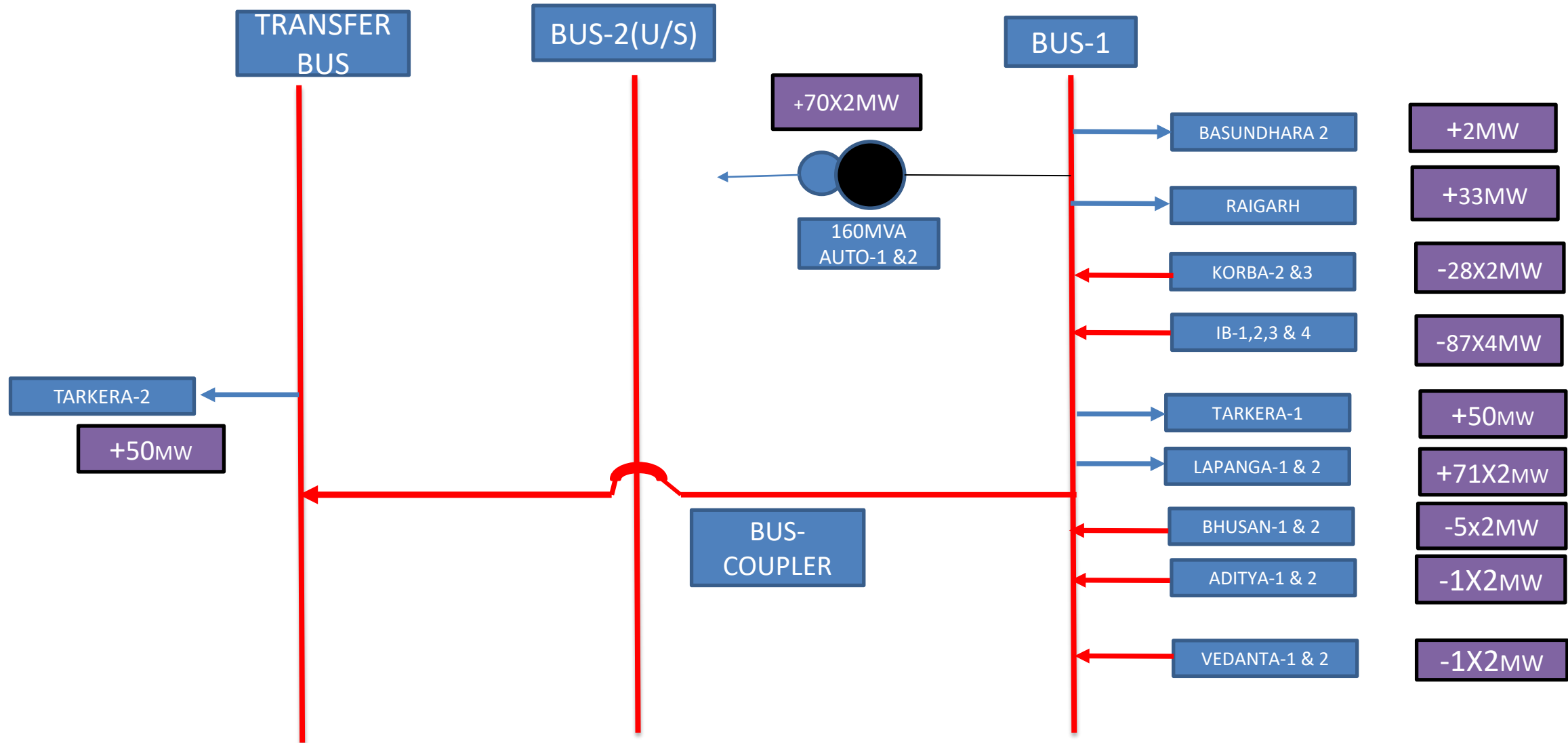
1. Both R & Y Phase LA of L # 69 replaced.
2. L 69 Line Differential communication established thus bringing back 87L in service in L # 69.

Tripping of 220KV system at Budhipadar Grid S/s on 25.12.2018.

- Date 25.12.2018 ,Time- 12:46 Hrs.
- Station : Budhipadar 220/132/33kV GSS
- Weather : Sunny.
- 220KV Bus-2 was under shutdown from 24.12.18 for annual maintenance work and all the feeders & Auto TFR were in Bus-1. Shutdown extended to 25.12.18 for attending pending maintenance work.
- 220 KV Tarkera-2 feeder was charged through 220 KV Transfer Bus Coupler.
- At 12.46Hrs. the Transfer Bus tension insulator of Y-phase detached near 220KV Lapanga-2 feeder & slides over Lapanga Ckt-2 and finally rest over 220KV Lapanga-1 ckt.
- Bus bar relay was in OFF condition for checking of status of isolators.

# PRE-FAULT CONDITION

## LOAD PATTERN OF DIFFERENT FEEDERS AT 12.00 HRS.(TARKERA-2 CHARGED THROUGH TBC)



DURING DISTURBANCE CONDITION

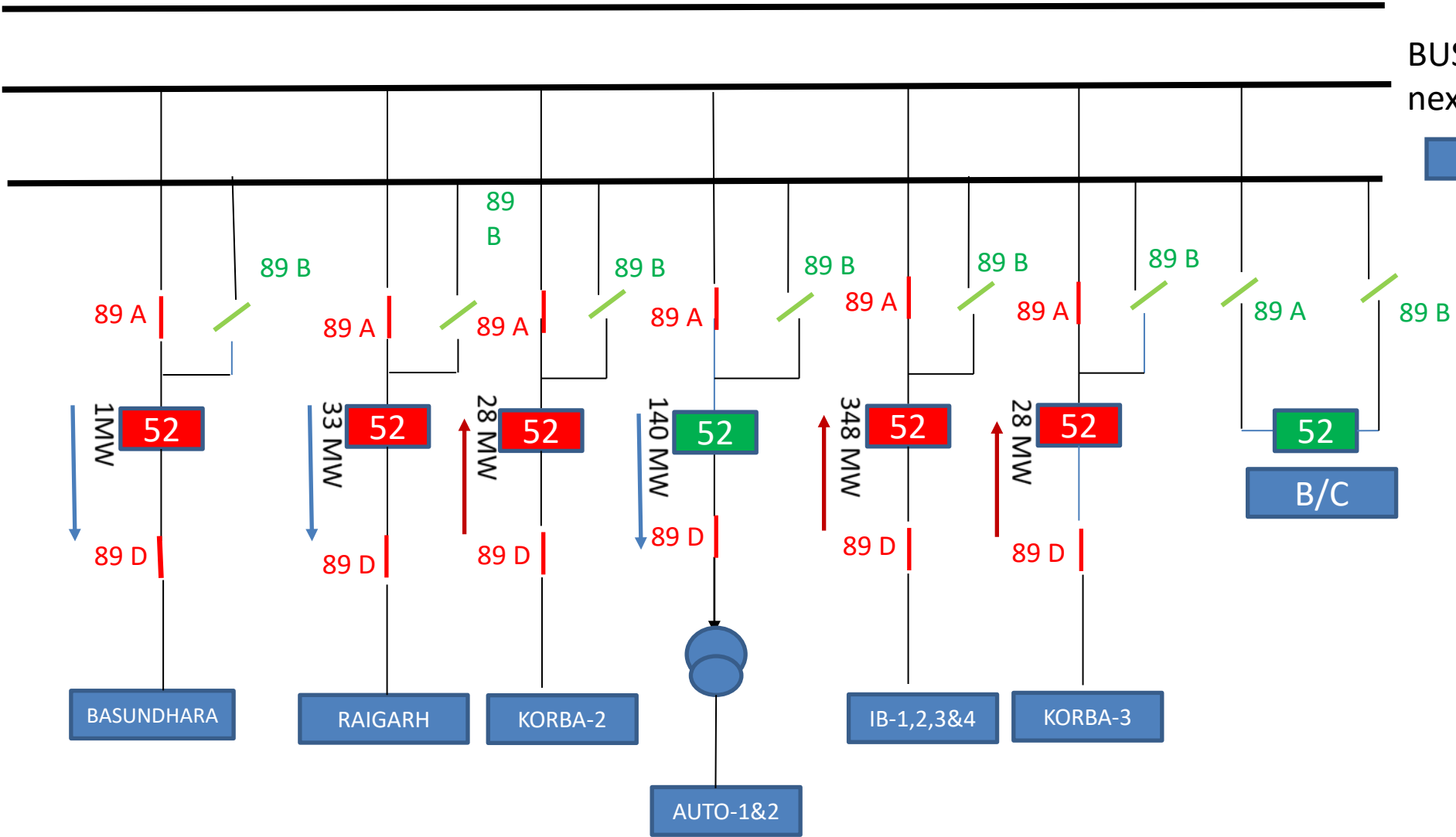
BUS-1- ALL 220 KV FEEDERS AND AUTO TRANSFORMERS WERE ON BUS -1  
BUS-2-UNDER SHUT-DOWN.

TRANSFER  
BUS

BUS-I

BUS-II

BUS Continued to  
next sheet

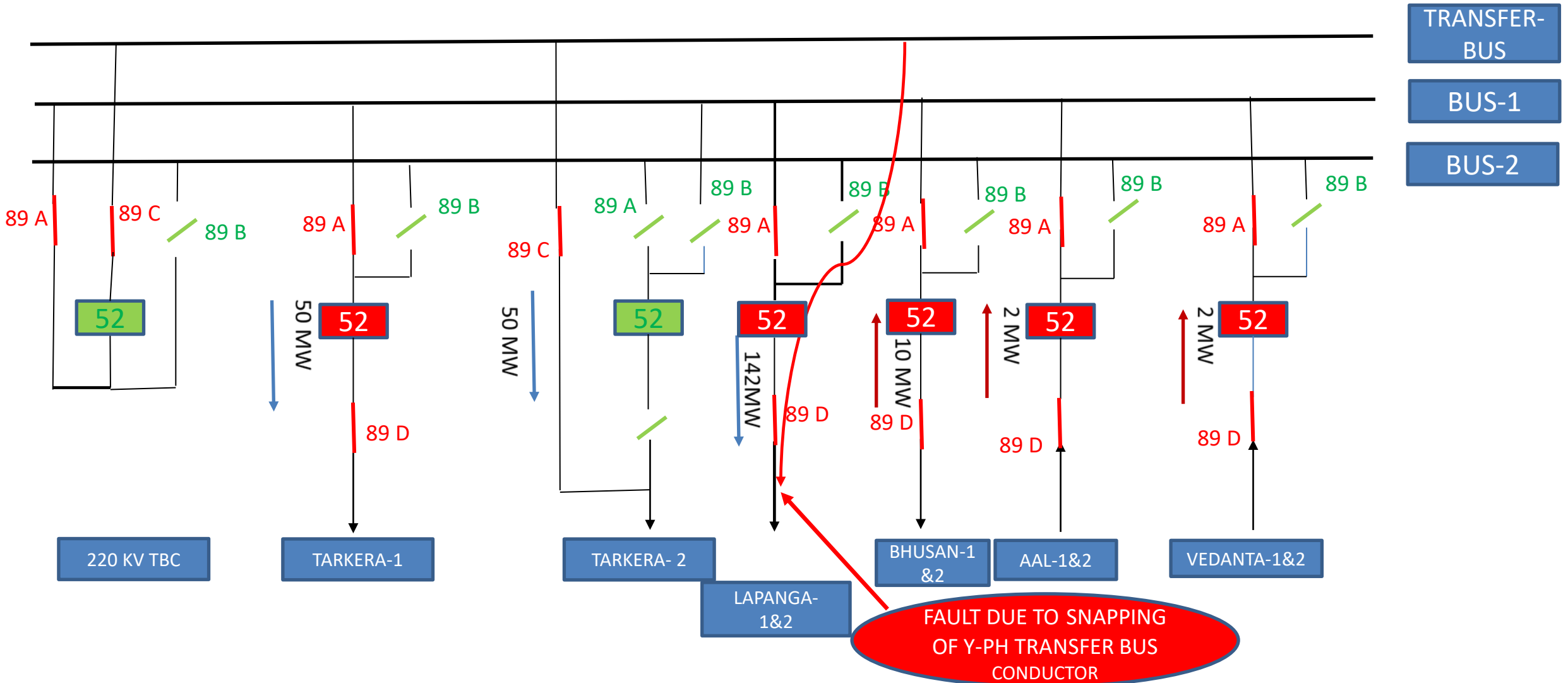




## DURING DISTURBANCE CONDITION

**BUS-1- ALL FEEDERS AND TRANSFORMERS WERE ON BUS-1**

**BUS-2-UNDER SHUT DOWN.**



LOCATION WHERE Y-PHASE TRANSFER BUS CONDUCTOR SNAPPED AFTER FAILURE OF INSULATOR





## TRANSFER BUS CONDUCTOR DE-ATTACHED AFTER FAILURE OF INSULATORS



**Date & Time of Occurrence:25.12.2018, 12.46 Hrs**  
**Details of occurrence**

Sl.No.	Name of feeder	Relay Indication	
		B.Padar end	Remote end
1	220 kV Transfer Bus-Coupler	Siemens-7SJ62( B/U Relay) Dir. O/C Y-ph Trip Ia= 0.28KA,Ib=34.50KA Ic=0.54KA	NA
2	220 kV Lapanga-2	No Trip	DP Relay Zone-2, FD=18.6Km Ir=5.4KA, Iy=5.74KA Ib=5.39KA
3	220 kV Lapanga-1	No Trip	DP Relay Zone-2, FD=17.17Km Ir=2.745KA, Iy=3.147KA
4	220KV Tarkera-1	No Trip	DP Relay Zone-2, FD=107.7Km Ir=1.91KA, Iy=2.15KA

Sl.No.	Name of feeder	Relay Indication	
		B.Padar end	Remote end
5	220KV Tarkera-2	No Trip	DP Relay Zone-2, FD=124.9Km Ir=1.41KA
6	132KV side Auto-1	Alstom-MicomP14D( B/U Relay) Dir. o/c R &Y-ph Trip Ia= 984.4A,Ib=1.225KA	NA
7	132KV side Auto-2	Alstom-MicomP14D( B/U Relay) Dir. o/c R &Y-Ph Trip Ia= 935.2A,Ib=1.95KA	NA

## **Analysis:-**

- 1. On dtd. 25.12.18 at 12.46Hrs. a heavy sound observed at switchyard. On inspection of the switchyard it was found that Y-phase Transfer bus conductor snapped in 220KV Lapanga Ckt-2 and finally rest over 220KV Lapanga Ckt-1. It happened due to material failure of tension insulators of Transfer bus conductor for which the transfer bus Y-phase conductor snapped and created a bus fault situation.**
- 2. 220KV Tarkera-2 was charged through TBC and TBC breaker tripped on O/C Y-phase (Siemens,7SJ62).**
- 3. The Auto Tfr - 1 & Auto Tfr - 2 tripped on Back up O/C & E/F relay of LV side and HV side tripped on inter tripping operation.The 220 KV Lapanga-1&Lapanga-2 feeder picked up the fault in Zone-4(Reverse direction) of DP relay.**
- 4. The other 220KV feeder tripped from remote end.**

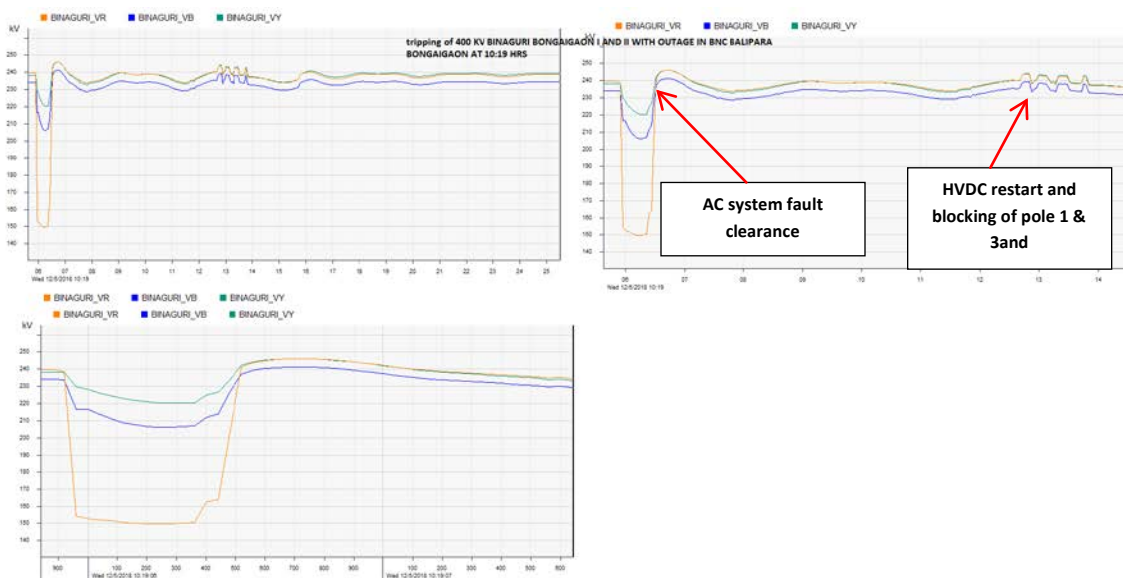
## **REMEDIAL MEASURES:**

- 1. The insulator bunch have been replaced with twin long rod insulator to avoid this problem.**
- 2. It is planned to replace the other insulators bunch in phased manner in similar fashion.**

# Queries on NER Disturbance on 05/12/18

At 10:19:05:945 hrs R-phase isolator of Bus reactor at Bongaigaon opened due to DC supply extension. This resulted in a fault near to the Bongaigaon 400kV Bus which is cleared by tripping of all lines either in zone-2 from remote end or in zone-4 from Bongaigaon end. By 10:19:06:470 hrs AC system fault got cleared. NER remain connected to ER by 220 kV Alipurduar-Salakati D/C.

Following this tripping HVDC BNC-AGRA pole 1 and 2 and APD-AGRA pole 3 tripped. Few issues observed in this HVDC tripping are pointed below:



## Queries:

1. In TFR captured from MC2 of APD, every 4th analog signal up to 52th signal is missing. In addition to this 72,84,88,99 and 100<sup>th</sup> analog signals also missing. In digital channel 4,34 to 36, 47 to 48, 53 and 104<sup>th</sup> signal are missing. Reason for the missing signals in the comtrade file may please be explained by PGCIL. It may kindly be noted that as per IEEE Comtrade Standard (IEEE C37.111-2013), the no of analog and digital channel recorded is mentioned in the 2<sup>nd</sup> line of the configuration file (.cfg) and these are also available in the comtrade data file. And in this case, it is showing 100 analog and 104 digital channels recorded but many are missing in between in the data file. Please find the snapshot from the configuration file.



```

1,BDP22_TRIP,1
2,OCPP20_TRIP,1
3,AVP110_TRIP,1
0,,0
5,CFP_TRIP1,1
6,CFP_SS_1,1
7,CF_DET,1
8,CFP_TRIP2,1
9,CRP_SS_2,1
10,VSP_TRIP,1
11,VSP_SS,1
12,VSP_INH_INC_UDI0,1
13,DOCP_TRIP_LEV1,1
14,DOCP_SS_LEV2,1
15,DOCP_TRIP_LEV2,1
16,DOCP_SS_TEMP,1
17,DOCP_TRIP_TEMP,1
18,ACGFP_INH_DEBL,1
19,ACGFP_TRIP,1
20,VSCP_TRIP,1
21,LLDP_TRIP,1
22,CONVPR_DIFF_TRIP,1
23,LOW_AC_VOLTAGE,1
24,DOCP_RB_TEMP,1
25,TDP_TRIP_D,1
26,TREFP_TRIP_D,1
27,TOCP_TRIP_D,1
28,TEFP_TRIP_D,1
29,TOP_TRIP_D,1
30,GAS_DET_RELAY_TRIP_D,1
31,TC_PRESS_RELAY_TRIP_D,1
32,OIL_WIND_TEMP_BLOCK_D,1
33,SF6_GAURD_TRIP_D,1
0,,0
0,,0
0,,0
37,TDP_TRIP_Y,1
38,TREFP_TRIP_Y,1

```

```

69,ID_MINUS_IVV,1,A,0.010159,-192.661500,0.000000,0,32767
70,ID_MINUS_IVD,2,A,0.006297,-148.726300,0.000000,0,32767
71,UDL_DER,3,kV,0.004503,-73.720130,0.000000,0,32767
0,,,,0.000000,-1.000000,0.000000,0,32767
73,IDNC_FUND_PEAK,1,A,0.003387,2.611120,0.000000,0,32767
74,IDNC_SEC_PEAK,2,A,0.009777,13.407330,0.000000,0,32767
75,UDL_FILT,3,kV,0.015444,333.081000,0.000000,0,32767
76,IDL_FILT,0,A,0.014957,14.928960,0.000000,0,32767
77,PB_DC_DIFF,1,A,0.000969,0.009475,0.000000,0,32767
78,POLE_DC_DIFF,2,A,0.001253,0.002291,0.000000,0,32767
79,NB_DC_DIFF,3,A,0.001135,0.001911,0.000000,0,32767
80,CONV_DIFF,0,A,0.001713,0.000089,0.000000,0,32767
81,IAAC_L1,1,A,0.000067,-1.000000,0.000000,0,32767
82,IAAC_L2,2,A,0.000067,-1.000000,0.000000,0,32767
83,IAAC_L3,3,A,0.000067,-1.000000,0.000000,0,32767
0,,,,0.000000,-1.000000,0.000000,0,32767
85,I_Z1_Z1_T1_D,1,A,0.008864,-130.422700,0.000000,0,32767
86,I_Z1_Z2_T1_D,2,A,0.005835,-93.970770,0.000000,0,32767
87,I_Z1_Z3_T1_D,3,A,0.004063,-64.403910,0.000000,0,32767
0,,,,0.000000,-1.000000,0.000000,0,32767
89,IAC_Y_FUND_SUM_ABS,,,A,0.000178,0.002400,0.000000,0,32767
90,IAC_Y_FUND_SUM_ARG,,,A,0.011805,-179.616800,0.000000,0,32767
91,IGND_Y_FUND_SUM_ABS,,,A,0.000191,0.953085,0.000000,0,32767
92,IGND_Y_FUND_SUM_ARG,,,A,0.011989,-179.977400,0.000000,0,32767
93,IAC_D_FUND_SUM_ABS,,,A,0.053304,4.379952,0.000000,0,32767
94,IAC_D_FUND_SUM_ARG,,,A,0.010273,-140.007800,0.000000,0,32767
95,IGND_D_FUND_SUM_ABS,,,A,0.053448,6.287143,0.000000,0,32767
96,IGND_D_FUND_SUM_ARG,,,A,0.010311,-150.003000,0.000000,0,32767
97,DLDP_DIFF_CURR,,,A,0.023033,-395.918900,0.000000,0,32767
98,RDPD_POW,,,MW,0.004839,35.790940,0.000000,0,32767
0,,,,0.000000,-1.000000,0.000000,0,32767
0,,,,0.000000,-1.000000,0.000000,0,32767

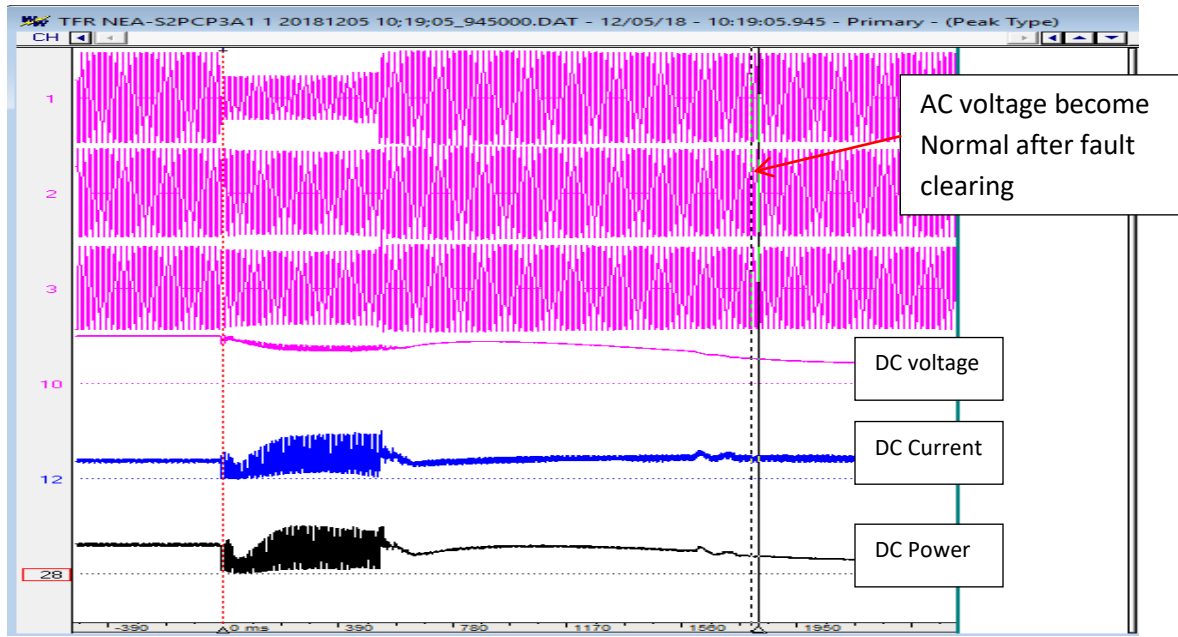
```

2. This event was an AC system fault however it was found that the two HVDC poles have tripped on DC line protection. The reason for the operation of DC line protection on AC fault may please be explained by PGCIL.
3. It is well known that low AC voltage can lead to pick up of DC line protection but there is some interlock to avoid wrong operation of DC line protection. It may kindly be intimated that was there any scope of avoiding DC protection operation by tuning interlock setting?
4. In DC line protection, derivative and level parts are present. Are these two parts are kept in AND logic or OR logic? What is the setting of derivative and level part of DC line protection? This will help in understanding the logic for DC line protection.
5. It is desired that the setting of low AC voltage blocking used to block DC protection during AC system disturbance may also be submitted. This will help in understanding the tripping of HVDC at ERLDC for any future event.
6. Alipurduar end AC system become healthy as soon as the fault is cleared, but as the DC line is common that's why due to persisting low voltage at BNC, APD could not bring the DC voltage to normal. So that APD-AGRA section could have been saved. The relevant plots are given below for Alipurduar end, BNC end and PMU plot of NER nodes. In such scenario, whether protective de-parallelising of only BNC converters was possible to safe guard healthy part of the network. PGCIL may study the possibility with OEM and intimate the ERLDC/ERPC on the finding.

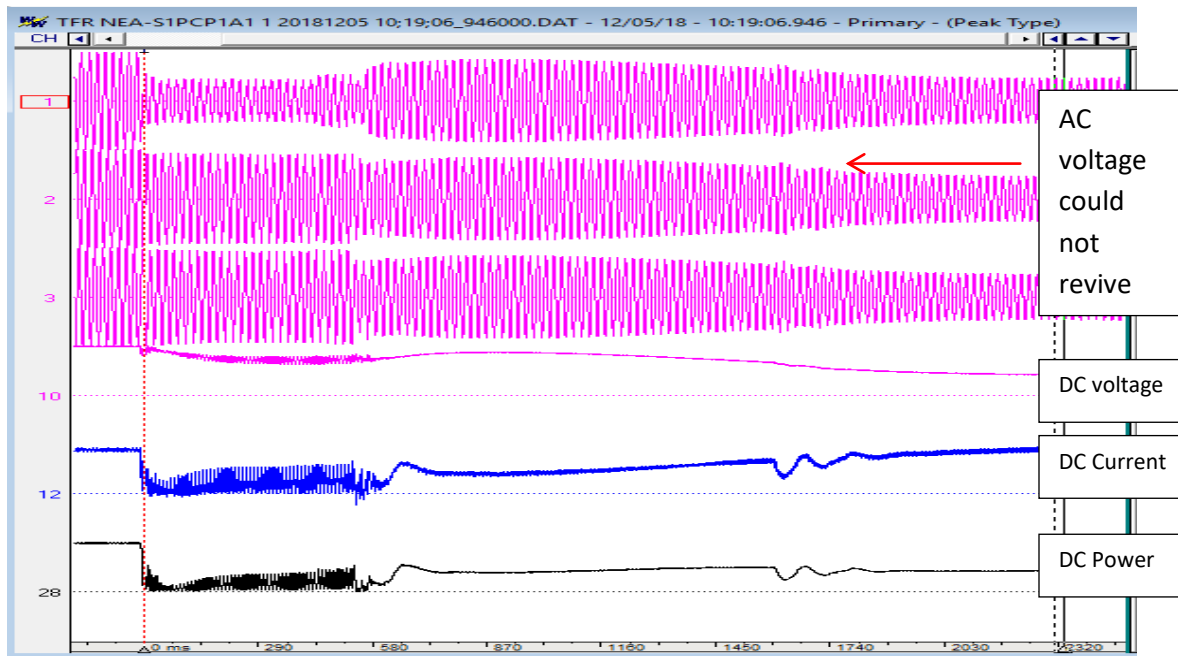
As seen from both PMU plot and DR plots that even after the fault clearing NER system continue to have oscillatory low voltage whereas Alipurduar AC system voltage recovered following fault clearing.

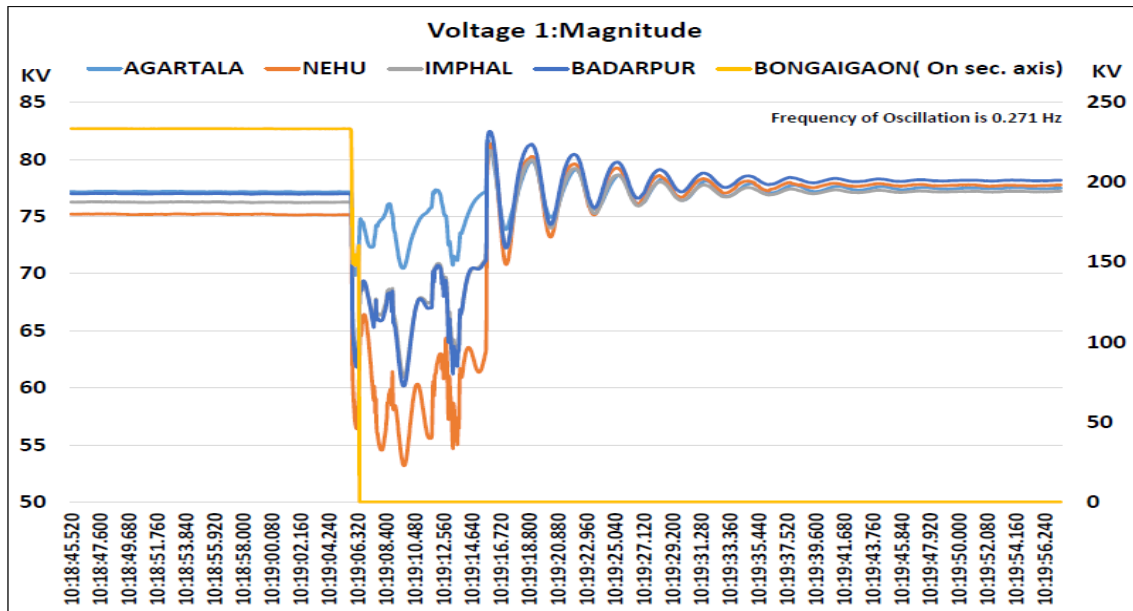
DR plots are as below:

At APD end: pole 3:

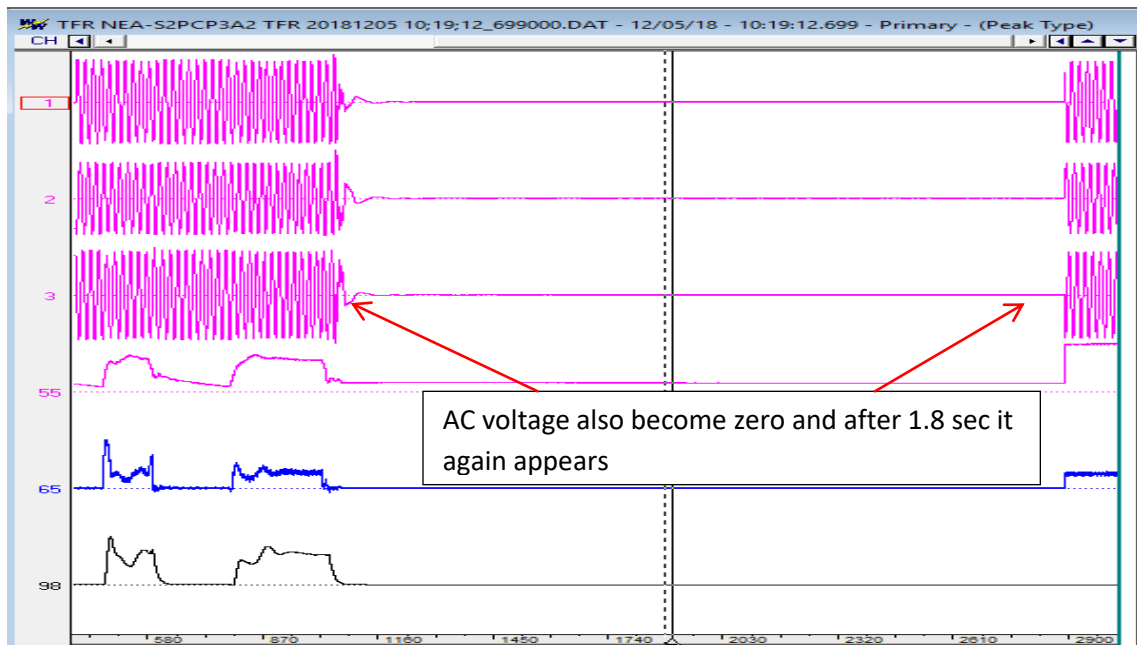


At BNC end: pole 1:





- Also from DR of APD it is seen that approximately 1 sec 800 ms after the blocking of HVDC pole at Alipurduar again around 480 kV Dc voltage is appearing in the line. This may be explained by PGCIL in order to understand the complete event and its progress.



## ANNEXURE-B.6

List of Intra Regional line tripping in the month of December 2018 where violation of protection standard has been observed												
LINE NAME	TRIP DATE	TRIP TIME	RESTORATI ON DATE	RESTORA TION TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	DR/EL RECEIVE D FROM LOCAL END	DR/EL RECEIVE D FROM REMOTE END	Remarks	75th PCC Comments
<b>Miscellaneous: High Fault</b>												
<a href="#">400KV MOTIHARI-BARH-II</a>	07-12-2018	11:25	07-12-2018	11:35	DT received at Motihari		DT received at Motihari	--	Yes		--	DR will be sent by Barh
<a href="#">220KV PUSAULI-SAHUPURI-SC</a>	07-12-2018	16:02	07-12-2018	16:32	RN, 0.98 KA,25.2 KM		R-N Fault	800 msec	Yes		No A/R operation	Z-3 Tripping at Pusauli
<a href="#">400KV KHARAGPUR-KOLAGHAT-I</a>	10-12-2018	16:01	10-12-2018	16:20	DT RECEIVED AT KGP WHILE TRANSFERRING TO MAIN BAY		DT RECEIVED AT KGP WHILE TRANSFERRING TO MAIN BAY	--			--	Communication Channel problem with Kharagpur
<a href="#">220KV ARRAH-NADHOKHAR-SC</a>	11-12-2018	0:40	11-12-2018	1:45		Nadokar: CB Auto trip, charged but tripped		--				Voltage at the time of tripping was 242 KV,Relay setting of O/V= 110% (242KV), Line was charged on no load from Arrah
<a href="#">765KV ANGUL-JHARSUGUDA-III</a>	17-12-2018	3:21	17-12-2018	4:05	DT SENT BY ANGUL		DT SENT BY ANGUL	--			--	Some wiring issue, solved
<a href="#">400KV PPSP-NEW PPSP-II</a>	17-12-2018	6:56	17-12-2018	9:56	LINE DIFFERENTIAL PROTN. OPTD.		LINE DIFFERENTIAL PROTN. OPTD.				No fault signature in PMU	Line differential relay (Main-1) at PPSP end suddenly mal-operated, WB approached Siemens to solve the issue
400KV NEW PPSP-NEW RANCHI-II	20-12-2018	8:46	20-12-2018	9:25	NO TRIPPING AT N PPSP END	DT Received at N Ranchi end	DT Received at N Ranchi end	--		Yes	--	no increase in DT sent of Carrier sent counter at New PPSP end
<a href="#">400KV MEERAMUNDALI-MENDHASAL-SC</a>	27-12-2018	17:40	27-12-2018	19:42	No tripping	Master trip signal at Mendhasal; 2nd time for 18:29, master trip operated	Master trip signal at Mendhasal	--			--	PLCC mal function, Replacement work in progress
<b>Autoreclose related issues</b>												
<a href="#">400KV KOLAGHAT-KHARAGPUR-II</a>	09-12-2018	13:32	09-12-2018	14:10	RN, 36.73 KM	RN, 20 KM, 1.6 KA	R-N Fault	< 100 msec	Yes	Yes	No A/R operation	DT signal accompanying the permissive signal from KTPS end. This problem of communication system could not be rectified. Digital protection coupler for the line shall be commissioned shortly
<a href="#">400KV DURGAPUR-SAGARDIGHI-II</a>	10-12-2018	9:28	10-12-2018	13:46	B-N Fault, A/R SUCCESSFUL FROM DURGAPUR END ONLY		B-N Fault	< 100 msec	Yes	Yes	No A/R operation	A/R initiated but Blocked at Sagardighi, A/R scheme under review, update will be given in next PCC
<a href="#">400KV PATNA-BARH-I</a>	19-12-2018	5:12	19-12-2018	5:46	A/R successful	BN, 15.07 KM, 20.23 KA	B-N Fault	< 100 msec	Yes		No A/R operation	Barh will update in next PCC
<a href="#">220KV PARULIA-DURGAPUR-II</a>	19-12-2018	11:57	19-12-2018	13:24	B-N , F/D-7.1 KM , F/CS.6KA		B-N Fault	< 100 msec			No A/R operation	Differential protection suggested by Powergrid
<a href="#">220KV BARIPADA-BALASORE-I</a>	20-12-2018	16:26	20-12-2018	21:47	R_ph LA burst at Baripada end		R_ph LA burst at Baripada end	< 100 msec			No A/R operation	PLCC project work in progress
<a href="#">220KV GAYA-SONENAGAR-II</a>	24-12-2018	23:28	24-12-2018	11:48	R-N, 64.9KM, 2.54KA, A/R Successful		R-N Fault	< 100 msec			No A/R operation	Issue has been raised to M/s GE for checking A/R related setting.
<a href="#">220KV PUSAULI-DEHRI-SC</a>	25-12-2018	12:59			RN, 39.4 KM, 3.4 KA		R-N Fault	< 100 msec	Yes		No A/R operation	PLCC work is going on

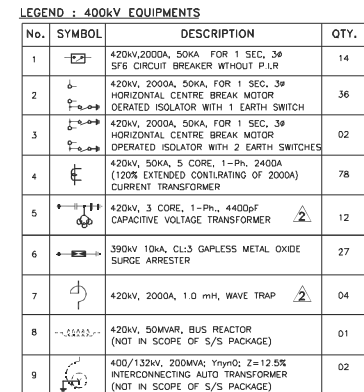
# **Disturbance at 400 kV-Switchyard BRBCL-Nabinagar .**

**400 KV Bus-II tripping  
On**

**25.11.2018**

# Sequence of events

- On- 25.11.2018 at 16:31 hrs, 400 kV Bus-II at BRBCL tripped on Busbar protection
- Main CB of GT-1 & Tie CB between 400/132 kV ICT-1 Tripped .
- Main bay tripping of 400 KV Sasaram line-1 led to DT sending in remote end leading to outage of the line.



**NOTE:**

1. WAVE TRAP LOCATIONS MENTIONED ARE FOR INDICATIVE PURPOSE ONLY; THE SAME SHALL BE AS PER NTPC'S DIRECTIONS.
2. 8800PF & 4400PF CVT'S AND 0.5mH & 1.0mH WAVE TRAPS SHOWN IN SASARAM LINE-1 & SASARAM LINE-2 ARE TENTATIVE AND SHALL BE FINALIZED AS PER NTPC'S DIRECTIONS. AFTER THE RECEIPT OF CVT & WT DETAILS OF OTHER END.

CORE DETAILS OF 400kV CT's (120% EXTENDED RATING OF 2000A)

CODE NO.	APPLICATION	CURRENT RATIO (A)	OUTPUT BURDEN (VA)	ACCURACY CLASS AS PER IEC 185	MIN. KNEE POINT VOLTAGE (VOLTS)	MAX. CT SECONDARY WINDING RESISTANCE (OHMS)	MAX. EXCITING CURRENT (mA) AT KNEE POINT VOLTAGE
1	BUS DIFFERENTIAL CHECK	2000-1000/1	—	PS	2000-1000	10 5	30 ON 2000V/1TAF 60 ON 1000V/1TAF
2	BUS DIFFERENTIAL MAIN	2000-1000/1	—	PS	2000-1000	10 5	30 ON 2000V/1TAF 60 ON 1000V/1TAF
3	METERING	2000-1000-500/1	20 1000-20 20	0.2 — 0.2	— — —	— — —	— — —
4	TRANSF. BACKUP/ L.NE. BACKUP PROTECTION	2000-1000-500/1	—	PS	4000-2000-1000	10 5 2.5	30 ON 2000V/1TAF 60 ON 1000V/1TAF 120 ON 500V/1TAF
5	TRANSF. DIFF./ L.NE. PROTECTION	2000-1000-500/1	—	PS	4000-2000-1000	10 5 2.5	30 ON 2000V/1TAF 60 ON 1000V/1TAF 120 ON 500V/1TAF

CORE DETAILS OF 400kV CVT's

PARTICULARS	PRIMARY	SECONDARY I	SECONDARY II	SECONDARY III
RATED SECONDARY VOLTAGE		110V/ $\sqrt{3}$	110V/ $\sqrt{3}$	110V/ $\sqrt{3}$
APPLICATION		PROTECTION	PROTECTION	METERING
ACCURACY	400kV/ $\sqrt{3}$	3P	3P	0.2
OUTPUT BURDEN (MINIMUM)		75VA	75VA	75VA

We reserve all rights in this document and in the information contained there in Reproduction, use or disclosure to third parties without express authority is strictly forbidden. ©ABB.

<b>BHARATIYA RAIL BIJLEE COMPANY LTD.</b> (A JOINT VENTURE COMPANY BETWEEN NTPC LIMITED AND MINISTRY OF RAILWAYS)			
<div style="border: 2px solid black; padding: 5px; display: inline-block;"> <b>एन टी सी</b>  <b>NTPC</b> </div>	<b>NTPC LIMITED</b> (A GOVERNMENT OF INDIA ENTERPRISE)		
CONTRACT NO.	N.T.P.C. DRAWING NO.		
	0270-572-PVE-P-002		
<b>NABINAGAR THERMAL POWER PROJECT (4x250MW)</b>			
NOA NO.: CS-0270-572-2-FC-NOA-88A-09-10			
<b>400KV SWITCHYARD SINGLE LINE DIAGRAM</b>			
DRAWN <i>Shankar</i> CHECKED <i>DAVA</i> APPROVED <i>SP</i>	SCALE <b>3VN1004551002</b>		

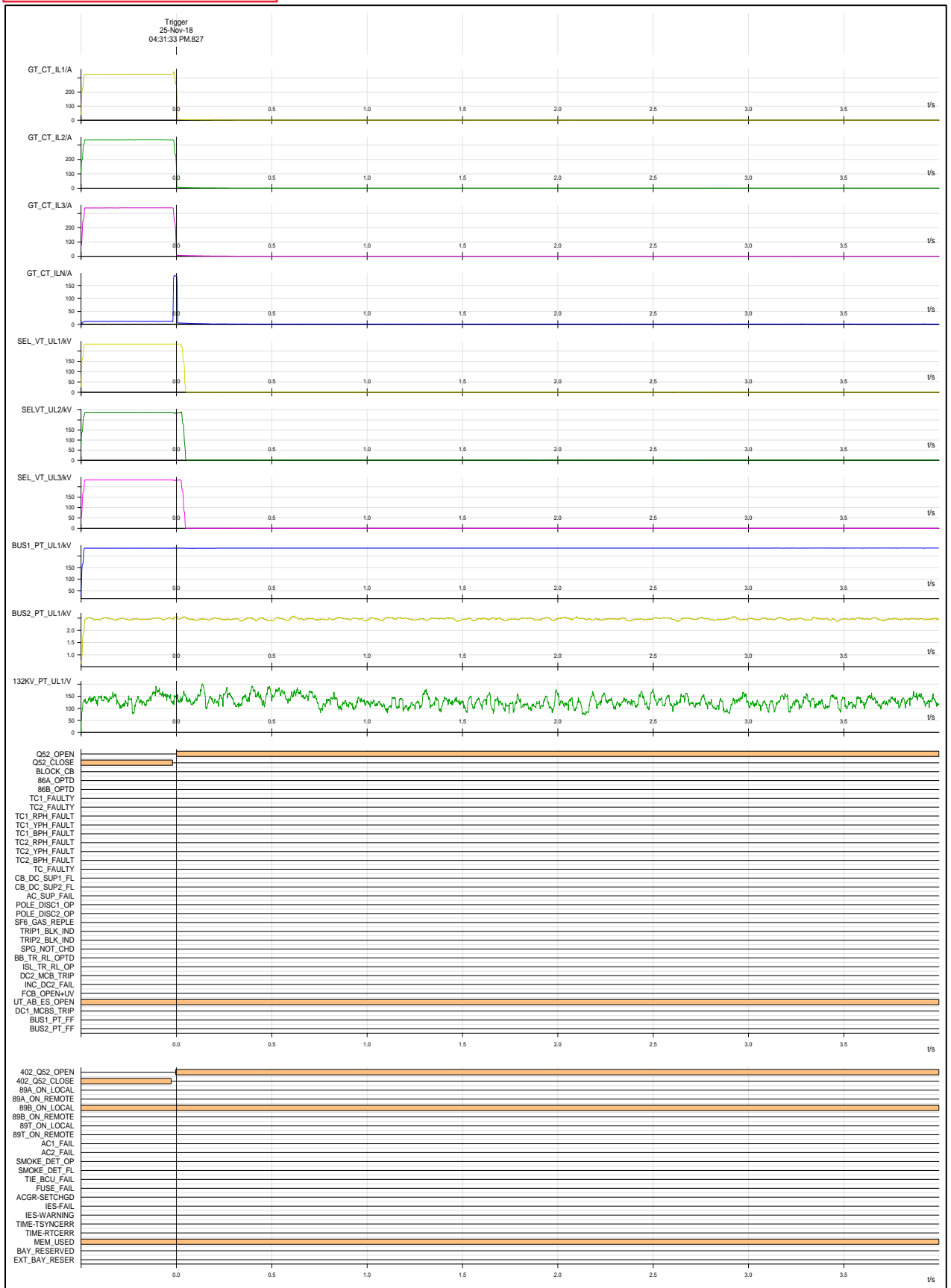
REV-2	10.05.2011	WAVE TRAP AND CIVI RATING REVISED			
REV-1	03.06.2010	AS PER NTPC COMMENTS			
REV-0	16.06.2010	FIRST SUBMISSION			
INDEX	DATE	REMARKS	APPROVAL CAT.	DATE	ISSUED FOR CONSTRUCTION

# FAULT ANALYSIS & RESTORATION

- No fault has been observed at the time of the event-(figure-2)
- **Restoration:**
- 400KV Sasaram Nabinagar- I was charged at 18:02 hrs
- 400 KV Bus II was normalized at 19:53 hrs
- 400/132 KV 200 MVA ICT I was normalized at 19:56 hrs
- UNIT#1 SYNCHRONIZED at 22.10 hrs.



## DR- BRBCL - UNIT#1

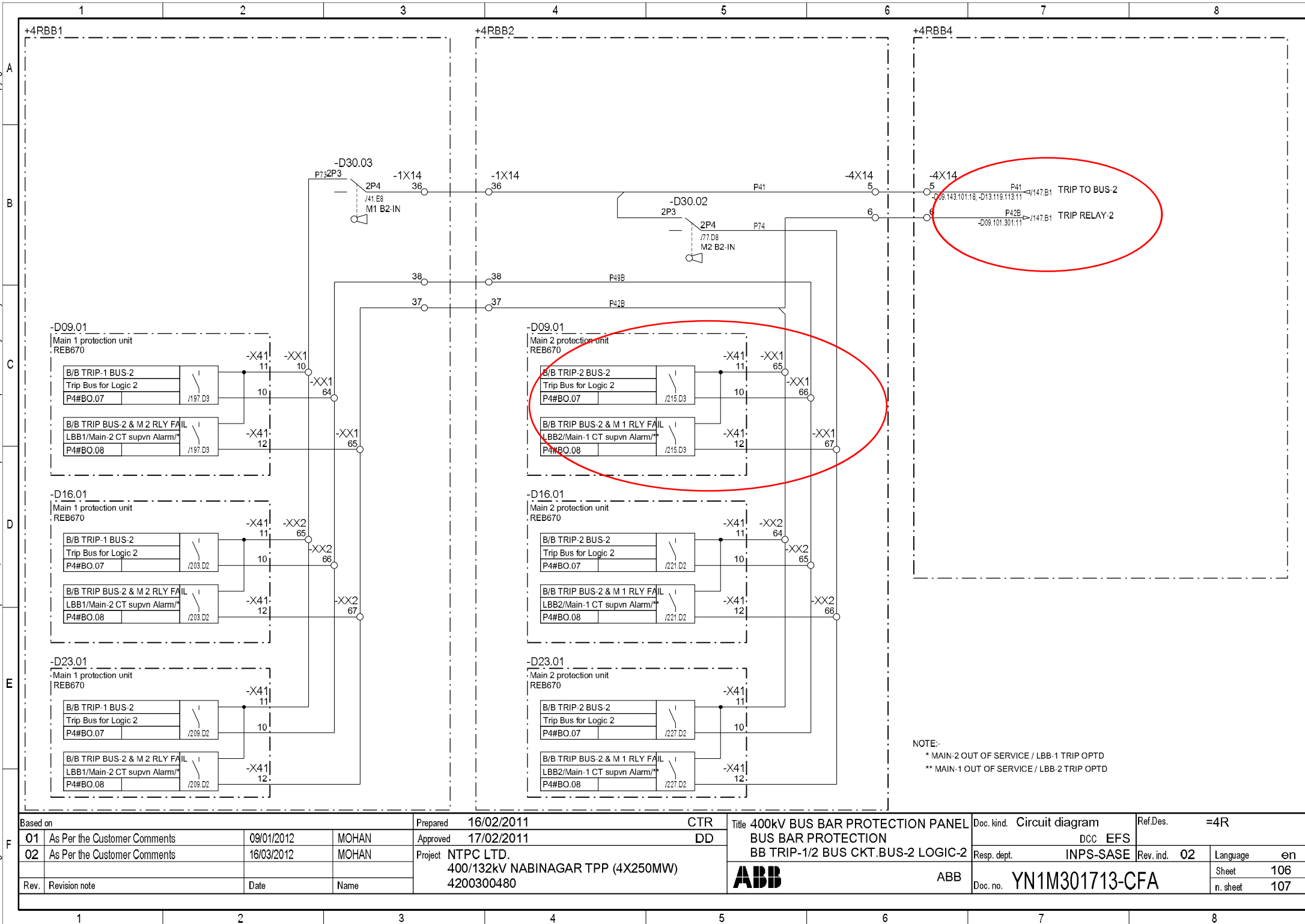


# Detailed Analysis of Points Raised

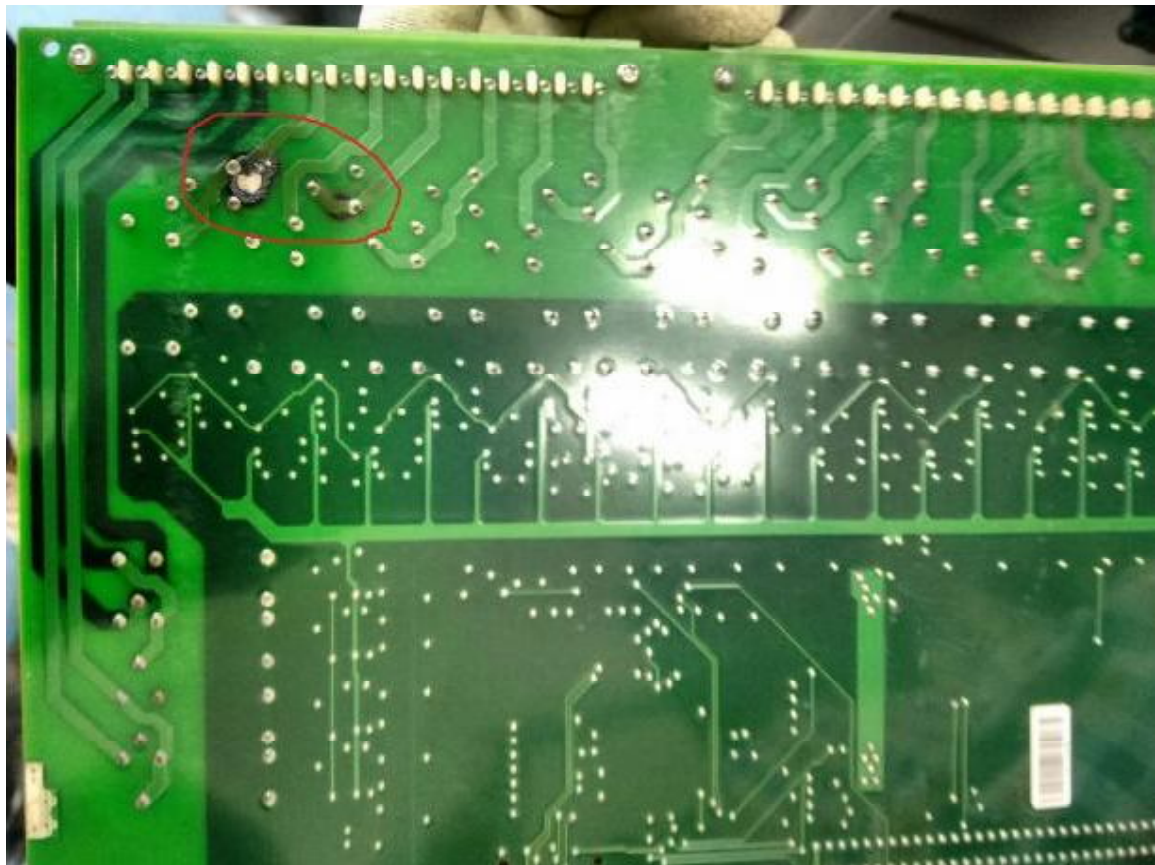
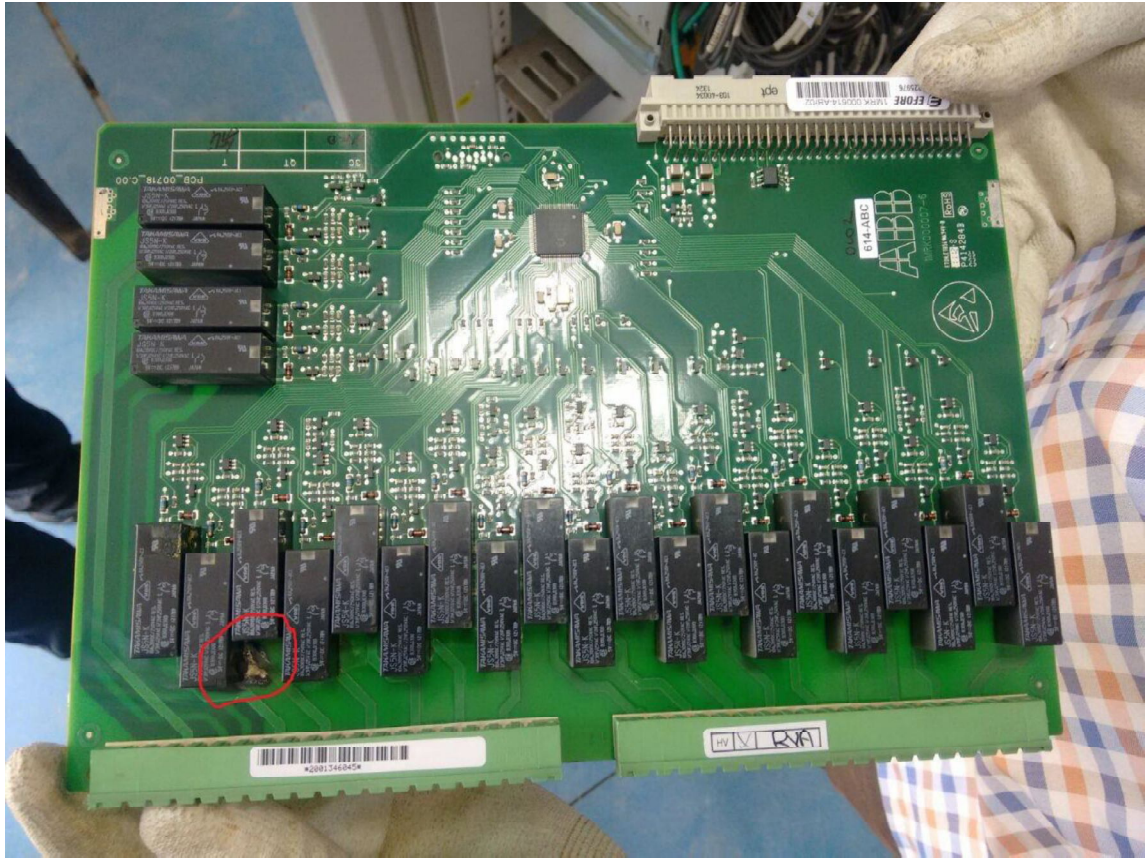
- *Reason for mal operation of Busbar Relay which tripped 400 kV Bus-II.*
- *Reason for tripping of tie circuit Breaker between 400/132 kV ICT – I & GT – I at the same time*
- *Reason for tripping of 400 kV Sasaram-1 line.*
- *Necessary Action Taken*

## ***Reason for mal operation of Busbar Relay which tripped 400 kV Bus-II.***

- At BRBCL- FOR BUSBAR PROTECTION ABB make-N/R REB-670 are Commissioned
- Having various BIM & BOM MODULES .
- BUSBAR- REALY- M2 - R-PAHSE BOM-4,  
(BINARY OUTPUT MODULE ) FOUND TO BE  
FAILED- VARIUOS BO REALYS FOUND  
SHORTED- WHICH CAUSED DIRECT  
ACTUATION OF ALL TRIPPING RELAYS(96)OF  
BUS-2 .



Based on				Prepared	16/02/2011	CTR	Title 400kV BUS BAR PROTECTION PANEL BUS BAR PROTECTION BB TRIP-1/2 BUS CKT.BUS-2 LOGIC-2  <b>ABB</b> ABB	Doc. kind.	Circuit diagram	Ref.Des.	=4R			
01	As Per the Customer Comments	09/01/2012	MOHAN	Approved	17/02/2011	DD		DCC	EFS					
02	As Per the Customer Comments	16/03/2012	MOHAN	Project	NTPC LTD. 400/132kV NABINAGAR TPP (4X250MW) 4200300480			Resp. dept.	INPS-SASE	Rev. ind.	02	Language	en	
Rev.		Revision note	Date	Name				Doc. no.	YN1M301713-CFA				Sheet	106
													n. sheet	107



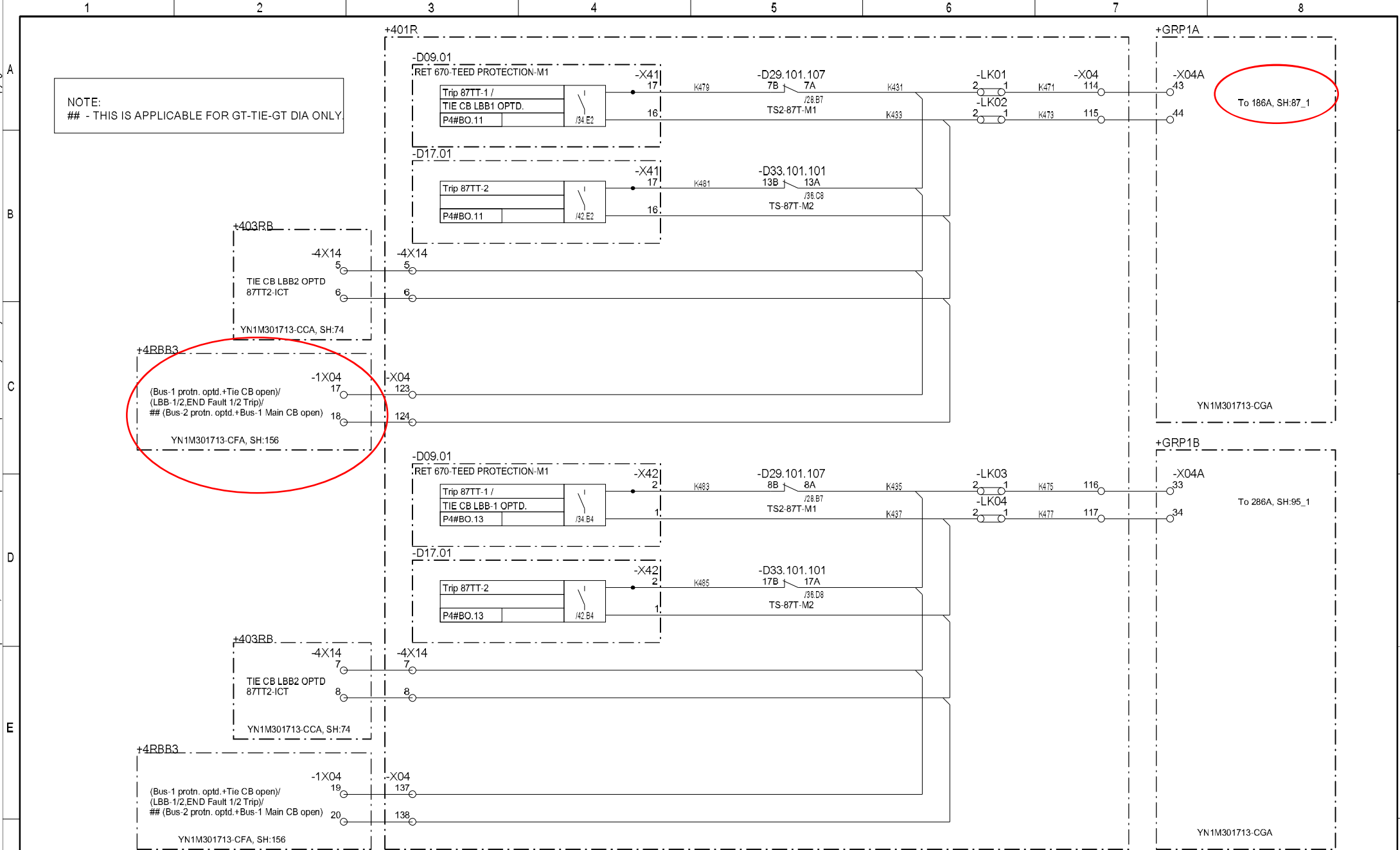


## ***Reason for tripping of tie circuit Breaker between 400/132 kV ICT – 1 & GT – 1 at the same time***

- One Direct Trip(BO) is envisaged from LBB –protection(from the subject relay) to generator protection - (which actuates master trip-86A of unit protection)
- Master Trip-class-A(86A) of unit protection acts to trip main & tie both - which caused tripping of UNIT#1 GT & tie CB between ICT-1 & GT-1

Print: 31/10/2022 12:40:00 PM Z:\MOHAN\NTPC NABINAGAR\4200300480\01. DRAWING SUBMISSIONS\REV.02 Drawings\40KV\YN1M301713-AA\_40KV GT PROTN PANEL.s3s  
We reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third parties without express authority is strictly forbidden.

© Copyright 2010 ABB



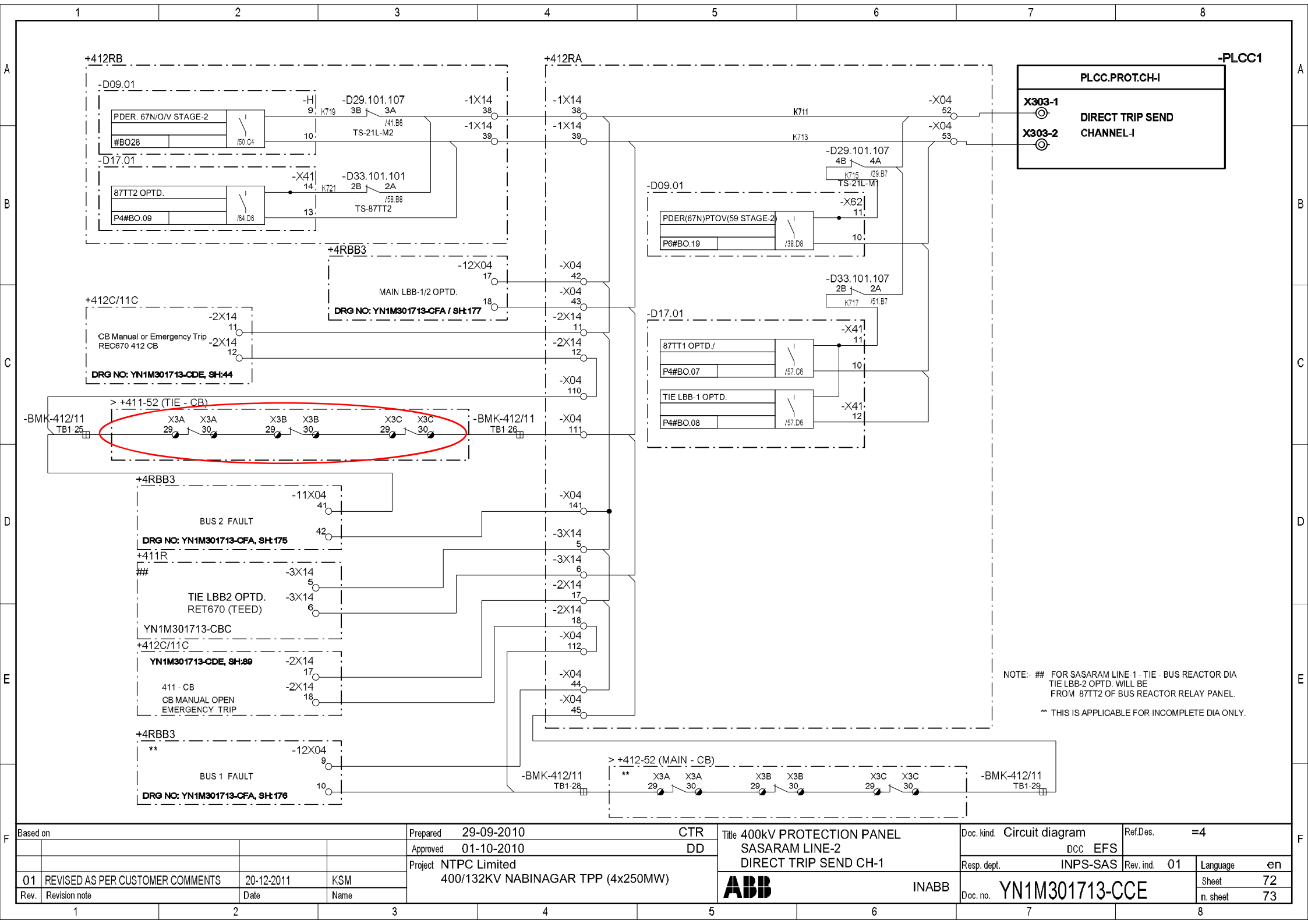
F	Based on				Prepared 08.09.2010		KSM	Title 400kV PROTECTION PANEL GENERATOR TRANSFORMER INTERFACE CKT	Doc. kind. Circuit diagram		Ref.Des. =4R	
	01	REVISED AS PER CUSTOMER COMMENTS	03-11-2011	KSM	Approved 14.09.2010		NT		DCC EFS			
	02	REVISED AS PER CUSTOMER COMMENTS	19-01-2012	KSM	Project NTPC LTD. 400/132kV NABINAGAR TPP (4X250MW) 4200300480			Resp. dept. INPS-SASE	Rev. ind. 02	Language en		
	Rev. Revision note		Date	Name						Sheet 52		
	1MYN691003-102(A3)REV01							ABB	ABB INDIA	Doc. no. YN1M301713-CAA	n. sheet 55	



## ***Reason for tripping of 400 kV BRBCL-Sasaram-1 line***

- As per logic DT will be send in the case of Tie Breaker open & Bus-2 Fault occurs.
- It has been observed that Tie Breaker open feedback was persisting due to some wiring issue, so when Bus-2 Fault occurred (96 relays operated ) DT was send to Remote END & *400 kV BRBCL-Sasaram-1 line got Opened.*
- The wiring issue is resolved & the logic is found correct.





Based on				Prepared 29-09-2010 CTR		Title 400kV PROTECTION PANEL		Doc. kind. Circuit diagram		Ref.Des. =4	
				Approved 01-10-2010 DD		SASARAM LINE-2		DCC EFS			
				Project NTPC Limited		DIRECT TRIP SEND CH-1		Resp. dept. INPS-SAS		Rev. ind. 01	
01 REVISED AS PER CUSTOMER COMMENTS				20-12-2011		KSM				Language en	
Rev. Revision note				Date		Name				Sheet 72	
										n. sheet 73	

# *Necessary Action Taken*

- Bus Bar scheme has been thoroughly checked , all logics and wiring checked so that such event does not occur again and such protection system mal-operation could be avoided in future
- Protection system & Relays are checked thoroughly & also referred to M/S ABB for analyzing the event of Relay failure & BOM - ERROR the case is actively being followed by NTPC- Engineering
- As the remedial measure the faulty Relay is being replaced by new relay & faulty relay is being send to OEM(ABB) for analyzing the problem

Sl No.	Name of the incidence	PCC Recommendation	Latest status
<b>74<sup>th</sup> PCC Meeting</b>			
1.	Disturbance at 220 kV TTPS (NTPC) S/s on 29.11.18 at 07:21 hrs	<p>PCC advised NTPC to verify the PSL logic in the distance relay and check the reason for distance relay pickup in this case.</p> <p>PCC felt that 3.1 sec for pole discrepancy timer is quite high and advised NTPC to review the pole discrepancy timer settings.</p>	NTPC informed that revised PD timer settings will be implemented very shortly. They added that the PSL logic for PD tripping also has been changed so that the tripping command will directly go to trip coils without initiating 86 relay.
2.	Multiple tripping incident at Darbhanga at 13:33 hrs on 06-11-18 and at 15:23 hrs on 06-11-18	PCC suggested to keep the highset setting more than 7 and advised DMTCL to review the settings.	
3.	Tripping of 400 kV KTPP Kharagpur - I S/C on 11.11.18	PCC advised WBSETCL and WBPDCCL to coordinate autorecloser discrimination time with the dead time of circuit breaker.	WBSETCL informed that the autorecloser settings have been corrected.
4.	Tripping of 400 KTPP New Chanditala S/C at 12:12 hrs on 15.11.18	PCC advised WBPDCCL to verify zone-3 time settings as well as TOR settings.	It was informed that the setting has already been revised.
5.	Tripping of 400 kV Jeerat-Bakreswar S/C at 00:22 hrs on 18.11.18	PCC observed that sampling frequency and time duration of DR at Bakreswar end is not proper and advised WBPDCCL to take necessary action.	WBPDCCL informed that DR in numerical relay settings were correct but the standalone DR has limitation. PCC advised WBPDCCL to submit the DR of numerical relay to ERPC and ERLDC in future.
6.	Tripping of 400 kV KTPP-Kharagpur-2 & 400 KTPP-New Chanditala S/C at 12:21 hrs on 23.11.18	<p>PCC advised WBPDCCL to submit a report explaining the following points.</p> <ul style="list-style-type: none"> <li>Reason for tripping of Y &amp; B</li> </ul>	WBPDCCL informed that the pole discrepancy relay was found healthy.

		<p>phase breaker in 400 KTPP-New Chanditala S/C line and subsequently non-operation of pole discrepancy relay at KTPP end.</p> <ul style="list-style-type: none"> <li>Reason for sending carrier signal from KTPP end to New Chanditala end.</li> <li>Reason for delayed opening of R-phase breaker(manually) of 400 KTPP-New Chanditala S/C line at KTPP end.</li> </ul> <p>PCC also advised WBSETCL and WBPDCCL to verify the DEF status for 400 KTPP-New Chanditala S/C line at respective end.</p>	The reason for operation of PD relay on that day could not be found out.
7.	Total power failure at 220kV Hatia (JUSNL) S/s on 20.07.18 at 09:10 hrs.	PCC also advised JUSNL to test the healthiness of the relays at 220kV Patratu and 220/132kV Hatia S/s on urgent basis.	JUSNL informed that testing for healthiness of relays will be done by third party vendor. The work has already been awarded to the vendor and it will be completed by February' 19.
<b>73<sup>rd</sup> PCC Meeting</b>			
8.	Total Power failure at 220 kV Hatia (JUSNL) substation on 03.10.18 at 17:23 hrs and on 04.10.18 at 00:26 hrs	PCC advised JUSNL to test the Bus bar and LBB protection, PLCC and configuration of DT signal in the relay at Hatia end.	JUSNL informed that the testing of PLCC and Protection system will be completed by February' 19.
9.	Total Power failure at Madhepura(BSPTCL) S/s on 20.10.18 at 09:48 hrs.	PCC advised BSPTCL to check for any trippings in downstream network.	BSPTCL informed that there was no tripping in the downstream system on 20.10.18.
10.	Total Power failure at TLDP-III S/s on 27.10.18 at 10:24 hrs.	PCC advised WBSETCL and NHPC to review the DEF settings for proper protection coordination between the transmission lines and generating	PCC advised PRDC to coordinate the settings with reference to GT of

		station.	TLDP side.
<b>72<sup>nd</sup> PCC Meeting</b>			
11.	HVDC TFR triggering standardization and reporting requirements.	PCC advised POWERGRID to submit TFR triggering criteria and TFR signal list for all HVDC station of Eastern region to ERLDC	
<b>71<sup>st</sup> PCC Meeting</b>			
12.	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.	BSPTCL informed that DR of 15.08.18 is not available in the relay. They added that OEM will visit the station for reconfiguration of relay.
13.	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.	NTPC informed that the relay has been replaced. They added that the carrier healthiness will be checked at next available shutdown.
<b>68<sup>th</sup> PCC Meeting</b>			
14.	Issues related with Generation Backing down during Talcher-Kolar SPS operation on 16th May 2018.	<p>PCC advised Powergrid to explore for inclusion of pole block with ground return mode signal in the SPS logic.</p> <p>PCC advised NTPC also to explore for inclusion of pole block with ground return mode signal in the SPS logic.</p>	<p>Powergrid informed that the issue was referred to OEM but OEM was not responding.</p> <p>PCC advised Powergrid to coordinate with Kolar end as the same issue has already been resolved at their end.</p>
15.	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.	

**ERPC Proposed****Guide Lines**

**Triggering criteria for DR :** Any Start  
**DR time window :** minimum 3 seconds.

**Pre-fault time window (S):**

**Post fault time window (S):**

**Minimum sampling frequency:** 1000 Hz

**Analog signals as per priority**

**A. Mandatory signals:**

1. Three phase voltage
2. Neutral voltage
3. Three phase current
4. Neutral current

**B. Optional signals:**

1. Mutual current
2. Check Sync

3. Open Delta

**Digital signals as per priority**

**A. Mandatory signals:**

1. Any Start
2. Any trip
3. Z1, Z2, Z3, Z4 pick up
4. Over current and Earth fault pick up
5. Over voltage stage I & II pick up
6. DT send & reverse
7. Carrier send & Receive
8. Main three phase CB open signal
9. Tie three phase CB open signal (where applicable)
10. Power Swing
11. SOTF/TOR
12. LBB
13. A/R L/O
14. Main-1/2 operated
15. Bus Bar trip
16. VT failure
17. Distance Forward & Reverse
18. T1, T2, T3, T4
19. Broken conductor
20. 86A & 86B
21. A/R 1P In Prog
22. A/R Fail
23. STUB/TEED (where applicable)

**B. Optional signals:**

1. Any External input
2. Any Binary Input

Internal protection trip signals, external trigger input, analog triggering (any phase current exceeding 1.5 pu of CT secondary current or any phase voltage below 0.8pu, neutral/residual overcurrent greater than 0.25pu of CT secondary current).  
 minimum 2 seconds.

0.5 -

2.5

64 Samples Per Cycle

0.3

1. Three phase-to-neutral voltages
2. Three phase currents and neutral currents.
3. Neutral Currents
4. Frequency

1. Polarizing currents and voltages, if used.
  2. Real and reactive power
- The Minimum parameters to be monitored in the Fault record shall be specified by the respective RPC.

## ERPC Proposed

## Guide Lines

**Triggering criteria for DR :** Any Start  
**DR time window :** minimum 3 seconds.

**Pre-fault time window (S):**

**Post fault time window (S):**

**Minimum sampling frequency:** 3200Hz

**Analog signals as per priority**

**A. Mandatory signals:**

1. Three Phase Currents & Neutral Currents of HV
2. Three Phase Currents & Neutral Currents of LV
3. Three Phase Currents & Neutral Currents of MV
4. I Ref HV
5. I Ref LV
6. I Ref MV
7. Voltages
8. Frequency
9. Differential Currents
10. Restraining Currents
11. Low Impedance REF-DIFF - of all windings
12. Low Impedance REF-Restraining - of all windings

**Digital signals as per priority**

1. Any Start
2. Any trip
3. Differential Trip
3. REF Trip HV, MV & LV
4. Over-current Trip
5. Earth Fault Trip
6. Over Flux
7. Over Voltage
8. Under Voltage
9. 2nd Harmonic
10. 5th Harmonic
11. Frequency Protection
12. External Trip Signals

Internal protection trip signals, external trigger input, analog triggering (any phase current exceeding 1.5 pu of CT secondary current or any phase voltage below 0.8pu, neutral/residual overcurrent greater than 0.25pu of CT secondary current).  
minimum 2 seconds.

0.5 -

2.5

64 Samples Per Cycle

0.3

**ERPC Proposed**

**Guide Lines**

Internal protection trip signals, external trigger input, analog triggering (any phase current exceeding 1.5 pu of CT secondary current or any phase voltage below 0.8pu, neutral/residual overcurrent greater than 0.25pu of CT secondary current).  
minimum 2 seconds.

0.5 -  
2.5 0.3  
64 Samples Per Cycle

- Triggering criteria for DR :** Any Start  
**DR time window :** minimum 3 seconds.  
**Pre-fault time window (S):**  
**Post fault time window (S):**  
**Minimum sampling frequency:** 3200Hz  
**Analog signals as per priority**  
**A. Mandatory signals:**
1. 3Phase Diff Current
  2. 3Phase Bias Current
  3. Neutral Differential Current
  4. Neutral Bias Current
- B. Optional Signals:**
1. Individual Feeder Currenrts if available
  2. Zone wise Differential and Bias Currents
- Digital signals as per priority**
1. Any Start
  2. Any trip
  3. R-Phase Fault
  4. Y-Phase Fault
  5. B-Phase Fault
  6. Earth Fault
  7. Check Zone Operated
  8. Zone 1 BB Fault
  9. Zone 2 BB Fault
  10. Trip Bus bar Zone 1
  11. Trip Bus bar Zone 2
  12. Trip Breaker Failure Zone 1
  13. Trip Breaker Failure Zone 2
  14. Bus bar Differential Blocked



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

**NAME OF ORGANISATION:**  
**FOR THE MONTH OF:**

**SUBSTATION DETAIL:**

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

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