



Agenda for 76th PCC Meeting

Date: 14.02.2019
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 76TH PROTECTION SUB-COMMITTEE MEETING TO BE HELD AT ERPC, KOLKATA ON 14.02.2019 (THURSDAY) AT 11:00 HOURS

PART – A

ITEM NO. A.1: Confirmation of minutes of 75th Protection sub-Committee Meeting held on 22nd January, 2019 at ERPC, Kolkata.

The minutes of 75th Protection Sub-Committee meeting held on 22.01.19 circulated vide letter dated 06.02.19.

Members may confirm the minutes of 75th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN January, 2019

ITEM NO. B.1: Disturbance at 220kV New Bargarh S/S on 05-01-19 at 10:51 hrs.

220 kV New Bolangir - Bolangir (PG) was under shutdown. 220 kV New Bolangir - New Bargarh S/C was the only source to New Bolangir S/S.

At 10:52 hrs, 160 MVA 220/132 kV ATR - I tripped on REF, differential protection at New Bargarh S/S. Simultaneously B/B protection operated at New Bargarh S/S which led the tripping of 220 kV New Bargarh - New Bolangir S/C, 220 kV New Bargarh - Katapalli S/C and 220/132 kV 160 MVA ATR - II followed by station black out of 220 kV New Bargarh and New Bolangir S/S.

As per ERLDC SOE data, 400/220 kV ICT I & II tripped at Bolangir (PG) S/S (ICT II from both sides, ICT I from 220 kV side).

Load loss 100 MW

Fault was cleared within 100 ms as per the PMU data.

OPTCL and Powergrid may explain.

ITEM NO. B.2: Disturbance at 220 kV Katapalli S/s on 07.01.2019 at 15:40 hrs.

220 kV Katapalli - Bolangir S/C along with 220 kV Katapalli - Hindalco D/C, 132 kV Katapalli - Burla D/C and 132 kV Katapalli Chiplima D/C tripped due to snapping of R phase jumper of 220 kV Katapalli - Bolangir S/C.

OPTCL may explain.

ITEM NO. B.3: Disturbance at 400kV Gaya(PG), 220kV Gaya and Bodhgaya on 05-01-19 at 11:20 hrs.

220 kV Gaya - Bodhgaya D/C and 220 kV Gaya Khijasarai D/C tripped on Y-B fault on both sides. At the same time, 220 kV Bodhgaya- Khijasarai D/C tripped from Khijasarai end. Relay indications are as follows:

Name	Relay Indication at End 1	Relay Indication at End 2
220 kV Gaya Bodhgaya I	Y-B, Z-I, 12 kA, carrier sent	Y-B, Z-II, 5 kA; No carrier received
220 kV Gaya Bodhgaya II	Y-B, Z-II, 5.75 kA, carrier sent	Z-III started but later reset. After 500 ms, line tripped from Bodhgaya end; No initiation recorded in DR.
220 kV Bodhgaya Khijasarai I	Did not trip	Y-B, 74 km (143.5%)
220 kV Bodhgaya Khijasarai II	Did not trip	Y-B, 74 km (143.2%)
220 kV Gaya Khijasarai I	DT received; Gr B operated	Y-B, 1.3 KA, 75.9 km (135%); instantaneous trip command issued
220 kV Gaya Khijasarai II	DT received; Gr B operated	Y-B, 1.3 KA, 76.8 km (136%); instantaneous trip command issued

In PMU data, fault was cleared after 350 ms.

Load loss 150 MW

BSPTCL and Powergrid may explain.

ITEM NO. B.4: Disturbance at 400kV Gaya(PG), 220kV Gaya and Bodhgaya on 09-01-19 at 12:44 hrs.

220 KV Main Bus II at Gaya tripped at 12:44 Hrs along with '400/220 KV 315 MVA ICT II at Gaya, 220 KV Gaya-Khijasarai II, 220 KV Gaya-Sonenagar II, 220 KV Gaya-Dehri I, 220 KV Gaya-Bodhgaya I & 220 KV Bus Coupler at Gaya

BSPTCL and Powergrid may explain.

ITEM NO. B.5: Disturbance at 220kV Hazipur on 23-01-19 at 12:33 hrs.

All lines emanating from Hazipur tripped due to fire hazard in 220 kV GIS bay of Amnour at Hazipur due to SF6 gas leakage.

BSPTCL may explain.

ITEM NO. B.6: Disturbance at 400 kV Muzaffarpur S/s on 05.01.2019 at 06:56 hrs.

400 kV Muzaffarpur - Gorakhpur D/C & 400 kV Bus II at Muzaffarpur tripped.

Powergrid may explain.

ITEM NO. B.7: Disturbance at 400kV Bakreswar S/s on 21.01.2019 at 02:29 hrs.

220 kV bus II along with 400/220 kV ICT II at Bakreswar, 220 kV Bakreswar - Bidhannagar - II, 220 kV Barkreswar - Sadai - II, 220 kV Bakreswar - Bidhannagar - II tripped due to CT burst of 220 kV Bakreswar - Bidhannagar - II at Bidhannagar end.

WBPDCCL and WBSSETCL may explain.

ITEM NO. B.8: Disturbance at 220kV New Jalpaiguri S/s on 06.01.2019 at 20:34 hrs.

220KV NJP-TLDP IV-II, 220KV BINAGURI-NJP-I & 220 kV Bus I at NJP tripped.

WBSSETCL, Powergrid and TLDP may explain.

76th PCC Agenda

ITEM NO. B.9: Islanding of CESC on 19.01.19 at 1845 Hrs: ERLDC

At 18:52 hrs. BBGS Unit-3 tripped due to Condenser Vacuum Low resulting in load shed through Unit Lock Out (ULO) scheme. At the same time all three 132 kV CESC Circuits tripped from WBSETCL Howrah Substation through operation of Back Up Overcurrent Relays causing islanding of CESC System from the Grid. Frequency in the islanded CESC system fell sharply causing Under-frequency relays to operate entailing load shed at different Frequency levels. Ultimately islanded Frequency rose and Restoration of Supply commenced from 18:55 Hrs. and all supply was restored at 19:10 hrs. CESC system was synchronized with grid at Kasba point of supply at 18:58 hrs. Synchronizing point of CESC system shifted from Kasba to Howrah point of supply at 20:43 hrs and BBGS Unit-3 again Synchronized at 20:57 hrs.

Points of concern:

1. Setting of over current protection of tie lines needs to be done considering impedance of the tie line and their thermal capacity together.
2. Possibility of load shedding scheme design considering Tie line loading need to be explored.
3. DR time synchronization is extremely important for this tie line. Also installation of PMU for better performance monitoring may be thought of.

CESC may explain.

ITEM NO. B.10: Tripping of STATCOM at Rourkela on 06.01.19 at 20:06 hrs: ERLDC

MSR 1 was brought into service due to system requirement by the Controller at 20:06:32 hrs on 06/01/19. 3X171 MVA coupling transformer tripped due to actuation of NGT ground over-current protection at 20:06:47 Hrs, which tripped both the main (41052) CB and tie (41152) CB, there by isolating the fault.

Fault comes under the SVC bus bar zone. For fault in this zone is seen by the following protection

- a. SVC Bus bar protection.
 1. BB differential protection
 2. Overcurrent protection
 3. Ground fault overcurrent protection
- b. Earthing transformer Protection
 1. Displacement overvoltage protection
 2. Earthing transformer overcurrent protection
 3. **Earthing transformer ground fault overcurrent protection**

Now in this case as per report submitted by the utility "**Earthing transformer ground fault overcurrent protection**" operated. This protection has two stages:

1. Stage 1 is 150 % of Maximum continuous current of Earthing resistor with 2 sec delay
2. Stage 2 120 % of Maximum continuous earth current of SVC PLUS system with 0.05 sec delay

So it is seen that stage 2 operated in this case. Fault was extremely high resistive in nature and took 2 sec to clear.

In this context utility may explain the following:

1. Is this type of fault will only be cleared by Earthing transformer protection? Is SVC Bus bar protection not covering such fault as from TFR it is clear that SVC Bus Bar protection not triggered? If yes then is there any scope of setting modification to make it responsive to such fault?

2. What is the performance of the voltage displacement based back up protection is not clear from the data submitted. Utility may review the same and share their experience to the system operator for larger benefit of the system.

To review and find any scope of improvement of the protection performance existing activated protection function and their setting may be submitted to ERPC/ERLDC.

Powergrid may explain.

ITEM NO. B.11: Mutual effect 400kV Andal-Jamshedpur-II on 400 kV Adhunik-Jamshedpur D/C: ERLDC

During analysis of the tripping of 400kV Andal-Jamshedpur-II on 10.01.19 at 16:47 hrs it is found that whenever the above circuit is in service due to mutual effect the flow of the 400 kV Adhunik-Jamshedpur D/C is becoming different.

Then on further analysis it is found that when the 400kV Andal-Jamshedpur-II is in service then Y phase current of the 400 kV Adhunik-Jamshedpur 1 & 2 becoming different and the difference is to the tune of 50 to 60 Amps. This may affect distance protection and in some other operational configuration this might create a problem for other protections also

On verbal communication with the site it is found that while entering the Jamshedpur station 400 kV Andal-Jamshedpur-I and II are on single circuit horizontal tower and Andal-Jamshedpur-II crossed both the circuit of 400 kV Adhunik-Jamshedpur. Being a small line 400 kV Adhunik-Jamshedpur D/C (300 meter) is having differential protection. Still it needs to be investigated and what precautions need to be taken may be discussed by the members.

Also it is found that due to only a 400kV Andal-Jamshedpur-II line switching there is poorly damped oscillation in the 400kV Adhunik-Jamshedpur D/C, which shows there is a requirement of retuning of PSS Adhunik units.

Members may discuss.

ITEM NO. B.12: Tripping Incidences in the month of January, 2019.

Other tripping incidences occurred in the month of January 2019 which needs explanation from constituents of either of the end is given in **Annexure-B12**.

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.

In 74th 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 01st Jan. 2019.

Members may discuss.

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 26th 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.

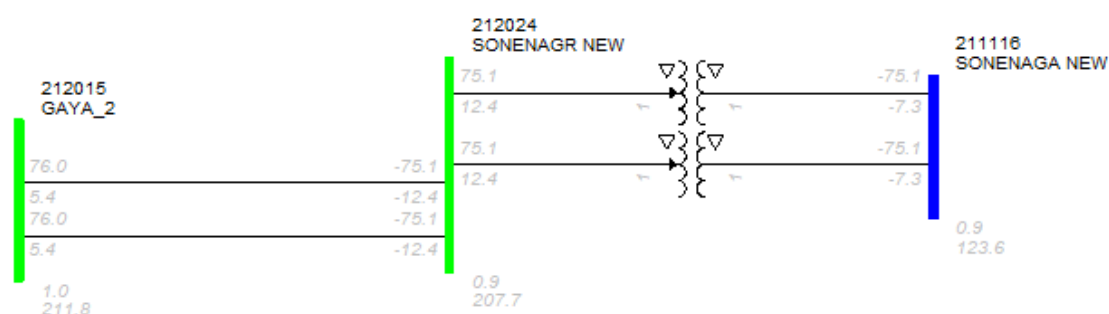
In 75th PCC, all the states were advised to submit the present practice which is being followed to carry out protection audit and checking of relay settings in transmission system/distribution system within the states.

Members may update.

ITEM NO. C.2: 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



In 75th PCC, 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.

Thereafter, BSPTCL had submitted the PSL logic to ERPC. ERPC in consultation with PRDC had submitted the following comments to BSPTCL:

1. Zone1 fault was directly assigned to master trip due to this master trip will be operated for 76th PCC Agenda

zone 1 fault and also auto reclose will get blocked.

2. Anytrip-R, Anytrip-Y & Anytrip-B was assigned to Trip circuits R, Y & B respectively.

BSPTCL may update.

ITEM NO. C.3: 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

In 75th PCC, 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-C3**.*

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.

Powergrid may update.

ITEM NO. C.4: 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.

In 75th PCC, WBSETCL was advised to send their comments to Powergrid on implementation of distance protection at 220kV Bus sectionaliser as a back-up protection.

WBSETCL may update.

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 73rd 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.

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

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

Sl 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	
6.	For All States	ERPC	02.09.2019-06.09.2019	on PSCT

Members may update.

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 73rd 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 74th PCC, Powergrid & DVC informed that they will submit the details at the earliest.

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

Members may update.

ITEM NO. C.8: 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.9: 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	<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	JUSNL	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						

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:

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

Members may update.

ITEM NO. C.10: 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 74th PCC, all the constituents were advised to submit their comments/observations relating to the draft standard.

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

*In 75th PCC, PRDC presented the draft standard for Transformer Protection and Busbar Protection. Draft standard is enclosed at **Annexure-C10**.*

Members may update.

ITEM NO. C.11: Additional Agenda

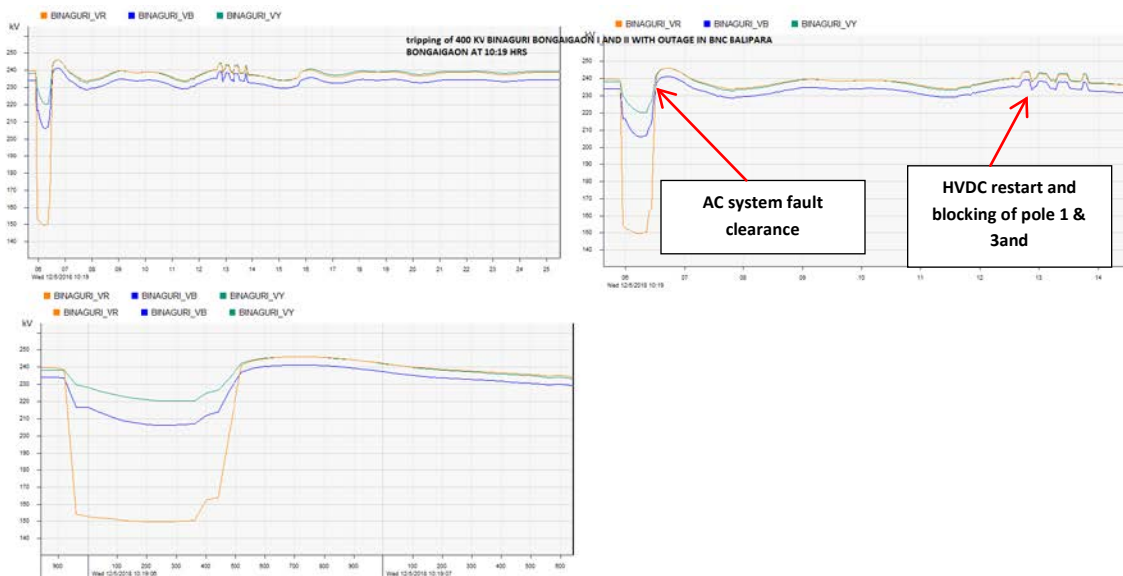
List of Intra Regional line tripping in the month of January 2019 where violation of protection standard has been observed

S.NO	LINE NAME	TRIP DATE	TRIP TIME	RESTORATI ON DATE	RESTORATI ON TIME	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	Remarks
Miscellaneous: High Fault clearing time, Tripping on DT, No Fault observed in PMU										
1	220KV BEGUSARAI-NEW PURNEA-II	03-01-2019	22:39	04-01-2019	0:20	DID NOT TRIP	DT RECEIVED AT PURNEA END	DT RECEIVED AT PURNEA END	--	
2	220KV BEGUSARAI-NEW PURNEA-II	04-01-2019	17:27	04-01-2019	17:51	DID NOT TRIP	DT RECEIVED AT PURNEA END.	DT RECEIVED AT PURNEA END.	--	No Fault observed in PMU
3	220KV BEGUSARAI-NEW PURNEA-II	04-01-2019	22:51	04-01-2019	23:32		DT RECEIVED AT PURNEA END.	DT RECEIVED AT PURNEA END.	--	
4	220KV BEGUSARAI-NEW PURNEA-II	05-01-2019	8:07	05-01-2019	18:32	Z-1 ,56.60 KM Y-N 2.66 KA	130 KM ,F.C 1.41 KA Y-N A/R SUCCESSFUL	Y-N Fault	< 100 ms	No Auto Reclose
5	220KV BEGUSARAI-NEW PURNEA-I	08-01-2019	12:02	29-01-2019	15:36		B-N .79 KA,66.6 KM	B-N Fault	--	No Auto Reclose
6	220KV BEGUSARAI-NEW PURNEA-II	08-01-2019	14:44	08-01-2019	15:11		DT RECEIVED AT PURNEA END.	DT RECEIVED AT PURNEA END.	--	No Fault observed in PMU
7	220KV BEGUSARAI-NEW PURNEA-II	08-01-2019	15:26				DT RECEIVED AT PURNEA END.	DT RECEIVED AT PURNEA END.	--	
8	220KV BEGUSARAI-NEW PURNEA-II	20-01-2019	5:55	20-01-2019	6:51		RN, Z1, 1.81 KA,102.4 KM	R-N Fault	< 100 ms	No Auto Reclose
9	400KV FSTPP-BAHARAMPUR-II	09-01-2019	11:04	09-01-2019	11:21	No indication	DT received	DT received at Baharampur	--	No Fault observed in PMU
10	400KV FSTPP-KhSTPP-III	12-01-2019	11:00	12-01-2019	11:22	DT RECEIVED AT FSTPP		DT RECEIVED AT FSTPP	--	No Fault observed in PMU
11	400KV LAPANGA-STERLITE-II	16-01-2019	20:00	18-01-2019	16:48		DT RECEIVED AT STERLITE	DT RECEIVED AT STERLITE	--	
12	400KV MERAMUNDALI-LAPANGA-II	17-01-2019	12:40	17-01-2019	20:10	PLCC PROBLEM		PLCC PROBLEM AT MEERAMUNDALI	--	
13	220KV DALKHOLA (WB)-DALKHOLA (PG)-II	23-01-2019	14:21	23-01-2019	15:58		Tripped form Dalkola(PG) end only	Tripped form Dalkola(PG) end only	--	No Fault observed in PMU
14	400KV LAPANGA-STERLITE-II	28-01-2019	2:56	28-01-2019	10:52	DT RECEIVED AT LAPANGA END		DT RECEIVED AT LAPANGA END	--	B-N fault observed in PMU
Autoreclose related issues										
15	220KV STPS(WBSEB)-CHANDIL-SC	01-01-2019	2:52	01-01-2019	3:15	R-PH Z1 3.172 KA 41.61 KM	R-PH ,Z1,62.98 KM,2.293 KA	R-N Fault	< 100 ms	No Auto Reclose
16	220KV CHANDIL-STPS(WBSEB)-I	03-01-2019	3:59	03-01-2019	4:35	Y-N, F/C=1.9KA,Z-1		Y-N Fault	--	No Auto Reclose
17	400KV MUZAFFARPUR-GORAKHPUR-II	05-01-2019	4:40	05-01-2019	5:45	BN, 194.7 KM, 2.994 KA		B-N Fault	< 100 ms	No Auto Reclose
18	220KV DEHRI-GAYA-I	06-01-2019	11:51	06-01-2019	12:23	Z-1, 1.72 KA 55.97 KM	A/R SUCCESSFUL B-N,36.45 Km,3.95 KA	R-N Fault	< 100 ms	No Auto Reclose
19	400KV KHARAGPUR-CHAIBASA-II	07-01-2019	14:19	07-01-2019	14:43	Successful A/R	B-N, 159.5KM, 2.82KA	B-N Fault	< 100 ms	No Auto Reclose
20	400KV INDRAVATI(PG)-INDRAVATI(GR)-SC	08-01-2019	9:24	08-01-2019	12:49	B-N Fault		B-N Fault	300 msec	No Auto Reclose
21	220KV PANDIABILI-SAMANGARA-I	23-01-2019	3:11	23-01-2019	3:56	b-n , f/c-7.5ka , f/d-15km		B-N Fault	< 100 ms	No Auto Reclose
22	765KV FATEHPUR-PUSAULI-I	25-01-2019	8:35	25-01-2019	10:09		Z1, RN, 186.89 KM, 1.66 KA	R-N Fault	< 100 ms	No Auto Reclose

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 100th analog signals also missing. In digital channel 4,34 to 36, 47 to 48, 53 and 104th 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 2nd 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,TREFF_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,TREFF_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,INDC_FUND_PEAK,1,,A,0.003387,2.611120,0.000000,0,32767
74,INDC_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,-140.087800,0.000000,0,32767
95,IGND_D_FUND_SUM_ABS,,,A,0.053448,6.287143,0.000000,0,32767
96,IGND_D_FUND_SUM_ARG,,,A,0.010311,-150.083000,0.000000,0,32767
97,DLDP_DIFF_CURR,,,A,0.023033,-395.918900,0.000000,0,32767
98,RPDP_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

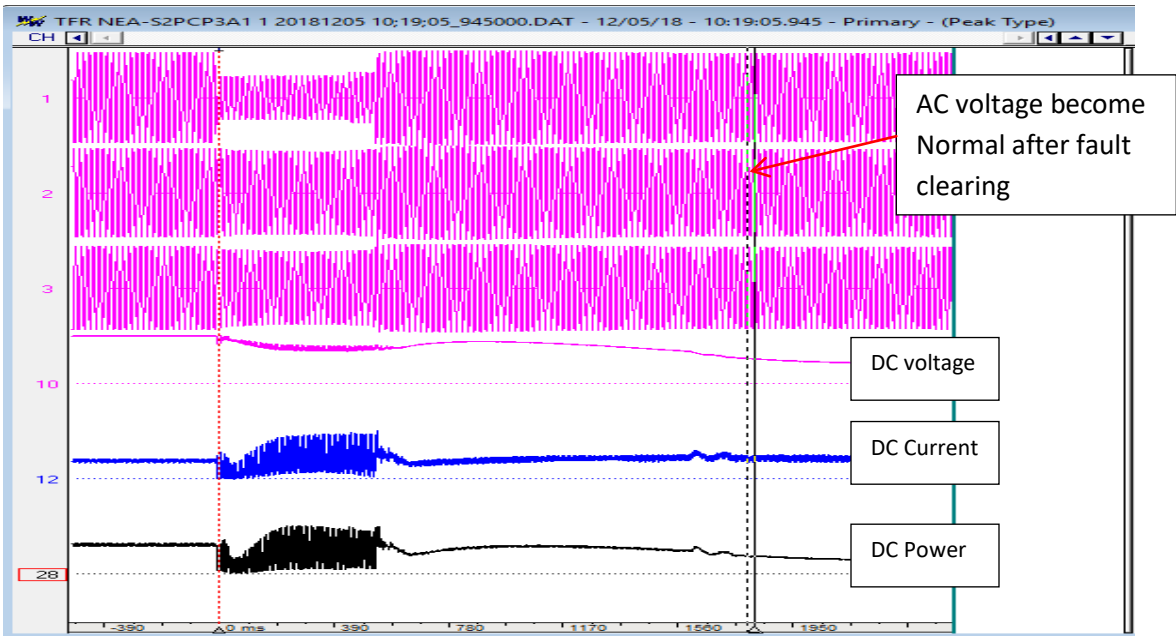
```

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.

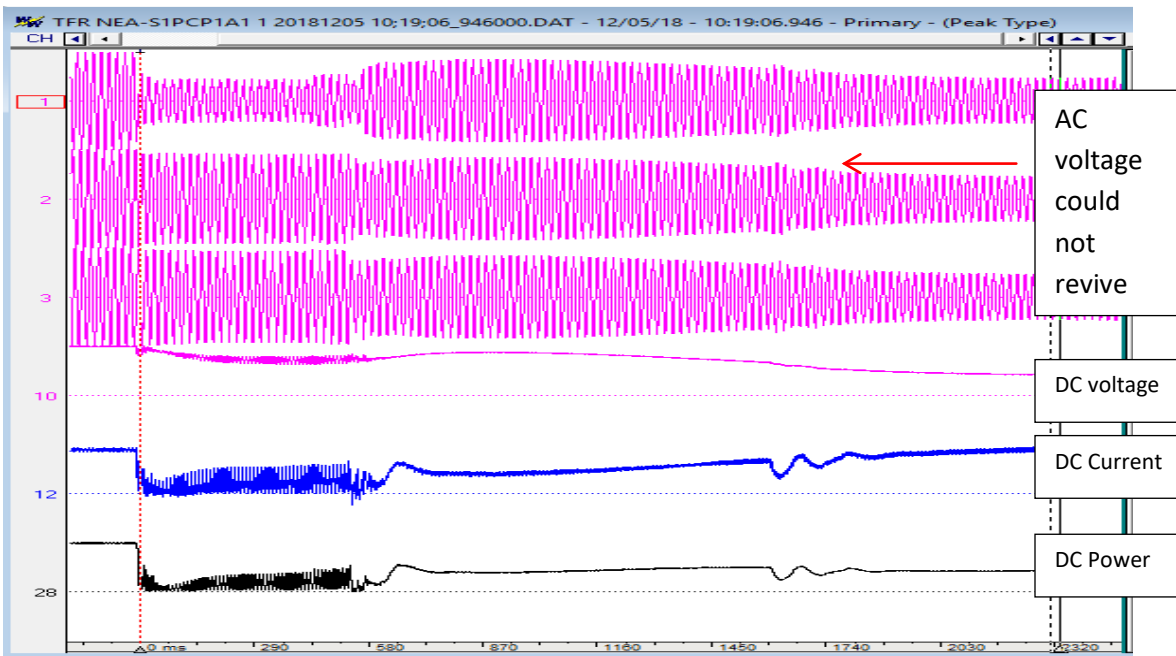
As seen from both PMU plot and DR plots that even after the fault clearing NER system continue to have oscillatory low voltage whereas Alipurduar AC system voltage recovered following fault clearing.

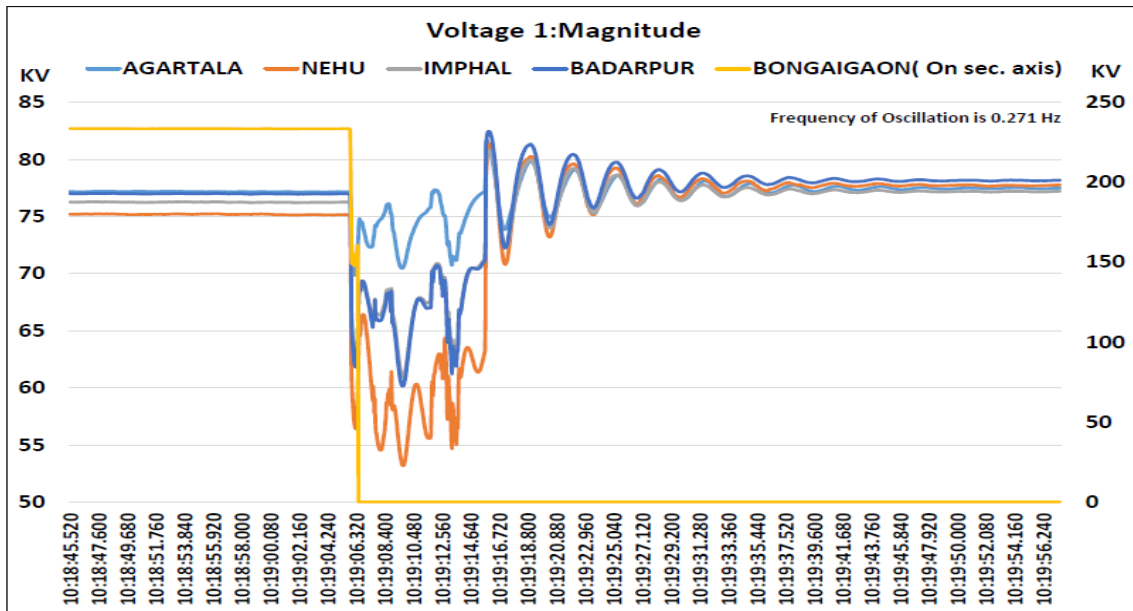
DR plots are as below:

At APD end: pole 3:

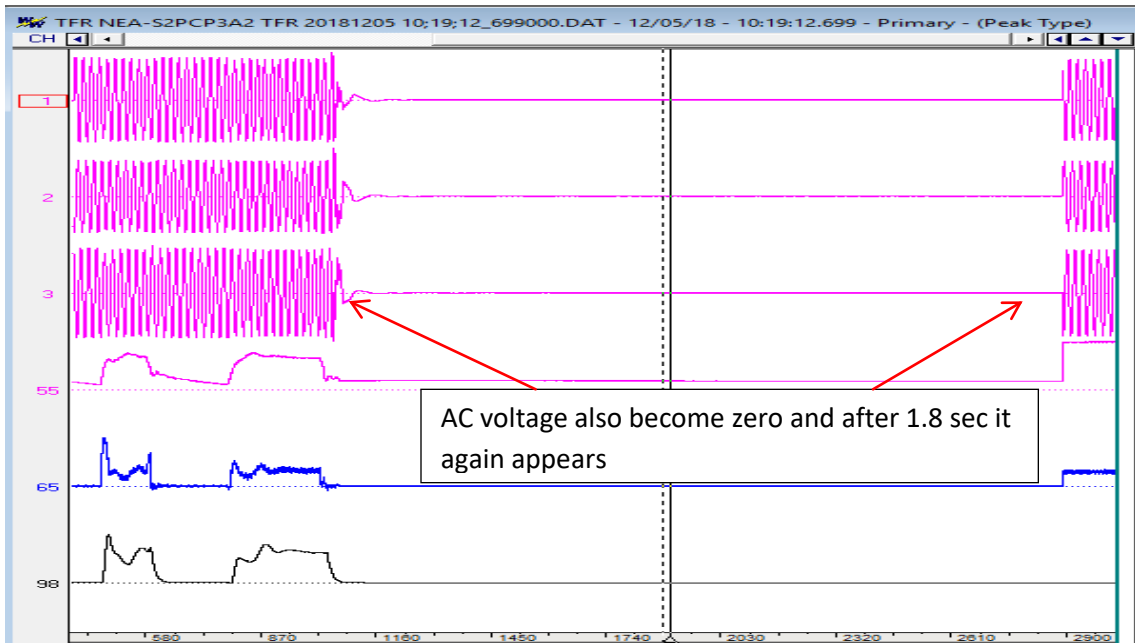


At BNC end: pole 1:





- 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.



ERPC Proposed**Guide Lines**

Triggering criteria for DR :	Any Start	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).	
DR time window :	minimum 3 seconds.	minimum 2 seconds.	
Pre-fault time window (S):		0.5 -	
Post fault time window (S):		2.5	0.3
Minimum sampling frequency:	1000 Hz	64 Samples Per Cycle	
Analog signals as per priority			
A. Mandatory signals:			
	1. Three phase voltage	1. Three phase-to-neutral voltages	
	2. Neutral voltage	2. Three phase currents and neutral currents.	
	3. Three phase current	3. Neutral Currents	
	4. Neutral current	4. Frequency	
B. Optional signals:			
	1. Mutual current	1. Polarizing currents and voltages, if used.	
	2. Check Sync	2. Real and reactive power	
		The Minimum parameters to be monitored in the Fault record shall be specified by the respective RPC.	
	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		

ERPC Proposed

Guide Lines

Triggering criteria for DR :	Any Start	Internal protection trip signals, external trigger input,	
DR time window :	minimum 3 seconds.	analog triggering (any phase current exceeding 1.5 pu	
Pre-fault time window (S):		of CT secondary current or any phase voltage below	
Post fault time window (S):		0.8pu, neutral/residual overcurrent greater than 0.25pu	
Minimum sampling frequency:	3200Hz	of CT secondary current).	
Analog signals as per priority		minimum 2 seconds.	
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		

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.

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 Currents 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

0.5 -

2.5

64 Samples Per Cycle

0.3