North Eastern Regional Power Committee

MINUTES OF SYSTEM PROTECTION SCHEME

Date : 30/08/2016 (Tuesday)
Time : 11:00 hrs
Venue : "NERLDC Conference Hall", Shillong.

The List of Participants in the Meeting is attached at **Annexure – I**

Shri B. Lyngkhoi, Director/SE(O/Commercial) welcomed all the participants and mentioned that as requested by the OCC forum, the issue of SPS and other related operational issues to be discussed in the sub-group so that the same can be finalized at the earliest. He thanked all the participants and requested to take active participation for fruitful deliberation.

1. Summary of System Protection Schemes (SPS)

Normally all the System protection schemes are proposed, discussed and getting approved in RPC meetings such as OCC, PCC, TCC and RPC Board meetings.

The Summary of System Protection Schemes (SPS) both inter/Intra regional which are in service, and no of schemes Approved, no of schemes under discussion stage are detailed below

Sl. No.	Region	No. of Schemes In service	No. of Schemes approved (yet to be operationalized)	No. of schemes under discussion	Remarks
1	North Eastern Region	9	Nil	Nil	-

The System protection schemes for Inter / intra-regional corridor (Region wise) divided in to three categories as stated below.

i) SPS related to tripping of critical line / corridor

ii) SPS related to safe evacuation of Generation

iii) SPS related to overloading of Transformers

iv) SPS related to maintaining transfer capability

The summary of SPS both inter/intra-regional which are in service, and number of schemes yet to be operationalized based on the categories above are detailed below:

Region	Tripping of critical line(s) / corridor			Safe evacuation of generation			Overloading of Transformers / Critical line(s)			TOTAL
	In Service	Approved	Under Discussion	In Service	Approved	Under Discussion	In Service	Approved	Under Discussion	
NER	4	-	-	2	-	-	3	-	-	9

Also the system protection schemes for inter/intra-regional corridors (region-wise) can be categorized as stated below:

i) SPS related to Generation rejection

ii) SPS related to Load rejection

iii) SPS related to Generation/Load rejection

iv) SPS related to HVDC controls

v) SPS related to others

2. SPS in North Eastern Region

Ref No.	Name of the Scheme	Implementing Agency	Status
SPS/NER/LINE/01	SPS associated with tripping of 400 kV Palatana – Silchar D/C lines	CTU, OTPC AEGCL, MePTCL and TSECL	In Service w.e.f. 23.02.2015
SPS/NER/LINE/02	SPS associated with tripping of 400 kV Silchar – Azara S/C and 400 kV Silchar – Byrnihat S/C lines when there is no generation at Palatana CCGT	CTU, AEGCL, MePTCL and TSECL	In Service w.e.f. 14.09.2013
SPS/NER/LINE/03	SPS associated with overloading of 220 kV Salakati – BTPS D/C lines (PG)	CTU, AEGCL	In service w.e.f 23.06.2015
SPS/NER/LINE/04	SPS associated with tripping of 132 kV Umiam Stg-I to Umiam St-III D/C lines	MePTCL	In service w.e.f June 2015
SPS/NER/GEN/01	SPS associated with tripping of 400 kV Silchar – Azara S/C and 400 kV Silchar – Byrnihat S/C lines during generation of 1st Module of Palatana	CTU, OTPC, AEGCL, MePTCL and TSECL	In Service w.e.f 23.02.2015

SPS/NER/GEN/02	SPS associated with generation evacuation from AGTPP	NEEPCO, CTU	In service w.e.f. 21.07.2015
SPS/NER/TRF/01	SPS associated with tripping of generation of 1st Module of Palatana CCGT (363.3 MW)	CTU, OTPC, AEGCL, MePTCL and TSECL	In Service w.e.f. 14.09.2013
SPS/NER/TRF/02	SPS associated with tripping of 400/132 kV, 2x200 MVA ICTs at Silchar (PG)	CTU, AEGCL	In service w.e.f. 29.06.15
SPS/NER/TRF/03	SPS associated with more than 60 MW loading from LV to HV side of Azara ICTs	AEGCL	In Service w.e.f August 2014

Ref No.	**Name of the Scheme**	**Implementing Agency**	**Status**	
SPS related to tripping of critical line / Corridor				
SPS/NER/LINE/01	SPS associated with tripping of 400 kV Palatana – Silchar D/C lines	CTU, OTPC AEGCL, MePTCL and TSECL	In Service	
SPS/NER/LINE/02	SPS associated with tripping of 400 kV Silchar – Azara S/C and 400 kV Silchar – Byrnihat S/C lines when there is no generation at Palatana CCGT	CTU, AEGCL, MePTCL and TSECL	In Service	
SPS/NER/LINE/03	SPS associated with overloading of 220 kV Salakati – BTPS D/C lines (PG)	CTU, AEGCL	In Service	
SPS/NER/LINE/04	SPS associated with tripping of 132 kV Umiam Stg-I to Umiam St-III D/C lines	MePTCL	In Service	
SPS related to Safe evacuation of generation				

SPS/NER/GEN/01	SPS associated with tripping of 400 kV Silchar – Azara S/C and 400 kV Silchar – Byrnihat S/C lines during generation of 1st Module of Palatana	CTU, OTPC, AEGCL, MePTCL and TSECL	In Service	

SPS/NER/GEN/02	SPS associated with generation evacuation from AGTPP	NEEPCO, CTU	In Service	
SPS related to overloading of Transformers / Critical Line(s)				
SPS/NER/TRF/01	SPS associated with tripping of generation of 1st Module of Palatana CCGT (363.3 MW)	CTU, OTPC, AEGCL, MePTCL and TSECL	In Service	
SPS/NER/TRF/02	SPS associated with tripping of 400/132 kV, 2x200 MVA ICTs at Silchar (PG)	CTU, AEGCL	In Service	
SPS/NER/TRF/03	SPS associated with more than 60 MW loading from LV to HV side of Azara ICTs	AEGCL	In Service	

SPS for NER Grid Security with Modules (GT+ST) of OTPC Palatana generating station (2 x 363.3MW)

SPS 2 - When 400 kV Palatana-Silchar (D/C) lines trip:

Pre-condition:

Following lines should be kept in open condition:

- 132 kV Khliehriat – Lumshnong S/C/ or 132 kV Lumshong- Panchgram
- 132 kV Pailapool – Jiribam line at Jiribam end or 132 kV Srikona- Pailapool
- 132 kV P.K. Bari – Dharmangar S/C or 132 kV Dharmanagar- Dullavcherra will be kept open

Scheme:

i. When both the ckts of 400 kV Palatana – Silchar lines trip, a signal will be generated from trip relays at Silchar.

~~**ii.** This signal should trip the HV Circuit Breaker of 400/132 kV, 2x125 MVA Palatana ICTs to maintain safe, secure and reliable operation of Tripura system~~

iii. Palatana Protection to operate at their end and bring gen to house load.

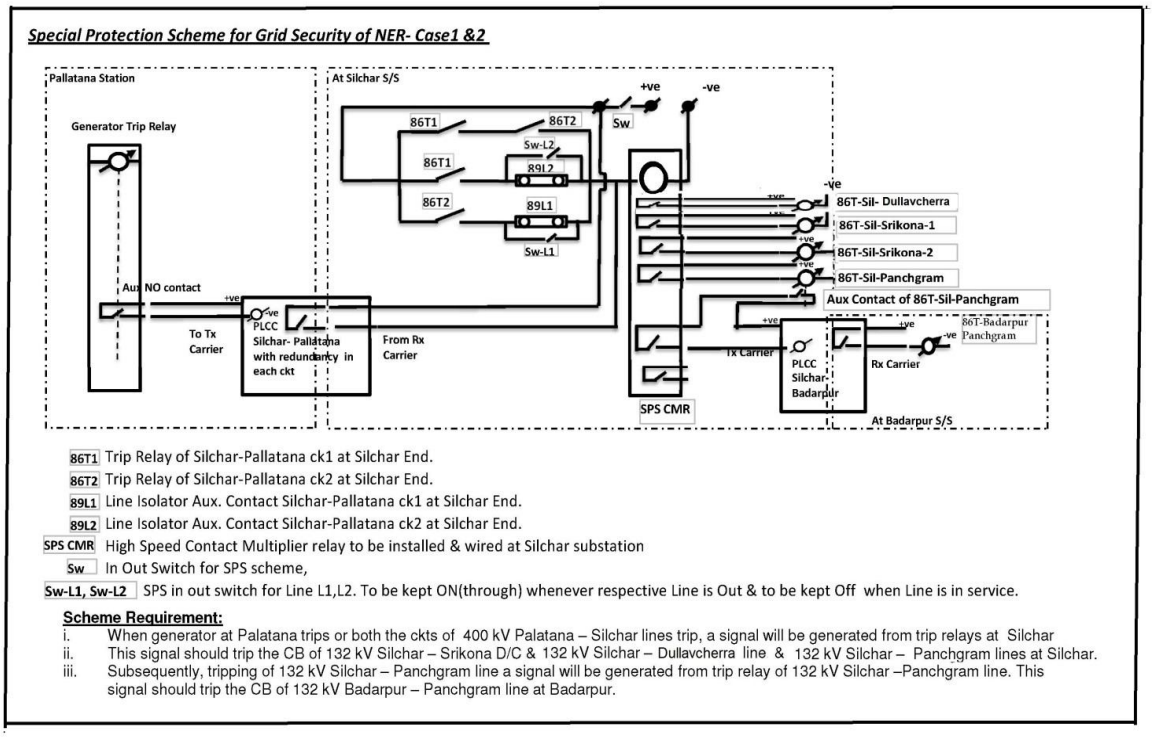
~~**iv.** Also this signal should trip CB of 132 kV Silchar – Srikona D/C, 132 kV Silchar – Panchgram S/C & 132 kV Silchar – Dullavcherra S/C lines at Silchar.~~

~~**v.** Subsequent to tripping of 132 kV Silchar – Panchgram line, a signal will be generated from trip relay of 132 kV Silchar – Panchgram line. This signal should trip the CB of 132 kV Badarpur – Panchgram line at Badarpur.~~

vi. ~~After these trippings a instant load relief of 109 MW at Off-peak & 159 MW in Peak.~~

vii. The signal from tripping of 400 kV Silchar – Palatana D/C should also enable reduction of Generation of Module I & II of Palatana, OTPC (both GTs to around 20 MW excluding the auxiliary consumption.

viii. Then manual demand management / disconnection should be imposed, if necessary.



SPS for NER Grid Security with Modules (GT+ST) of OTPC Palatana generating station (2 x 363.3MW)

SPS 4 - When 400 kV Silchar – Byrnihat S/C and 400 kV Silchar – Azara S/C line trips (without generation at Palatana)

Pre-condition:

Following lines should be kept in open condition

- 132 kV Khliehriat – Lumshnong S/C
- 132 kV Pailapool – Jiribam line at Jiribam end
- 132 kV PKBari – Dharmangar S/C will be kept open

Scheme:

i. When 400 kV Silchar – Byrnihat line and 400 kV Silchar – Azara line trips, a signal will be generated from trip relays at Silchar. Also, in case of outage of

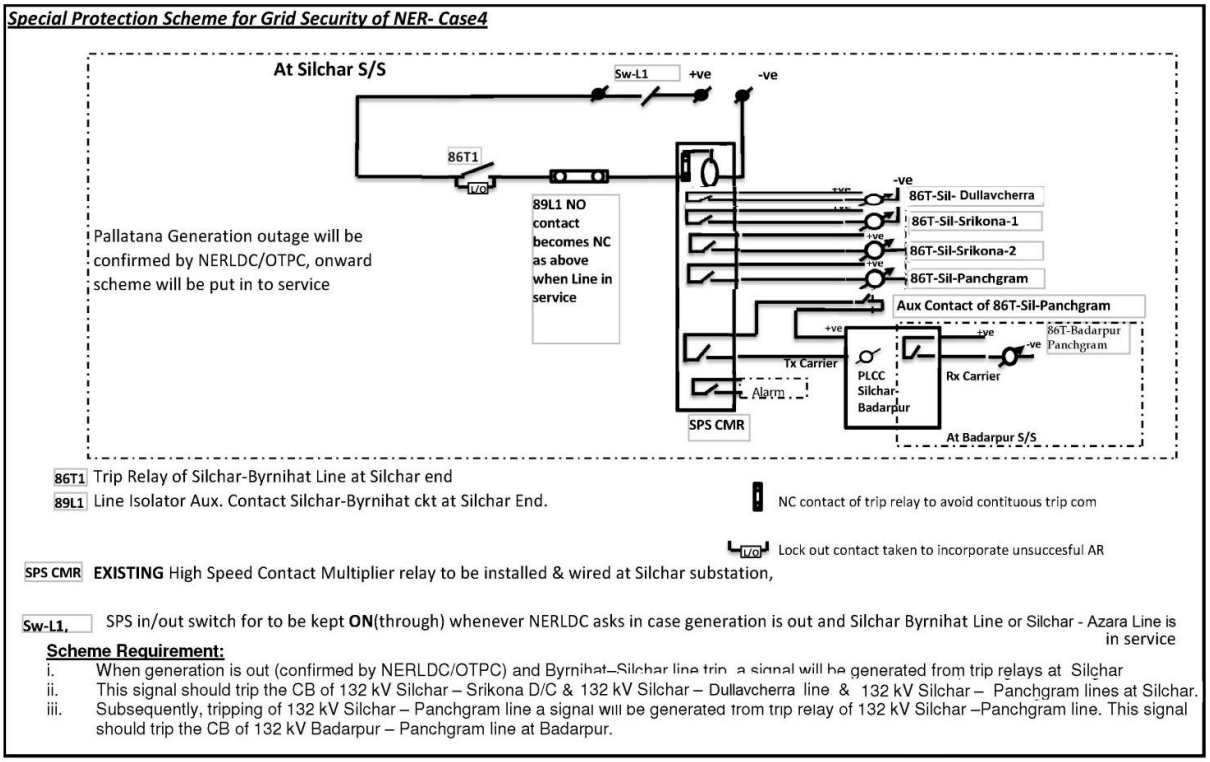
either 400 kV Silchar – Byrnihat line or 400 kV Silchar – Azara line, if other line trips, signal will be generated from trip relays at Silchar.

ii. This signal should trip the CB of 132 kV Silchar – Srikona D/C, 132 kV Silchar – Panchgram S/C & 132 kV Silchar –Dullavcherra S/C lines at Silchar.

iii. Subsequent to tripping of 132 kV Silchar – Panchgram line, a signal will be generated from trip relay of 132 kV Silchar –Panchgram line. This signal should trip the CB of 132 kV Badarpur – Panchgram line at Badarpur.

iv. After these trippings an instant load relief of around 109 MW in Off-Peak and 159 MW in Peak Hours will be obtained.

v. Then manual demand management / disconnection should be imposed, if necessary.



Note:

The SPS schemes as stated above are subject to changes with changing grid conditions. The loads being disconnected with the configuration as per current SPS include loads in South Assam, part of Meghalaya and part of Tripura power systems.

SPS associated with overloading of 220 kV Salakati – BTPS D/C lines

Pre – Condition:

The Dhaligaon area load of Assam needs to be kept in radial mode and Bhutan load through 132 kV Rangia – Deothang S/C must not be affected due to operation of this SPS.

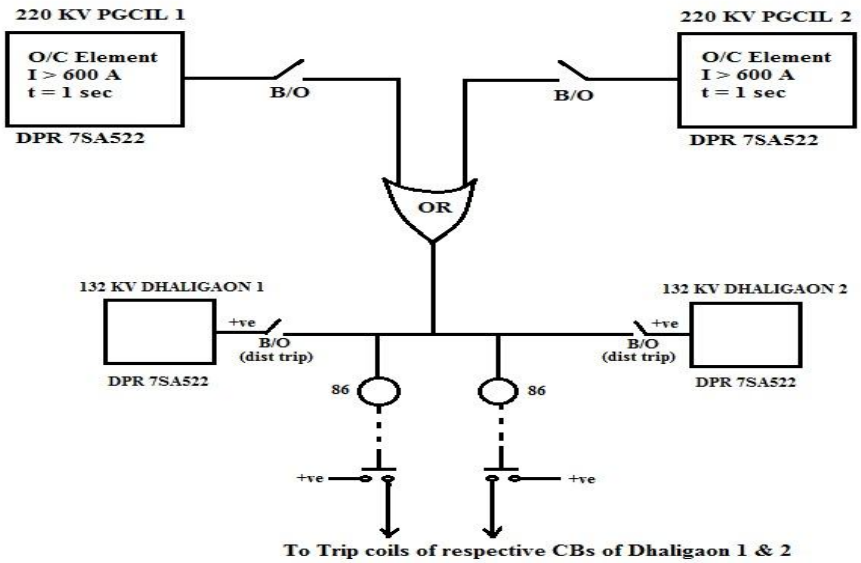
Scheme:

i. To prevent tripping of 220 kV Salakati – BTPS D/C lines, radial loads in Dhaligaon area of Assam may be shed as a precautionary measure.

ii. When 220 kV Salakati – BTPS D/C lines get overloaded (more than 600 Ampere current per circuit) in Salakati – BTPS direction, a signal would be generated that will trip radial loads in Dhaligaon area of Assam by tripping of 132 kV BTPS – Dhaligaon I & II lines.

iii. In case of outage of one circuit of 220 kV Salakati – BTPS D/C lines, and overloading of the existing circuit (more than 600 Ampere in Salakati – BTPS direction), a signal would be generated that will trip radial loads in Dhaligaon area of Assam.

Special Protection Scheme already implemented at 220/132 KV Salakati GSS, AEGCL



- The special protection scheme has been designed to limit the flow of 200MW / 600A load in either or both of the 220KV PGCIL 1 & 2 feeders from Birpara to Salakati. As soon as the load exceeds the set limit, the 132 KV Dhaligaon 1 & 2 feeders shall be disconnected from bus.

NOTE: One CFC logic has been designed for blocking the above Overcurrent protection when Distance protection picks up for any 220 KV feeder faults

SPS associated with tripping of 132 kV Umiam Stg-I – Umiam Stg-III D/C lines

Pre – Condition:

Meghalaya power system shall be segregated into 3 parts by opening of 132 kV Umiam Stg-I – Umiam line & 132 kV Mawlai – Umiam line and 132 kV Nongstoin – Mawphlang line. One part of Meghalaya power system loads shall be fed from Khliehriat (PG) substation, other part connected through 132 kV Agia – Mendipathar line and the 3rd part through 220/132 kV Killing (Byrnihat) substation.

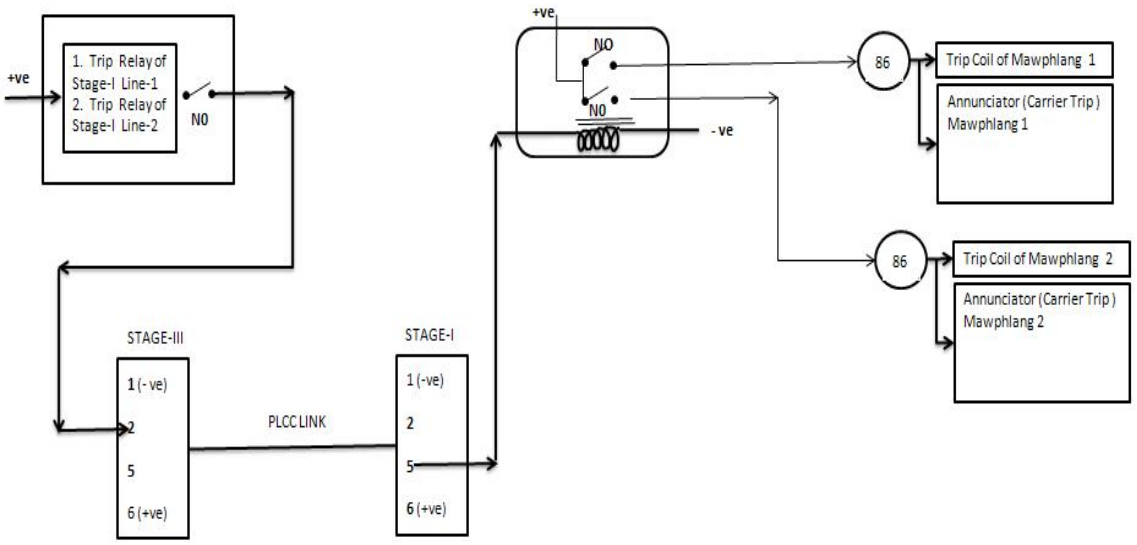
Scheme:

i. To prevent collapse of part of Meghalaya system fed from 220/132 kV Killing (Byrnihat) substation, carrier inter-tripping scheme has been implemented to prevent tripping of 132 kV Umiam St-I – Umiam St-III D/C lines.

ii. In the event of any fault that results in failure or tripping of 132 kV Umiam St-III – Umiam Stg-I D/C lines, a carrier signal would instantaneously be received at the PLCC Protection equipment. The same signal would be transmitted via PLCC link from Stage III to protection equipment at stage I power station. The command is further extended to the tripping circuit at C&R panel resulting in direct trip of two feeders namely, Mawphlang Feeder 1 and Mawphlang Feeder 2 at Stage I power Station shedding a combined load of 25 MW (max) instantaneously.

iii. If Garo Hills load is provided through 132 kB Nangalbibra –Nongstoin line instead of 132 kV Agia-Nangalibra line, then the load relief on account of operation of this SPS shall 75 MW (maximum).

Inter-tripping scheme between 132 kV Umiam St-I to Umiam St-III D/C lines



SPS related to Safe evacuation of Generation

SPS for NER Grid Security with Modules (GT+ST) of OTPC Palatana generating station (2 x 363.3MW)

SPS 3 - When 400 kV Silchar – Byrnihat S/C and 400 kV Silchar – Azara S/C lines trip (with generation at Palatana):

Pre-condition:

Following lines should be kept in open condition

- 132 kV Khliehriat – Lumshnong S/C
- 132 kV Pailapool – Jiribam line at Jiribam end
- 132 kV PKBari – Dharmangar S/C will be kept open

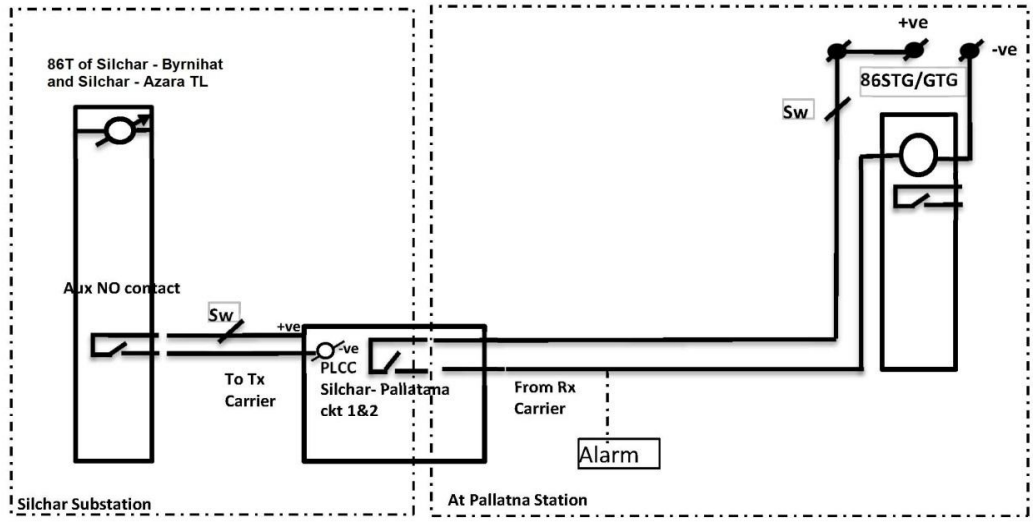
Scheme:

i. When 400 kV Silchar – Byrnihat S/C and 400 kV Silchar – Azara S/C lines trip, signal will be generated from trip relays at Silchar. Also, in case of outage of either 400 kV Silchar – Byrnihat line or 400 kV Silchar – Azara line, if other line trips, signal will be generated from trip relays at Silchar.

ii. This signal should trip CBs of GTG / STG of one Module of Palatana CCGT (as may be required). But the tripped unit of Palatana will be running in FSNL (Full Speed No Load). The units of Palatana may be tripped allowing a maximum of 240 MW generations including auxiliary.

iii. Then manual demand management / disconnection of load should be imposed, if necessary.

Special Protection Scheme for Grid Security of NER- Case:3



86T Trip Relay of Silchar-Pallatana ck1 at Silchar End.
86GTG 86 Trip relay for GTG at Pallatana
Note: At Present spare channel is not available for Silc-Pallatana PLCC links , can be made availble on procurement.
Sw In Out Switch for SPS scheme

Scheme:
i. When 400 kV Byrnihat – Silchar line & 400 kV Silchar - Azara lines trip, signal will be generated from trip relays at Silchar
ii. This signal should trip CB of GTG/STG of at Palatana. But unit will be running in FSNL
iii. A instant relief in line loading of 230/130 MW which will avert the system from cascade tripping.
v. Then manual demand disconnection should be imposed.

SPS for generation from 6 units of AGTPP – Extension project

When 132 kV AGTPP – Kumarghat S/C line trips (with generation from 4 nos. GT and 2 nos. ST-Extension of AGTPP)

Scheme:

i. Under N-1 contingency of 132 kV AGTPP – Kumarghat S/C, with generation from 4 nos. GT (Existing) of AGTPP and 2 nos. ST (Extension) of AGTPP, there may be sudden overloading in several lines outgoing from AGTPP or in Tripura power system.

ii. The tripping of 132 kV AGTPP – Kumarghat line should result in generation reduction of 32 MW at AGTPP (from AGTPP – Extension units) in order to maintain safe line loading on outgoing feeders from AGTPP

(The SPS has been put in service w.e.f. 1300 Hrs of 21-July-2015).

SPS for NER Grid Security with Modules (GT+ST) of OTPC Palatana generating station (2 x 363.3MW)

SPS 1 - When Palatana unit trips:

Pre-condition:

Following lines should be kept in open condition

- 132 kV Khliehriat (MePTCL) – Lumshnong S/C
- 132 kV Pailapool – Jiribam line at Jiribam end
- 132 kV P.K. Bari – Dharmangar S/C will be kept open

Scheme:

i. When both Module of Palatana CCGT trips, a signal will be generated from trip relay of the Modules.

ii. This signal should then trip the CB of 132 kV Silchar – Srikona D/C, 132 kV Silchar – Panchgram S/C & 132 kV Silchar –Dullavcherra S/C lines at Silchar.

iii. Subsequent to tripping of 132 kV Silchar – Panchgram line, a signal will be generated from trip relay of 132 kV Silchar –Panchgram line. This signal should trip the CB of 132 kV Badarpur – Panchgram line at Badarpur.

iv. After these trippings an instant load relief of around 109 MW in Off-Peak and 159 MW in Peak.

v. Then manual demand management / disconnection should be imposed, if necessary.

SPS for tripping of 400/132 kV, 2x200 MVA transformers at Silchar (PG)

Pre-condition:

Following lines should be kept in open condition

- 132 kV Khliehriat – Lumshnong S/C
- 132 kV Pailapool – Jiribam line at Jiribam end
- 132 kV P.K. Bari – Dharmangar S/C will be kept open

Scheme:

i. To maintain safe loading of 400/132 kV, 2x200 MVA transformer at 400/132 kV Silchar (PG) substation, radial loads in Southern part of NER Grid are to be shed.

ii. Upon tripping of any ICT among 2 x 200 MVA, 400/132 kV ICTs at Silchar, a signal shall be generated.

iii. This signal should then trip the CB of 132 kV Silchar – Srikona D/C, 132 kV Silchar – Panchgram S/C & 132 kV Silchar –Dullavcherra S/C lines at Silchar.

iv. Subsequent to tripping of 132 kV Silchar – Panchgram line, a signal will be generated from trip relay of 132 kV Silchar –Panchgram line. This signal should trip the CB of 132 kV Badarpur – Panchgram line at Badarpur.

v. After these trippings an instant load relief of around 109 MW in Off-Peak and 159 MW in Peak.

vi. In case one ICT at 400/132 kV Silchar substation is out-of-service; the SPS will still act to disconnect radial loads in Southern part of NER Grid.

SPS associated with more than 60 MW loading from LV to HV side of 400/220 kV, 2 x 315 MVA Azara ICTs

Scheme:

i. When power flows in 400/220 kV, 2x315 MVA ICTs at Azara (AEGCL) substation from 220 kV to 400 kV, it may lead to overloading of 220 kV Salakati – BTPS D/C lines.

ii. When power flow on 400/220 kV, 2x315 MVA ICTs at Azara (PG) reaches 60 MW from 220 kV to 400 kV side, a relay would pick-up resulting in tripping of 400/220 kV, 2x315 MVA ICTs at Azara (AEGCL).

iii. This will prevent flow of power from 220 kV Salakati – BTPS D/C lines to Southern part of NER Grid, in absence of sufficient generation in Southern part of NER grid.

iv. This may affect load served in Southern part of NER Grid, but will avert tripping of critical corridors in NER Grid.