भारत सरकार Government of India
विद्युत मंत्रालय Ministry of Power
उत्तर पूर्वी क्षेत्रीय विद्युत समिति
North Eastern Regional Power Committee
मेघालया स्टेट हाउसिगं फिनांस को- आपरेटिव सोसायटी लि. बिल्डिगं
Meghalaya State Housing Finance Co-Operative Society Ltd. Building
नांग्रिम हिल्स, शिलोंग – 793003
Nongrim Hills, Shillong – 793003.

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No. NERPC/NERPC/Committee/2013/ 2969-3026. February 22, 2013

To,

1. Chairman, TCC & Chief Engineer (Power), Dept. of Power, Govt. of Nagaland, Kohima-797001.
2. Member (Tech.), ASEB, Bijuli Bhawan, Paltan Bazar, Guwahati -781001
3. Director (Distribution), Me. ECL, Lumjingshai, S.R. Road, Shillong-793001.
4. Director (Transmission), Me. TPCL, Lumjingshai, S.R. Road, Shillong-793001.
5. Director (Tech), TSECL, Agartala – 799 001
6. Executive Director, NERTS, PGCIL, Lower Nongrah, Lapalang, Shillong – 793 006.
7. Executive Director (O&M), NHPC, NHPC Office Complex, Faridabad-121003.
8. Executive Director (O&M), NEEPCO Ltd., Lower New Colony, Shillong-793003.
9. Regional ED (East-II), NTPC, OLIC Building, Plot No. N-17/2, Nayapalli, Bhubaneswar – 751012
10. Chief Engineer (GM), CEA, Sewa Bhawan, R.K. Puram, New Delhi - 110066
11. General Manager, NERLDC, Lapalang, Shillong – 793006
12. General Manager (O&M), NERTS, POWERGRID, Lapalang, Shillong – 793006
13. General Manager (Plant), OTPC, Badarghat Complex, Agartala, Tripura - 799014
14. CGM (LDC), SLDC Complex AEGCL, Kahelipara, Guwahati-781019.
15. Chief Engineer (E Zone), Dept. of Power, Govt. of Arunachal Pradesh, Itanagar-791111
16. Chief Engineer (W Zone), Dept. of Power, Govt. of Arunachal Pradesh, Itanagar-791111.
17. Chief Engineer (Power), Dept. of Power, Govt. of Manipur, Keishampat, Imphal-795001.
18. Engineer-in-Chief, P&E Dept., Govt. of Mizoram, Aizawl-796001.
19. Chief Engineer, Loktak HE Project, NHPC, Komkeirap, Manipur-795124.
20. Chief Engineer, AEGCL, Bijuli Bhawan, Paltan Bazar, Guwahati – 781 001
21. Chief Engineer, APGCL, Bijuli Bhawan, Paltan Bazar, Guwahati – 781 001
22. Chief Engineer, APDCL, Bijuli Bhawan, Paltan Bazar, Guwahati – 781 001
23. AGM , TSECL, Banamalipur, Agartala, Tripura – 799 001
24. SLDC, Me. ECL, Lumjingshai, S.R. Road, Shillong-793001
25. SLDC, Dept. of Power, Govt. of Arunachal Pradesh, Itanagar-791111
26. SLDC, Dept. of Power, Govt. of Nagaland, Dimapur
27. SLDC, Dept. of Power, Govt. of Manipur, Keishampat, Imphal-795001
28. SLDC, P&E Dept., Govt. of Mizoram, Aizawl-796001
29. SLDC, TSECL, Agartala – 799001

Sub: Minutes of meeting of Special Technical Co-ordination Committee (TCC) of NER Power Committee held at Shillong on February 9, 2013

Sir,

Please find enclosed herewith the minutes of meeting of Special TCC held at "Hotel Polo Towers", Shillong on the 9th February, 2013 under the aegis of POWERGRID for your kind information and further necessary action. The same is also available on the website of NERPC (www.nerpc.nic.in).

भवदीय / yours faithfully,

22/2/2013

(एस. के. रॉय मोहापात्रा/ **S. K. Ray Mohapatra**)
सदस्य सचिव / Member Secretary I/C

Copy for kind information to PS/PPS of:

1. Chairman, NERPC and Hon'ble Minister of Power, Govt. of Nagaland, Kohima - 797 001
2. Hon'ble Chief Minister & Minister of Power, Govt. of Manipur, Imphal – 795 001
3. Hon'ble Chief Minister & Minister of Power, Govt. of Mizoram, Aizawl - 796 001
4. Hon'ble Minister of Power, Govt. of Assam, Dispur, Guwahati - 781 006
5. Hon'ble Minister of Power, Govt. of Meghalaya, Shillong - 793 001
6. Hon'ble Minister of Power, Govt. of Arunachal Pradesh, Itanagar – 791 111
7. Hon'ble Minister of Power, Govt. of Tripura, Agartala – 799 001
8. Member (GO&D), CEA, Sewa Bhavan, R.K. Puram, New Delhi - 110 066
9. Secretary (Power), Govt. of Arunachal Pradesh, Itanagar
10. Principal Secretary (Power), Govt. of Assam, Dispur, Guwahati – 781 001
11. Principal Secretary (Power), Govt. of Manipur, Imphal - 795001
12. Principal Secretary (Power), Govt. of Meghalaya, Shillong - 793001
13. Secretary (Power), Govt. of Mizoram, Aizawl - 796001
14. Principal Secretary (Power), Govt. of Nagaland, Kohima - 797001
15. Principal Secretary (Power), Govt. of Tripura, Agartala - 799001
16. Chairman, ASEB Bijuli Bhavan, Paltan Bazar, Guwahati - 781 001
17. Chairman, MeSEB, Lumjingshai', S.R. Road, Shillong - 793 001
18. Chairman Cum-Managing Director, TSECL, Agartala - 799001
19. Chairman Cum Managing Director, NEEPCO Ltd., Lower New Colony, Shillong - 793 003
20. Director (Finance), NHPC Ltd., NHPC Complex, Sector-33, Faridabad - 121 003
21. Director (Op.), POWERGRID, B/9, Qutub Institutional Area, Katwaria Sarai, New Delhi – 110016
22. Director (Coml), NTPC Ltd. NTPC Bhawan, Scope Complex, Institutional Area, Lodhi Road – 110 003
23. Managing Director, OTPC, 6th Floor, A-Wing, IFCI Tower -61, Nehru Place, New Delhi - 110019
24. Director (Operation), PTC, NBCC Tower, 15 Bhikaji Cama, Place, New Delhi – 110022
25. CEO, NVVNL, Core 5, 3rd Floor, Scope Complex, 7 Institutional Area, Lodhi Road, New Delhi – 03
26. Executive Director, (SO), NLDC, B/9, Qutub Institutional Area, Katwaria Sarai, New Delhi – 16
27. Managing Director, AEGCL, Bijuli Bhavan, Paltan Bazar, Guwahati - 781 001
28. Managing Director, APGCL, Bijuli Bhavan, Paltan Bazar, Guwahati - 781 001
29. Managing Director, APDCL, Bijuli Bhawan, Paltan Bazar, Guwahati – 781 001

22/2/2013

(एस. के. रॉय मोहापात्रा/ **S. K. Ray Mohapatra**)
सदस्य सचिव / Member Secretary I/C

North Eastern Regional Power Committee

Summary Record of Discussions
of
Special TCC meeting

The Special Technical Co-ordination Committee (TCC) meeting was held on 9th February, 2013 at "Hotel Polo Towers," Shillong under the aegis of POWERGRID.

The list of participants of the meeting is enclosed at **Annexure - I.**

Proceedings of the Special Committee meeting

The meeting started with the welcome address by Shri Ajoy Patir, General Manager, NERTS, POWERGRID. He welcomed all the delegates of Special TCC and informed that POWERGRID was honoured to host the Special TCC meeting of NERPC at Shillong. He wished all the participants a pleasant and comfortable stay. The meeting was inaugurated with lighting of ceremonial lamps by Shri K. Miachieo, TCC Chairman & Chief Engineer, Dept. of Power, Govt. of Nagaland, Shri S. K. Ray Mohapatra, Member Secretary I/C, NERPC, Shri W. S. Kynjing, Director (Trans.), Me.ECL, Shri A. Perme, Chief Engineer (Tran.), Dept. of Power, Govt. of Ar. Pradesh, Shri Bikash Paul, CGM, AEGCL, Shri T. S. Singh, GM, NERLDC, Shri B. Lyngkhoi, Superintending Engineer (O), NERPC and Shri D. K. Sarma, GM I/C, NERTS, POWERGRID.

Shri S. K. Ray Mohapatra, Member Secretary I/C on behalf of NERPC, welcomed all the members and the delegates of the Special TCC meeting of NERPC. He thanked the officers of POWERGRID for agreeing to host this meeting in a very short notice and for making excellent arrangements for comfortable stay of the members and participants. He briefed the house about the urgency of this meeting and highlighted some of the issues relating to main agenda of the meeting before further deliberation. He also expressed that complexity in NER grid is likely to increase in future because of addition of huge generation in Ar. Pradesh and addition of more

numbers of HVDC link between NER and other regions for evacuation of power. Hence, managing the grid security, safety and reliability is a great challenge in such a complex environment. The real time monitoring, control, reliable telecommunication link, automation, adoption of state-of-art technology and minimum human intervention is the need of hour. He also highlighted that GSES scheme covers nine (9) islanding schemes and UFR based load shedding of about 500MW has been proposed against existing UFR based load shedding of 120MW. The handouts of the presentation are enclosed at **Annexure-II**. He requested all members for active participation in the deliberations and to contribute for a fruitful outcome.

Thereafter, Shri K. Miachieo, TCC Chairman & Chief Engineer, Dept. of Power, Govt. of Nagaland addressed the august gathering. He stated that despite of busy schedule and the election in three states of the region, the members have managed to spare their valuable time to attend the meeting. He requested all delegates for active participation in the deliberations so that the decision of the committee can be conveyed to CERC. Thereafter, TCC Chairman requested Member Secretary (I/C), NERPC to take up the agenda items for discussion.

ITEM NO. 1.0	**Grid Security Expert System (GSES)**

Subsequent to the recent Grid Disturbance of 30th and 31st July 2012, a meeting was held on 06th August 2012 between Union Power Minister of India with Chief Ministers/ Power Ministers of States of Northern region and a 12 point resolution was drawn to ensure that such type of incidents do not occur in future. The points pertaining to defence plans are as follows:-

Point No.1: Adequate defence plans and protection system shall be put in place to ensure integrated operation of the National/Regional Grids in adherence with the Indian Electricity Grid Code [IEGC]. All the states shall ascertain preparedness of power system defence plans and cooperate at the Regional level for coordinating their Protection systems.

Point No.2: Defence plans of the states must include islanding schemes, under frequency relays, rate of change of frequency relays, special protection schemes and automatic demand management schemes. The defence plans shall also include restoration procedures that shall be updated and reviewed regularly.

Point No.11: POSOCO would evolve a contingency load shedding protocol, especially when non frequency related load shedding is required".

Further CERC in the order of petition number 125/MP/2012 for Northern Region on the subject of "Effective proper load management by Northern region Constituents and curbing overdrawal" has directed as follows:-

" NRLDC is directed to identify in consultation with the CTU, CEA, STUs and SLDCs the feeders in the State network which are incidental to the inter-state transmission of electricity which can be opened in case of sustained overdrawal from the grid or any other imminent danger to the grid. It also emerged during the hearing that the identified feeders can be disconnected and restored centrally through the SCADA network".

Accordingly POSOCO prepared a template for ten numbers of scenarios when the power system would be under stress along with the substation and feeder details. The same was communicated by POSOCO vide letter dated 11th September 2012 to CEA with a copy to POWERGRID/RPCs/CERC for automated defense plan for all five regions. (Summary of the scheme is attached at **Annexure -1.0 (I).**

Based on the above inputs, POWERGRID has planned an automated defense plan for all five regions named as Grid Security Expert System (GSES). The brief details of the GSES system are enclosed at **Annexure - 1.0 (II).**

The implementation of the above scheme has been proposed through following projects:-

(i) GSES System: This would involve the installation of relays, PLCs etc at Substation/Generating station level and advance GSES Software at all SLDCs and RLDC. The list of feeders where the relays shall be put has

been proposed by RLDC and is proposed to be monitored in the Centralized GSES system at SLDCs. The logics for operation of the above relays shall be finalized by RLDC/RPC in consultation with SLDCs. As per this plan, the automated feeder disconnection has been proposed at 125 No. Substations in North-Eastern Region.

(ii) Communication System for GSES system: this would require dedicated and reliable communication system. Accordingly Fiber Optic based Communication from Substations to SLDCs/RLDC has been proposed.

The communication system for GSES system shall have to be reliable, dedicated and fully secure system. Further, the system shall have to be monitored and operated in real time and hence a fast and dedicated communication network based on fiber optics would be required. The Detailed Project Report for the Fiber Optic based communication for GSES system has been prepared separately.

The Region wise estimated cost based on the feeders identified by POSOCO including IDC shall be as follows:

S.N	Subject	NR	SR	WR	ER	NER	All India
1.	Estimated DPR cost of GSES (in Rs. Crores)	82.59	42.13	124.85	55.42	49.47	354.46
2.	Number of Feeders	1064	763	1502	503	410	4242
3.	Estimated DPR cost of OPGW based communication system (in Rs. Crores)	141.61	368.37	174.24	83.18	80.42	847.82
4.	Length of OPGW	4967	14706	6111	2868	2688	31340
	Total Estimated cost (in Rs. Crores)	**224.20**	**410.50**	**299.09**	**138.60**	**129.89**	**1202.30**

It may be mentioned that the actual quantity may vary during implementation depending upon the number of feeders and substations included in the project.

Deliberation of TCC

Member Secretary (I/C) requested POWERGRID to give the detail presentation on the GSES scheme. During the presentation POWERGRID highlighted that consequent to grid disturbance on 30th and 31st July,2012, twelve (12) point resolutions were drawn in the meeting between Union Power Minister of India with Chief Ministers / Power Ministers of States of NR. As per Para 11 of the resolution, POSOCO had prepared Automatic Defence Plans envisaging ten conditions such as overdrawls, over injection / underdrawls, under voltage, ICT / line loading crossing limits, flows crossing TTC limit, loss of generation > 1000 MW, Angular difference, Under-Frequency Relays, Df/dt relays, and Islanding. Based on the inputs from POSOCO, POWERGRID has prepared detailed project report for implementation of above scheme for all five regions under the Project named as "Grid Security Expert System (GSES)". The system is proposed to be deployed at each SLDC and RLDCs.

The project would involve installation of

- Knowledge based SCADA system
- Relays and PLCs etc. at Substation/Generating station level, Digital Tele Protection Coupler (DTPC)
- Advance GSES Software at all SLDCs and RLDC level
- Dedicated and reliable OPGW communication system

In case of load disconnection, the command shall be executed initially from SLDC. In case of non-functionality of command at SLDC level within stipulated time frame, command shall be executed at RLDC level. Similarly in case of disconnection of generator (backing down of generation as being used for SPS) the command shall also be executed from SLDC/RLDC level.

The estimated cost including IDC for the project is Rs. 1202.30 crores (for all five regions) and Rs. 129.89 Crores (for NER). As per scheme, the automated feeder disconnection has been proposed at 125 Nos. of Substations in North Eastern

Region covering 410 feeders. The cost of GSES for 410 feeders is Rs. 49.47 Crores and that for dedicated OPGW based communication system (2688km) is Rs. 80.42 Crores. The handouts of the presentation are enclosed at **Annexure 1.0 (III)**.

Chairman, TCC appreciated the proposal of POWERGRID and stated that NER States are not familiar with the scheme and would need more clarifications. Further, he requested all constituents to express their views on implementation of GSES in NER.

CE, Ar. Pradesh stated that proposal is welcome in principle and it is the technology for the future. This is an automatic scheme and before putting into service, it is desirable to know whether such system is well established, whether equipments/auxiliaries are available and whether our existing system / equipments are adequate to adopt the scheme. Since, operation of whole region/country will be put in automatic mode, the software and logic needs to be developed and well proven. Further, the cost implication needed to be seen, whether it will be shared on regional basis or national basis.

He further emphasized that if it is an unified scheme and cost will be shared on national basis, not on regional basis, then it is acceptable. Otherwise, NER should wait and watch the success of implementation the GSES in other region as revenue return is not good.

POWERGRID clarified that the cost recovery will be on regional basis or State basis as the implementation will be at state level.

AGM, NTPC stated that the scheme formulated by PGCIL talks about only reduction / tripping of generation / load and is silent on time frame and conditionalities to bring back the generation / load to restore the grid. Any automatic command for generation, reduction may not be desirable. Therefore, command may be issued to the generator through emergency alarm indicating quantum of reduction of generation and the generator may be allowed to take best possible action. Any generation / load shedding should be evolved based on guidelines of CERC. NER,

compared to other region, is a very small grid, therefore, the scheme needs be re-examined to address specific conditions of NER grid and more focus should be on load management.

POWERGRID informed that the scheme is in preliminary stage. Before implementation of the scheme, the region specific information will be collected, discussed further and finalized in consultation with constituents of region.

Director, CEA stated that proposed scheme gives by and large the operational philosophy and, could be tuned and re-tuned through iterative exercises as per system requirement. Accordingly the algorithm/logic may be developed to meet the requirement of the region.

GM, NERLDC informed that the nodes have been identified and the feeders have not been identified for the scheme. Therefore, macro level study for feeders is required before implementation of the scheme.

SE (O), NERPC informed that NE region is very small in comparison to other regions and moreover, it is not well connected with other regions. The corridor/connectivity is inadequate and there is no redundancy in NER grid. Only three States are having full fledged SLDCs in NER. Further, because of remote and isolated location of stations, ensuring healthiness of sophisticated equipments (like MUX, OTDR etc.) is a question mark. In case of any problem with equipment, the system may be bypassed/ deactivated. He also mentioned that the quantum of UFR load relief in respect of NER states has to be relooked as the proposed quantum of load shedding is very high.

MS I/C, NERPC stated that before implementation of the scheme, the adequacy of the existing infrastructure available at substation level like relays, Breakers & auxiliaries / DC system etc. need to be ensured. Further, he requested POWERGRID to provide the detail break up for 2688 km OPGW link network, name of the substations and number of feeders considered at each station etc. for UFR or

df/dt based load shedding for NE Region. He also informed that islanding schemes and SPS scheme for the region are yet to be finalized.

CGM (Comml), AEGCL stated that all the States of NER do not have SLDCs and substations are still operating with Electro Mechanical relays. Most of the Sub-stations in NER need upgradation. Moreover, there are so many ongoing schemes, which are incomplete. Implementation of ongoing SCADA scheme has not been completed and its benefits have not been realized so far. Further, he informed that the NER State utilities are running in loss and hence commercial implication is to be seen and DoNER / Govt. of India may be approached for funding. The ongoing schemes should be completed and detail study is required before implementation of GSES.

Director (Trans.), Me.ECL stated that the GSES is a very good scheme, but before implementation of the scheme, all NER States should have SLDC and protection system should be in place and healthy. As far as funding is concerned he supported the view of Ar. Pradesh.

ACE, Manipur informed that there is no SLDC in Manipur and the sub-stations are very old and most of the relays are electro mechanical type, which are under replacement. He also expressed that funding is the major concern and hence scheme should be funded through Govt. of India.

SE, Nagaland stated that there is no SLDC in Nagaland also and hence before implementation of GSES schemes, the ground level infrastructures are required to be in place.

SE (Comml), Mizoram expressed that there is no SLDC in Mizoram and the scheme needs to be studied in detail before implementation.

Because of election in Tripura, the representative from TSECL could not attend the meeting. The following views of TSECL, received by NERPC secretariat, were informed to the house.

- The agenda items are of very new concept and attract advance technology & capital investment. The matter needs details review for examining technical & commercial aspects before discussion in TCC & NERPC meeting.

- TSECL would like to have all relevant information from respective agencies like PGCIL before deliberation in next TCC & NERPC meeting.

- The draft Automated Defence Plan has also not formulated taking into consideration uniform treatment to both State & Central utility in respect of generation & transmission. The load relief prescribed for NER needs review. The OPGW proposed for NER for 2688 Km needs detail breakup.

Chairman, TCC stated that the proposal is agreed in principle but further deliberation on technical and commercial implication is required before implementation of the scheme.

After detailed deliberation the decisions of the committee were summarised as follows:

- **All constituents agreed in principle to the technical requirement of the GSES scheme for NER grid.**
- **The basic infrastructure at most of Sub-station like circuit breakers, protection relays, etc. are not adequate for implementation of the scheme.**
- **There are no full fledged SLDCs in Ar. Pradesh, Manipur, Mizoram and Nagaland.**
- **Funding is major concern as NER states are financially weak.**
- **The quantum of UFR based load shedding needs to be relooked for NER States.**
- **More deliberation on technical and commercial issues is required before formulation/implementation of the scheme.**

ITEM NO. 1.2	Proposal for implementation of state of art PABX System:

During the recent grid disturbance, operators at control center faced many problems in voice communication with other control centers and important stations due to non-availability of fast dialing, easy directory sorting and inter-regional voice connectivity etc. which consequently delayed the grid restoration process. Considering this, POWERGRID has proposed to install state of the art PABX system at all SLDCs, RLDCs and NLDC of the country with features such as computerized touch screen dialing, directory sorting, voice recording system etc. The proposal for implementation of state of art PABX system for NLDC/NERLDC & all SLDCs of North-Eastern region under the additional Fiber Optic Project requirements for Central Sector of North Eastern Region was deliberated in 16th UCC meeting. The NIT for this requirement has already been floated and bids are under evaluation. This requirement is being included in the Additional Fiber Optic requirements is for Central Sector project of North-Eastern Region approved by 12th NERPC meeting.

Deliberation of TCC

The members of the committee agreed for implementation of state of art PABX system.

TCC agreed to the proposal and recommended for approval of RPC.

ITEM NO. 1.3	Expansion and Up-gradation of SCADA/EMS System at NERLDC and SLDCs of North Eastern Region:

In the 13th NERPC meeting held on 10th July 2012 at Faridabad, POWERGRID proposed to implement the project of Upgradation/ Expansion of SCADA/EMS system for SLDCs except Assam under the existing commercial agreement of ULDC and the tariff to be recovered as determined by CERC. NERPC/TCC agreed for the above proposal, however, the NERPC Committee also suggested to approach the DoNER/ NEC, Govt. of India for funding. Accordingly POWERGRID vide letter dated

13.09.12 intimated to the NER constituents that POWERGRID is moving ahead with the implementation of the above project in line with the approval of NERPC and the same shall be included in the existing commercial agreement already signed by the constituents and the tariff for the same as determined by CERC shall be payable by the NER constituents.

Subsequently, Assam Electricity Grid Corporation Limited (AEGCL) vide their letter ADB/ASEB/CE/TT/BID/Tech-2201/Part-XI/2011/52 dated 15th September 2012 has also requested for inclusion of their portion in the above project. Accordingly BOQ for AEGCL portion was finalized in the meeting held at POWERGRID, Gurgoan office on 16th October 2012. Further, AEGCL vide their letter dated 12th November 2012 requested NERPC fro suitable amendment in the resolution of RPC/TCC meeting for inclusion of scope for AEGCL. AEGCL has also confirmed vide letter MD/AEGCL/SLDC-PGCIL/2012 dated 01st December 2012 that Upgradation of existing SCADA/EMS system of Assam SLDC shall be part of the existing Commercial Agreement Signed between Assam and POWERGRID under ULDC project and the tariff shall be determined by CERC.

The issue was deliberated in the 16th UCC MEETING held on 11th December 2012 at Guwahati and the Finalized BOQ was circulated.

The tenders are under evaluation and Award is likely to be placed by January 2013.

Deliberation of TCC

POWERGRID informed that earlier all constituents except Assam had agreed for implementation of the above project and subsequently Assam had also confirmed that Upgradation of existing SCADA/EMS system of Assam SLDC shall be part of the existing Commercial Agreement Signed between Assam and POWERGRID under ULDC project and the tariff shall be determined by CERC.

AGM, Assam representatives informed that the final BOQ is yet to be received by them and POWERGRID need to carry out survey before finalization.

POWERGRID informed that BOQ has been finalized based on the inputs from Assam. PGCIL will also discuss the matter further before implementation and finalise BOQ in consultation with Assam.

After deliberation it was agreed that POWERGRID should go ahead with the implementation of Expansion/Upgradation of SCADA/EMS System at NERLDC and SLDCs of North Eastern Region and investment shall be recovered as tariff determined by CERC. However, if funding from DONER/NEC shall be available the same shall be suitably adjusted in the Project Cost/tariff.

All constituents agreed to the proposal of POWERGRID. However, the committee requested NERPC Secretariat to pursue the matter with DoNER for funding / funding from PSDF.

TCC agreed to the proposal and recommended for approval of RPC for inclusion of Assam in the above project.

ITEM NO. 1.4	**Unified Real Time Dynamic State Measurement (URTDSM) Scheme:**

With the growing dimension of Indian Power System and consequent manifold increase in complexities of integrated grid operation in new regime of open electricity market and increasing variability of non-conventional energy outputs, need of fast and reliable synchronous measurement and monitoring system is being felt for effective planning of system and for reliable, secured and economical system operation of such geographically spread Power network on real time basis. Application of synchrophasor technology for Wide Area measurement/Monitoring (WAMS) in Indian Power System has been proposed as "**Unified Real Time Dynamic State Measurement" (URTDSM) scheme**. This technology has capability of measuring & monitoring the system on real time, which would be helpful in better visualization of the system and utilization of existing transmission assets

with reliability, security and economy. The scheme covers placement of Phasor Measurement Units (PMUs) at sub-stations and both ends of transmission lines at 400 kV and above voltage level including generating stations at 220 kV level of STU, ISTS & IPP coming up by 2014-15 time frame. The scheme will be implemented in two stages. In the stage-I PMUs will be placed at those locations where fiber optic communication link is either available or would be made available under microwave frequency vacating program and regional strengthening program by 2014-15 along with installation of PDCs at all SLDCs, RLDCs, NLDC, NTAMC, strategic locations in state, remote consoles at RPCs, CEA, CTU and other locations. In stage-II PMUs would be installed at balance locations along with communications links.

The scheme was discussed and finalized in the Joint Meeting of all the five Regional Standing Committees on Power System Planning held on 05.03.12 wherein it was decided that in the Indian context, PMUs need to be installed in such a way that voltage phasor of each substation and current Phasor at both ends of each transmission line can be monitored to take care of redundancy in the event of outage of PMU, associated communication link etc. for wide area measurement and control. Experience of WAMS pilot project already implemented in Northern Region with PMU located at nine (9) locations was shared and benefit by way of preventive actions in advance based on synchrophasor measurements to avoid large scale disturbance and operation of the system in a more reliable manner was deliberated. Pilot Project in Northern Region has helped system operation on real time, protection co-ordination, disturbance analysis etc. It has helped in improving situational awareness by tracking the phase-angle separation, df/dt, voltage phasors and line loadings. With PMU data it has also become possible to identify the line tripping, generator tripping, inter area oscillations, load crash & auto-reclosure of lines. The archived PMU data has helped in the analysis of grid events, validation of protection schemes and validation of transfer capability through different flow gates.

In addition, possible utilization of PMU data through analytical software viz. supervised zone-3 blocking, dynamic (linear) state estimator, CVT parameter

validation, CT validation, angular stability, emergency control like frequency control, voltage instability, transient stability model validation etc. was also deliberated for development of analytics in parallel with implementation of the URTDSM scheme, in association with premier academic institutions (like IITs).

It was agreed that scheme shall be implemented as system strengthening and cost shall be added in the National transmission pool account and to be shared by all the Designated ISTS Customers (DICs) as per the POC mechanism under the CERC regulation. Estimated cost of the scheme is about Rs.650 Crore. The scheme has already been discussed and agreed in NRPC, WRPC, SRPC & ERPC.

In NER, 40 numbers of sub-stations/generating stations (ISTS – 18 and STU – 22) and 164 number of feeders (ISTS – 95 and STU – 69) have been identified for installation of 86 number of PMUs (ISTS – 50 and STU – 36), 6 nos. of Master Phasor Data Concentrator (MPDC) and 2 nos. Super Phasor Data Concentrator (SPDC) in two phases at an estimated cost of Rs. 50.77 Crores (Phase – I = Rs. 24.23 Crores and Phase – II = Rs. 26.54 Crores). The details of installation of PMUs and PDCs in constituent states of NER are as follows:

North Eastern Region (PMU &PDC)									
NER – Phase I				**NER – Phase II**			**PDC**		
	S/S	feeder	PMU	S/S	feeder	PMU	Nodal PDC	MPDC	SPDC
Ar. Pr.	1	4	2	3	8	4	*	2	
Assam	4	20	11	10	27	14	0	2	
Tripura	0	0	0	1	2	1	*		
Megh.	0	0	0	2	6	3	*	2	
Naga	0	0	0	1	2	1	*		
Central	9	69	36	9	26	14			2
G. Total	**14**	**93**	**49**	**26**	**71**	**37**	**0**	**6**	**2**

The above issue has been taken up by NERPC with the constituents of NER and they have agreed in principle regarding implementation of the above scheme.

Deliberation of TCC

Member Secretary (I/C) informed that the matter was taken up by NERPC with the constituent states of NER and in principle all constituents were agreeable for implementation of above scheme. In the meantime formal letters of acceptance were received from the States of Assam, Nagaland and Tripura. The queries regarding voltage level of substation for installation of PMUs was also clarified by POWERGRID. MS(I/C) requested POWERGRID to give a presentation on the overview of the scheme. GM, POWERGRID gave a detail presentation on implementation of URTDSM scheme and briefed the house about the advantages and need of synchrophasor technology for wide area measurement/monitoring of grid, addressing various queries from the Constituents. The handouts of the presentation are enclosed at **Annexure 1.4**.

Director, CEA informed that all the five regional grids are likely to be operated in synchronism by early 2014, forming one all India Grid. He added that huge hydro generation capacity addition in Ar. Pradesh has been envisaged and a comprehensive scheme for transmission, sub-transmission and distribution system for all the States in the region have been planned. Some projects like Pallatana GBPP and Bongaigaon TPS and associated transmission system are also under various stages of completion. In this context, URTDSM scheme would provide the entire spectrum of system dynamics in millisecond and facilitate system operator to take timely decision and corrective action for efficient operation of the Grid.

CE (Trans.), Ar. Pradesh was concerned about the financial implication to the constituents of NER. POWERGRID clarified that in the joint meeting of the all five Regional Standing Committees on Power System Planning held on 5th March, 2012 in Gurgaon, it was decided that the scheme would be implemented as system strengthening scheme and transmission charges would be included in the National transmission pool and to be shared by all the Designated ISTS Customers (DICs) as per the POC mechanism under the CERC regulation.

TCC agreed for implementation of the proposal and recommended for approval of RPC.

ITEM NO. 1.5	Pollution mapping for North Eastern Region:

In order to facilitate cost effective selection of insulators for transmission lines and minimizing the trippings of transmission lines due to insulator flash over, it is essential to have knowledge of the pollution severities. Inquiry Committee on Grid Disturbance in Northern Region on 2nd Jan' 2010, recommended POWERGRID to complete pollution mapping in association with CPRI. Transmission corridors of region are adversely affected due to heavy pollutants emitted by Industries / Costal Pollutants in the region. Proper mapping is necessary to develop a pollution profile of the region.

Pollution mapping of the region is proposed to be executed in association with CPRI using approach similar to the one adopted in Northern region.

- CPRI & POWERGRID shall provide training (including hands on training) to the associated engineers of POWERGRID & constituents (State Utilities) at suitable locations in the region and suggest the Guidelines/Procedures.
- Dummy insulator to be arranged & installed by POWERGRID and STUs on their transmission lines. Measurements shall be carried out three (03) times representing three seasons per year and shall repeat the same for next year also. (i.e. total 6 samples for two years)
- Initial samples shall be installed & measurement of Equivalent Salt Deposited Density (ESDD) & Non Soluble Deposited Density (NSDD) to be done under the supervision of CPRI. Subsequent measurements shall be carried out by officials of constituents.
- Chemical Analysis of selected samples shall be carried out by CPRI. The CPRI shall analyze the measurements / results of test carried out at site & laboratory and determine the pollution levels. Pollution map shall be produced on geographical map of region.

Funding:

- Expenditure on pollution mapping is to be reimbursed to POWERGRID directly from the beneficiaries as one time reimbursement. **Expected expenditure for the program is INR 3 Crores**

The above methodology & funding mechanism for Pollution Mapping Program is similar to the one adopted for Northern Region and in line with the decision taken in 22nd NRPC & 66th OCC meeting.

Deliberation of TCC

MS I/C, NERPC informed that pollution level in different areas is generally classified into four categories depending on level of pollution like low, medium, heavy and very heavy. Depending upon the severity of pollution, the creepage distance requirement of insulators, which depends on level of pollution, is decided for substations or transmission lines at the design stage.

CE, Ar. Pradesh informed that during rainy seasons presence of pollutants is creating problem for 132/33 kV Daporizo and Along Sub-Stations.

POWERGRID also informed that pollution level is likely to increase in areas where cement industries are coming up. Ms (I/C) informed that not only Cement industries, but also other industrial development, coastal pollution and smokes from brick kilns etc. causes problem for existing / new transmission lines and substations. The insulators with higher creepage distance or polymer insulators are generally used in such highly polluted areas. It is essential to know the level pollution in different areas and hence, like NR, pollution mapping of NER, in association with CPRI, is also desirable.

After detail discussion the committee requested POWERGRID to bear the burden of one time expenditure of about Rs. 3 crores for NER. POWERGRID agreed to revert back on this matter.

The Sub-Committee noted as above.

ITEM NO. 2.0	Any other items:

2.1 Formation of Power System Study Group for NER:

Member Secretary (I/C) informed the committee that in last 82nd OCC meeting, it has been decided to form a Power System Study group for NER taking representation from constituent states, POWERGRID, NERLDC, NTPC, NEEPCO, NHPC, OTPC and IIT Guwahati. The studies relating to islanding scheme, SPS and any other studies required from time to time would be carried out by the group. The group will not only help for studies on regional basic but will of great help to each state for their planning studies. All members were requested for nominations.

The Sub-Committee noted as above.

2.2 Protection Co-ordination sub-Committee meeting :

Member Secretary (I/C) also informed that as per decision of MoP, Govt. of India and communicated by office of Member (GOD), PCC sub-committee has to meet on monthly basis instead of Quarterly basis till further order.

The Sub-Committee noted as above.

2.3 Telemetry of new elements:

The elements related to Monarchak power plant and 400kV Silchar-Byrnihat line is suppose to be commissioned in March-2013. So in line with CEA Grid connectivity standards, telemetry should be ensured.

POWERGRID was requested to look matter.

The Sub-Committee noted as above.

2.4 Analog and Digital Data status for existing elements:

- More than 50% RTU of Assam not reporting.
- Two (2) Nos. RTU of Meghalaya not reporting. Most of digital data status not reporting.
- Four (4) Nos. RTUs of Meghalaya not reporting.

Assam and Meghalaya was requested to look into the matter.

The Sub-Committee noted as above.

The meeting ended with thanks to the Chair.

****

ANNEXURE - I

List of Participant in Special TCC Meeting

Organisation	Name S/Shri	Designation
Arunachal Pradesh	1. Sh. A. Perme	CE (Transmission)
Assam	1. Sh. Bikash Paul 2. Sh. N. C. Das 3. Sh. B. C. Bordoloi 4. Sh. J. K. Baishya 5. Sh. A. K. Saikia	CGM (Comml), AEGCL CGM (SLDC), AEGCL DGM(SLDC), AEGCL AGM, AEGCL AGM, AEGCL
Manipur	1. Sh. Ng. Sarat Singh 2. Sh. Ng. Brijit Singh	Addl. Chief Engineer Superintending Engineer
Meghalaya	1. Sh. W. S. Kynjing 2. Sh. O. G. Singh 3. Sh. A. Kharpran 4. Sh. F. E. Kharshiing	Director (Transmission) Addl. Chief Engineer (T&T) Superintending Engineer (SLDC) Executive Engineer (SLDC)
Mizoram	1. Sh. V. Rodingliana 2. Sh. Vanlalrema 3. Sh. B. Joy Singh 4. Sh. Lalhmingliana Hmar	Superintending Engineer (Com) Superintending Engineer (SLDC) Junior Engineer SDO
Nagaland	1. Sh. K. Miachieo 2. Sh. Khose Sale 3. Sh. T. Walling 4. Sh. A. Jakhalu	Chief Engineer (P) Superintending Engineer Executive Engineer Executive Engineer (Trans.)
Tripura	**No representative**	**No representative**
NEEPCO	1. Sh. D. K. Saikia 2. Sh. Bhaskar Goswami	Sr. Manager (E/M) Sr. Manager (O&M)
NHPC	1. Sh. Surajamani Singh	Manager
NERLDC	1. Sh. T. S. Singh 2. Sh. A. Mallick 3. Sh. Anupam Kumar	General Manager Chief Manager Engineer

Organisation	Name S/Shri	Designation
POWERGRID	1. Sh. D. K. Sarma 2. Sh. A. Patir 3. Sh. Subir Sen 4. Sh. A.S. Kushwaha 5. Sh. P. Kanungo 6. Sh. Sunil Kumar 7. Nirmit Mohan	General Manager (I/C) General Manager General Manager General Manager (LD&C) Dy. General Manager Chief Manager Engineer (LD&C)
NTPC	1. Sh. S. Nayak 2. Sh. A. K. Bishoi 3. Sh. S. K. Kar 4. Sh. L. Hokip	Addl. General Manager (OS) Addl. General Manager (Comml) Addl. General Manager (Comml) Dy. Manager (Comml)
NVVN	**No representative**	
CEA	1. Sh. R. Saha	Director
OTPC	1. Sh. Mukul Banerjee	General Manager (Plant)
NETC	**No representative**	
Special Invitee	**No representative**	
NERPC	1. Sh. S. K. Ray Mohapatra 2. Sh. B. Lyngkhoi 3. Sh. Lalrinsanga 4. Sh. D. K. Bauri 5. Sh. S. M. Aimol	Member Secretary I/C Superintending Engineer (O) Assistant Secretary Executive Engineer (O) Executive Engineer (Comml)

ANNEXURE-II

SPECIAL TCC
OF
NORTH EASTERN REGION
(February 9, 2013)

Member Secretary (I/C)
NERPC

1

IMPLEMENTATION OF GRID SECURITY EXPERT SYSTEM (GSES) IN NER

Record of Proceedings (ROP) of CERC in response to Petition No. 265/MP/2012 (Hearing on 10-1-2013)

- **"The Hon'ble Commission observed that in Petition Nos. 249, 250 and 265/MP/2012, Regional Power Committees of all regions have been directed during the hearing on 8.1.2013 to discuss the issue of "Implementation of the Automatic Demand Management Scheme at the SLDC/distribution company level" as an agenda item within one month and file their decisions."**

2

IMPLEMENTATION OF GRID SECURITY EXPERT SYSTEM IN NER

"The Commission directed that the Regional Power Committees of all regions would also take up to issue of 'Implementation of Grid Security Expert System' as an agenda item within one month from the date of issue of this ROP and file their decisions on affidavit within one week thereafter, after serving the copies thereof on all the constituents of the respective RPC."

3

IMPLEMENTATION OF GRID SECURITY EXPERT SYSTEM IN NER

Consequent to grid disturbance on 30th and 31st July,2012, 12 point resolutions were drawn in the meeting between Union Power Minister of India with Chief Ministers / Power Ministers of States of NR. As per Para 11 of the resolution, POSOCO had prepared Automatic Defence Plans envisaging following ten conditions:

- **Overdrawls**
- **Over injection / Underdrawls**
- **Under Voltage**

4

IMPLEMENTATION OF GRID SECURITY EXPERT SYSTEM IN NER

- ICT / line loading crossing limits
- Power Flows crossing TTC limit
- Loss of generation > 1000 MW
- Angular difference
- Under-Frequency Relays
- Df/dt relays
- Islanding

5

IMPLEMENTATION OF GSES IN NER

Based on the inputs from POSOCO, POWERGRID has prepared detailed project report for implementation of above scheme for all five regions under the Project named as "Grid Security Expert System (GSES)".

The system is proposed to be deployed at each SLDC and RLDCs.

6

IMPLEMENTATION OF GSES IN NER

The project would involve installation of

- Knowledge based SCADA system
- Numerical relays, RTUs upto 132kV stations and PLCs etc. at Substation/Generating station level, Digital Tele Protection Coupler (DTPC)
- Advance GSES Software at all SLDCs and RLDC level
- Dedicated and reliable OPGW communication system

7

IMPLEMENTATION OF GSES IN NER

- The estimated cost including IDC for the project is **Rs. 1202.30 crores (for all five regions)** and **Rs. 129.89 Crores (for NER).** As per this plan, the automated feeder disconnection has been proposed at **125 Nos. of Substations in North Eastern Region covering 410 feeders**. The cost of **GSES for 410 feeders is Rs. 49.47 Crores** and that for dedicated **OPGW** based communication system **(2688km)** is **Rs. 80.42 Crores**.

8

IMPLEMENTATION OF GSES IN NER

Present status in state sector in the region relating to this issue

- **Protection System**
  - Mostly EM relays
  - Absence of reliable communication link
  - Absence of bus bar protection even at 220kV level
  - LILO system operating without CB
  - DC system needs upgradation (existing Single battery system etc.
  - Need for improvement in earthing system

9

IMPLEMENTATION OF GSES IN NER

- **Quantum of UFR / df/dt based load shedding**

[Recently three stage UFR based load shedding of 120MW (Stage-I 48.8Hz : 60MW, Stage II 48.5 Hz: 30MW, Stage III 48.2 Hz: 30MW with Ar.P, M, Mi, N-3MW, A-65MW,T-19MW, Me-24MW) proposal completed.]

10

IMPLEMENTATION OF GSES IN NER

In present proposal there is also three stage UFR based load shedding (except Assam with 4 stages) of 500MW

[Stage-I 49Hz : 63MW, Stage II 48.8Hz: 111MW, Stage III 48.6 Hz: 126MW, Stage IV 48.4 Hz: 50MW, balance for survival of Island- 150MW with Ar.P, M-50MW, A-240MW, Me-60MW, Mi- 25MW, N-35MW, T-40MW and no df/dt has been envisaged]

11

IMPLEMENTATION OF GSES IN NER

- **Islanding Scheme**

[POSOCO has proposed 9 islanding scheme including isolation of region, Loktak, DHEP, NTPS, KLHEP, AGTPP, Rokhia, Umium, AGBPP and associated loads]

- **SPS scheme**

[Requirement in case of tripping of 400kV Silchar – Byrnihat line or tripping of one unit of OTPC]

12

IMPLEMENTATION OF GSES IN NER

- **Creation of study group**

  [Comprising of representatives from State Constituents, NERPC, NERLDC, POWERGRID, NEEPCO, NTPC, NHPC, OTPC and IIT Guwahati for Studying Islanding Scheme, SPS Scheme or any other studies required from time to time.]

13

IMPLEMENTATION OF GSES IN NER

- Keeping above facts in background
- Taking into account the likely increase in complexity in NER system in future
- Need of real time monitoring, control, reliable telecommunication link, automation, adoption of state-of-art technology and minimum human intervention in present scenario

I request the august gathering to deliberate on the subject matter so that decision of the committee can be communicated to CERC within the specified time frame.

14


Thank You

Annexure – 1.0 (I)

Automated Defence Plans for secure operation of the Grids

S no	Logic	Control Action
1	Overdrawal > 12% of schedule or 150 MW (PLC based scheme at LDCs)	On day 1, Group 1 load is shed in the first instance of violation followed by Group 2 in the second instance and so on say upto Group 5 if there are five (5) violations On day 2, Group 6 would be shed for the first violation followed by Group 7 and so on. After Group 60, Group 1 would start.
2	Under-drawals > 12% of schedule or 150 MW (PLC based scheme at LDCs)	On day 1, signal would be sent to Power station 'A' in the first instance followed by station 'B' in the second instance and so on say upto Power station 'C' if there are three (3) violations. On day 2, signal would be sent to the Power station 'D' in the first instance and so on.
3	Voltage <200 kV for more than 5 minutes (Local or PLC installed at the nodes identified)	Under Voltage Load Shedding (UVLS) Relays would be installed at each of the twenty nodes. In case of UV at node 1 shed load in Group 1 and if the UV persists, shed Group 2 and so on.
4	ICT/line loading crossing limits (Local or PLC installed at select locations).	Choose appropriate Groups from 1 to 60 for each set of ICTs/lines.
5	Flows crossing TTC and overdrawal (PLC based scheme at RLDCs)	Choose Group 1 in state 1, Group 1 in state 2 and so on for the first instance violation followed by Group 2 in state 1, Group 2 in state 2 and so on Day 1. On Day 2 move to the group following day 1 for the respective states.
6	Loss of generation > 1000 MW. (PLC based scheme installed at power station end)	Choose appropriate ten (10) groups adjacent to the power station. Further the PLC can also be used to secure the power station in case of depletion of the network emanating from the power station.

S no	Logic	Control Action
7	Angular difference (PLC based scheme at RLDC level)	Choose appropriate two groups for each state located downstream of the angle pair.
8	Under-Frequency Relays UFR1: 49.0 Hz UFR2: 48.8 Hz UFR3: 48.6 Hz UFR4: 48.4 Hz	 20% of identified loads for shedding……12 Groups 20% of identified loads ……12 Groups 30% of identified loads……18 Groups 30% of identified loads……18 Groups
9	Df/dt relays 49.9 Hz with 0.1 Hz/sec slope 49.9 Hz with 0.2 Hz/sec slope	 Overlap with UFR3 above Overlap with UFR4 above
10	Islanding at 47.9 Hz	Power station specific schemes to be formulated.

Annexure – 1.0 (II)

Grid Security Expert System

The Grid Security Expert System scheme shall take the various inputs as follows:-

- **The load/generation relief expected –** The data of MW,MVAR, KV, Frequency, Voltage, UI calculation available from real-time SCADA system .
- **Simulation study save cases** for various conditions resulting into a knowledge based database for the actions required to be taken based on the prevailing conditions in real-time.
- **Phasor data:- Through PDC installed at RLDC**

The sample diagram for implementation of the above scheme is as follows:-

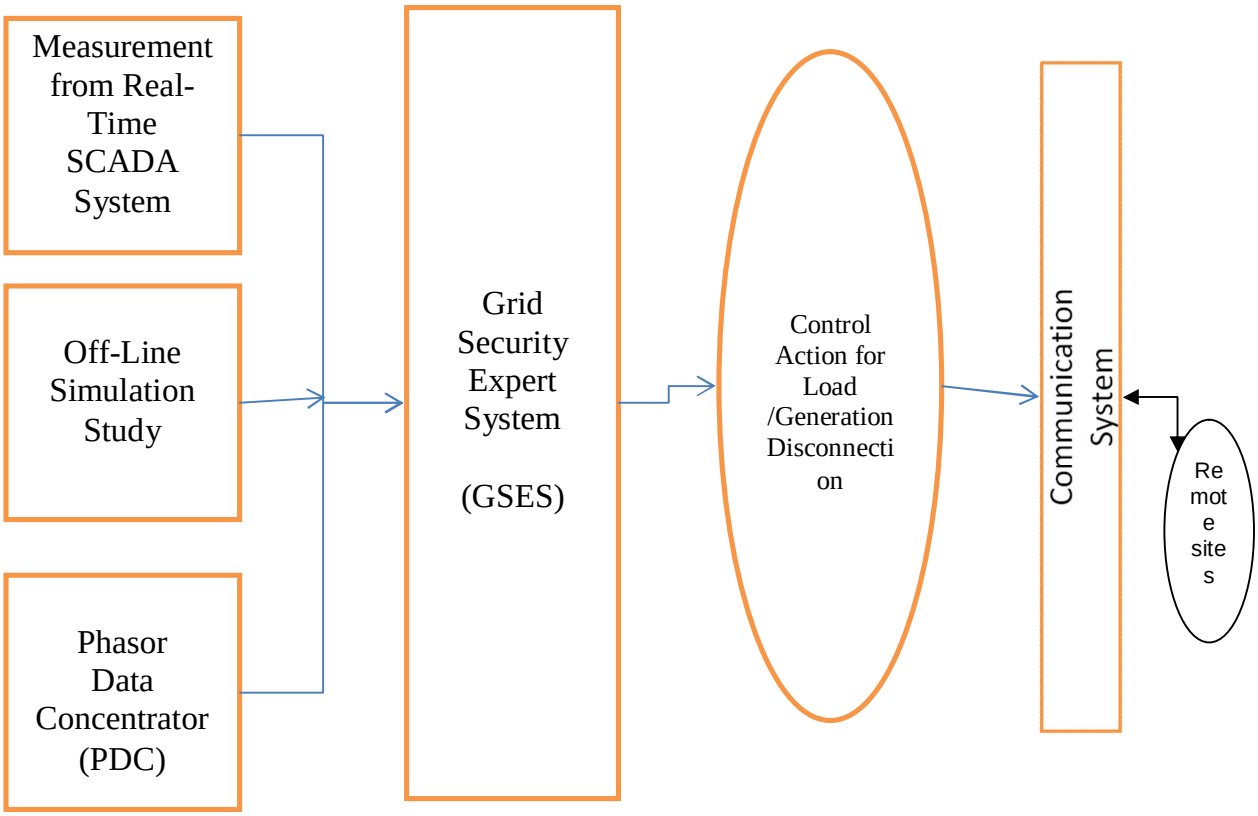


Figure 1.0:- Conceptual Architecture of GSES System

The expert system shall match the loads/generations and sent the command signal to different loads/generation for getting the relief. This experts system is proposed to be deployed at each SLDC and RLDCs. The expert system shall have

the knowledge database for different simulation conditions and different logics for disconnection. The SGES system shall match the real-time data with knowledge database and whenever the condition matches it will trigger the command with the best match conditions of the databank. While triggering the command it will check the real-time data for the load/generation to be disconnected. In case of load disconnection the command shall be initiated initially from SLDC. In case of non-functionality of command from SLDC, RLDC shall execute the command. However in case of disconnection of generator (backing down of generation as being used for SPS) the command shall be executed from RLDC . Further the telemetry provision shall be made for all the identified loads, Digital coupler circuit monitoring through the real-time SCADA system.

2.1. Implementation of Grid Security Expert System

The command from the expert system to load/generator shall be similar to the Special protection Scheme implemented. The PLC shall take the input from SGES and shall operate the circuit breakers of the identified load through Digital protection Couplers which shall require Fiber Optic communication system. For implementation of the above scheme, the following infrastructure shall be a prerequisite:-

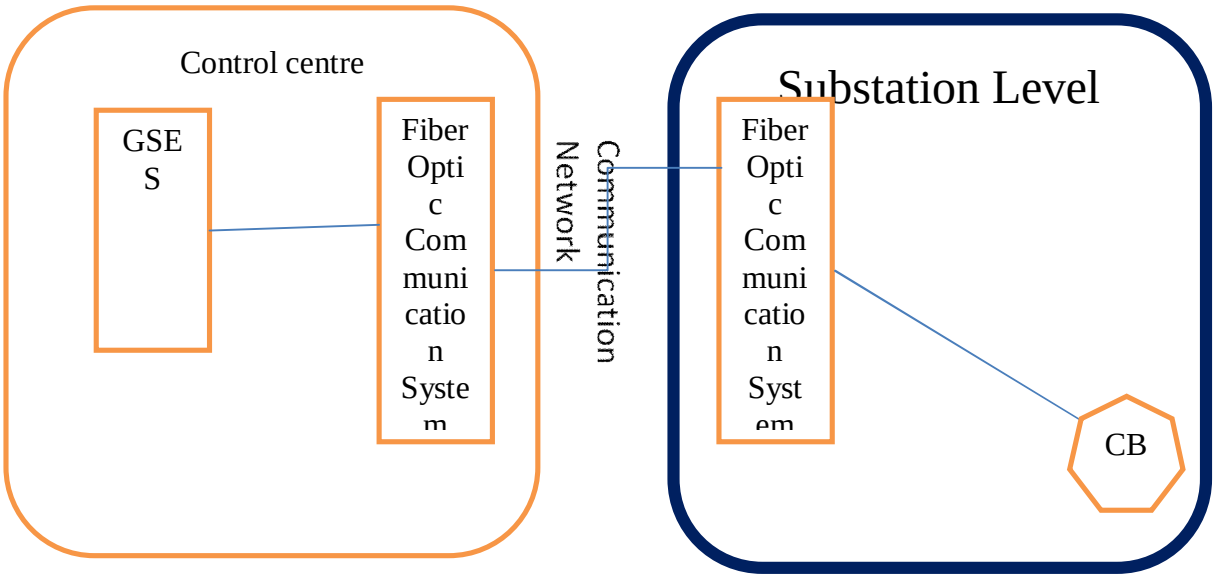
- ***Availability of Fiber Optic communication system of identified loads***
- ***Healthiness of trip/close circuits from Control Room to switchyard.***
- ***Availability of telemetry of these identified Loads to the SLDC as well RLDC***
- ***Proper logic check for Authority check in hierarchical manner among Substations, SLDC and RLDC i.e. if RLDC has initiated the operation, the same should not be operated from SLDC or from the substation.***
- ***Off-line simulation tool***
- ***Co-operation from SLDC/Generation Utility and***
- ***The experienced and trained manpower for creating the knowledge bank for Expert system***

2.2. GSES based on WAMS system

After deployment of sufficient Number of PMUs in India Power System, the analytic would be developed to find out the actual state measurement of the system. The state estimator system shall have more accurate result. The GSES system shall be provisioned to take the input from this state measurement system / state estimation system for building and updated its knowledge bank for handling the conditions elaborated above. The action for disconnection of the load/generation should be initiated accordingly.

2.3. Digital Tele Protection Coupler (DTPC) system

Digital Tele Protection Coupler (DTPC) is required to transfer the trip command over Digital communication or receive the command from the Remote stations. The DTPC after receiving the command from either GSES or remote DTPC actuates the contacts of the relays of the loads or the generators. In case of back down of Generators the DTPC system actuates the contacts the MW output generation setting of the generator. According to the Target MW output settings, the Steam bypass (HP/LP) and coal firing is varied and the desired back down is achieved. The schematic diagram of the Command Transfer is shown below:



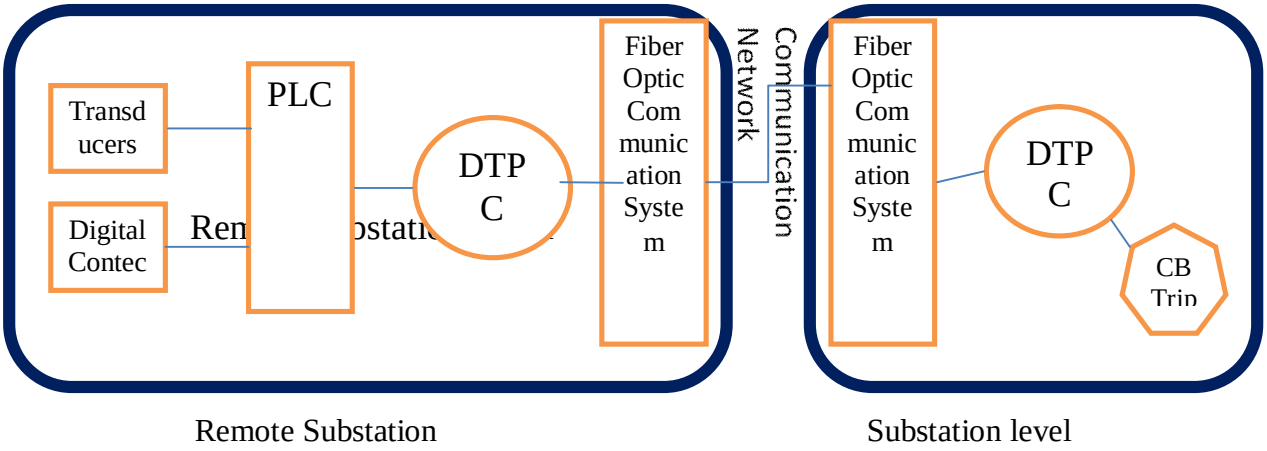


Figure 3.0 Tele Protection System

2.4. PLC System

The Programmable Logic Controller (PLC) shall be defined in the case of measurement the inputs would be taken from the local measurements and the tripping has to be executed on wide area. The typical PLC for the SPS design of Power Plant is given below.

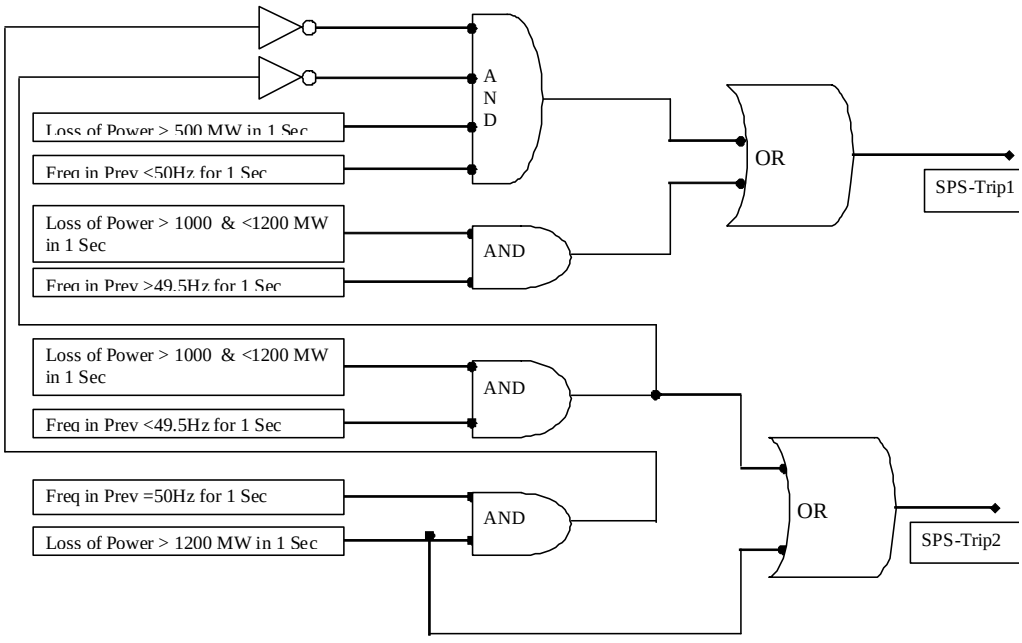


Figure 4.0 Typical PLC system

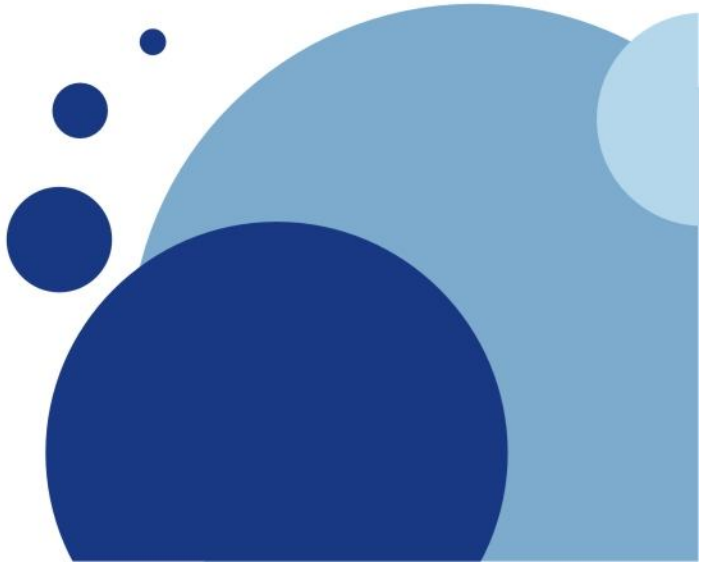
2.5. Features of Under Frequency Protection:

It is proposed to use Under Frequency Relay (UFR) on 132kV, 66kV and 33kV feeders based on loadability and importance of the feeders and type of load it feeds. The relay shall monitor the frequency of the bus and have a programmable feature to operate different output contacts based on different frequency values. UFR is required to be IEC 61850 complaint and on owner's communication network, a number of relays shall be connected to a server which may cater to requirement of a number of sub-station in the vicinity. This server along with a gateway if required may be located in Area load despatch centre where all the relays in the area shall be connected and monitored. The mode of communication shall be wide band.

2.6. Communication System for GSES system:

The communication system for GSES system shall have to be reliable, dedicated and fully secure system. Further the system shall have to be monitored and operated in real-time and hence a fast and dedicated communication network based on Fiber optics would be required. The alternate communication network based on GSM/GPRS technology is although can be made dedicated for this system. But the drawback of this GSM/GPRS technology is based on IP technology and hence the security of this system shall be major concern wherever the control system is being utilized. Hence the GSM/GPRS communication system shall be limited to monitoring of the system. The Detailed Project Report for the Fiber Optic based communication system is being proposed separately

Grid Security Expert System (GSES)



GSES System

- Background
- Technical Requirements
- Details of the proposed Scheme

GSES System

- After the recent Grid Disturbance of 30th and 31st July 2012, a meeting was held on 06th August 2012 between Union Power Minister of India with Chief Ministers and Power Ministers of States of Northern Region and a 12 point resolution was made to ensure that such types of incidents would not occur in future
- **"Point No. 11** POSOCO would evolve a contingency load shedding protocol, especially when non frequency related load shedding is required"
- POSOCO prepared *a template* for ten number of scenarios when the power system would be under stress along with the substation and feeder details. The same was communicated by POSOCO vide letter dated 11th September 2012 to CEA with a copy to POWERGRID/RPCS/CERC for automated defense plan for all five regions.

GSES System- Direction by CERC

- RLDCs filed a petition to CERC for implementation of Automated defense plan for maintaining Grid Security.
- CERC ORDER

- "We direct that the Regional Power Committees of all regions shall discuss the issue of "implementation of the Automatic Demand Management Scheme at the SLDC/distribution company level" as an agenda item within one month from the date of issue of this order and file their decisions on affidavit within one week thereafter after serving the copies thereof on all the constituents of the respective RPC. Since the Automatic Demand Management Scheme is required to be implemented by SLDCs through their respective State Electricity Board/Distribution Licensees in accordance with Regulation 5.4.2(d) of the Grid Code, we direct that all Distribution Licensees would also participate in the respective RPC meetings and their views should be taken into consideration. We further direct the SLDCs to provide all necessary data and assistance to NLDC and respective RLDCs for effective implementation of the Automatic Demand Management Scheme."

IEGC Provision

- Automatic Load shedding
- Load shedding in Groups
- Sudden reduction in generation/Sudden increase in load
- Governor operation

IEGC Provision for Automation

- Para 5.4.2 d)

  "The SLDC through respective State Electricity Boards/Distribution Licensees shall also formulate and implement state-of-the-art demand management schemes for **automatic demand management like rotational load shedding, demand response (which may include lower tariff for interruptible loads) etc. before 01.01.2011**, to reduce overdrawl in order to comply para 5.4.2 (a) and (b) . A Report detailing the scheme and periodic reports on progress of implementation of the schemes shall be sent to the Central Commission by the concerned SLDC."

IEGC Provision

- Para 5.4.2 e)

  "In order to maintain the frequency within the stipulated band and maintaining the network security, the interruptible loads shall be arranged in **four groups of loads,** for scheduled power cuts/load shedding, loads for unscheduled load shedding, loads to be shed through under frequency relays/ df/dt relays and loads to be shed under any System Protection Scheme identified at the RPC level. These loads shall be grouped in such a manner , that there is no overlapping between different Groups of loads.."

IEGC Provision

- Para 5.2 i)

  "Except under an emergency, or to prevent an imminent damage to a costly equipment, no constituent shall **suddenly reduce his generating unit output by more than one hundr**ed (100) MW (20 MW in case of North-Eastern region) without prior intimation to and consent of the RLDC, particularly when frequency is falling or is below [49.2 Hz]. Similarly, no constituent shall cause a **sudden increase in its load by more than one hundred (100 MW) (20 MW in case of North-Eastern region)** without prior intimation to and consent of the RLDC.."

IEGC Provision

- Para 5.2 e)

"All generating units, which are synchronized with the grid, irrespective of their ownership, type and size, shall have their governors in normal operation at all times . If any generating unit of over fifty (50) MW size (10 MW for North-Eastern Region) **is required to be operated without its governor in normal operation**, the RLDC shall be immediately advised about the reason and duration of such operation**. All governors shall have a droop of between 3% and 6%."**

NLDC proposal vide letter dated 11.09.2012

- NLDC forwarded the details of feeders and substations/Generating Stations as per information available with respective RLDC.
- NLDC requested for discussion at each Regional Power Committee (RPC) level so that the state-wise details are frozen and any other state specific scheme that may be required could also be finalized.
- The details of feeders proposed vide NLDC letter for **North *Eastern Region***
  - No of Feeders- 410
  - No. of Substations:- 125
  - Length of OPGW -2367 kms

The requirements may vary after discussion with the constituents.

GSES System- Petition by POWERGRID (265/MP/2012)

- ROP issued on 15.01.2013
- “The Commission directed that the Regional Power Committees of all regions would also take up to issue of 'Implementation of Grid Security Expert System' as an agenda item within one month from the date of issue of this ROP and file their decisions on affidavit within one week thereafter, after serving the copies thereof on all the constituents of the respective RPC.”

GSES System

- **NLDC proposal:-** Operational Philosophy to be finalized by the Constituents for secure operation of the Grid.

  BOQ proposed based on the data available with RLDCs. Actual quantity may vary as per discussion.

- **POWERGRID** proposal:- Implementation methodology for implementation of the above scheme.

  DPR prepared based on the BOQ forwarded by NLDC.

  The cost may vary depending the BOQ finalised by the constituents.

GSES System- Demand Control

- Variations in demand from the estimated or forecasted values
- Unforeseen generation/transmission outages resulting in reduced power availability
- Network congestion
- Heavy reactive Power demand causing low voltage
- Commercial reason
- Impact due to violation in other regions.

GSES System-Template by NLDC

1. Overdrawal > 12% of schedule or 150 MW
2. Under-drawals > 12% of schedule or 150 MW
3. Voltage <200 kV for more than 5 minutes
4. ICT/line loading crossing limits
5. Flows crossing TTC and overdrawal
6. Loss of generation > 1000 MW.
7. Angular difference
8. Under-Frequency Relays
9. Df/dt relays
10. Islanding

GSES System- Features

- Load Reduction
- Generation Increase/Decrease
- Inputs from simulated condition as well as pre-determine logics
- Integration with existing SPS scheme
- Implementation in all five regions
- Tripping though protection couplers in case of SPS
- Under Voltage shedding – Decide the tripping based upon actual Reactive Power Flow

GSES System- Features (Load Shedding)

- Manual from Substation
  - Time consuming does not meet the Grid Security requirement
- At Control Center
  - Centralized operation
  - Grouping of load
  - Rotational Basis
  - Reduce the time of Operation
  - Immediate Feed back on actual load shed
  - Wide spread load shedding in short span of time
- Fully Automatic
  - Immediate
  - Inputs from simulated conditions
  - Requires Dynamic Security Assessment
  - Implementation as per Grid code & may be combination of both
  - Wide spread load shedding on rotational basis

GSES System- Features

- **Operation of df/dt, UFR, Islanding Relays**
  Presently:- Non-Monitored, Configuration Setting:- Local
  Proposed:- Centralised Monitoring, Centralised Configuration

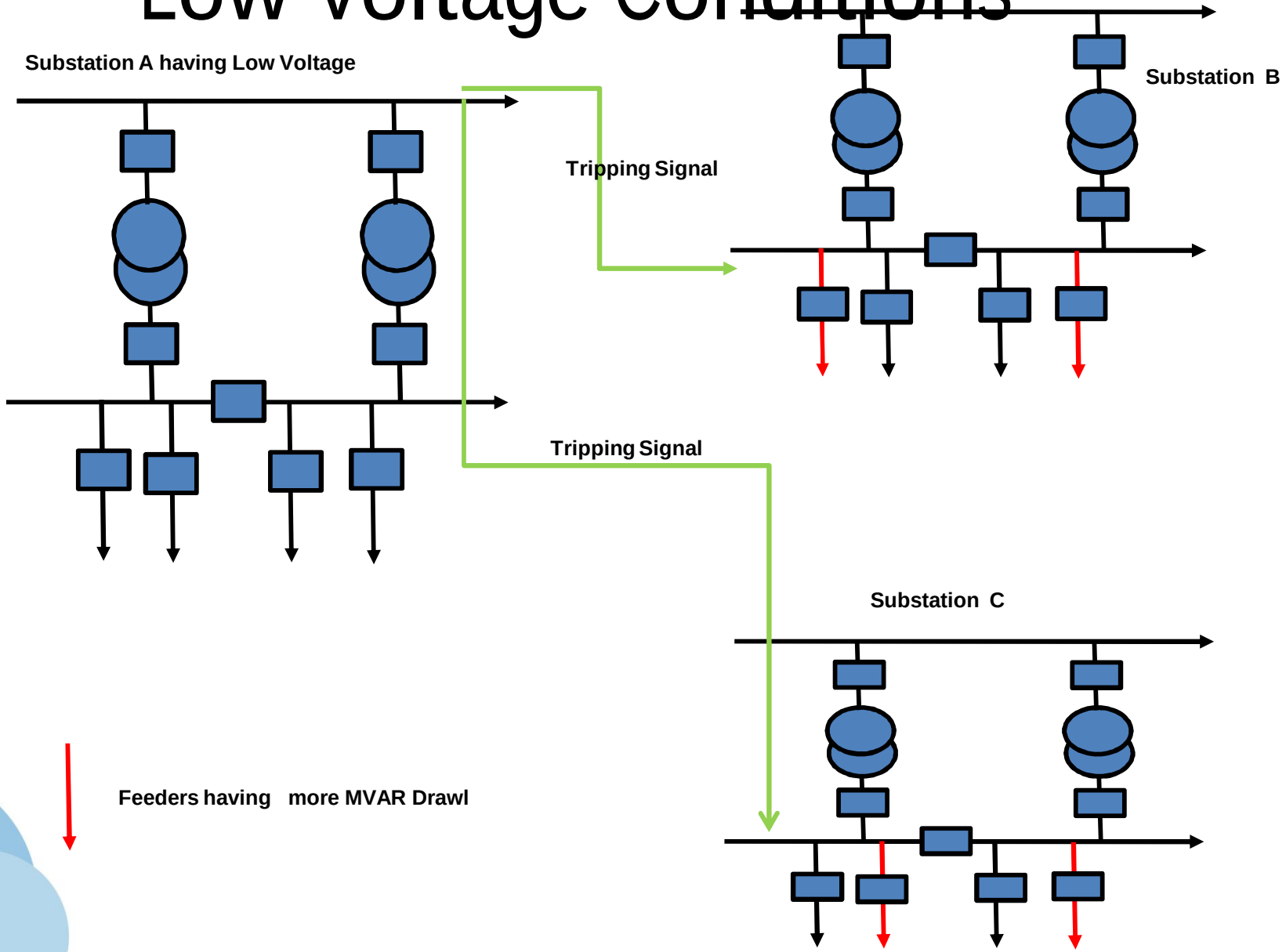
- **Voltage Control**
  Presently:- Local, Opening of 132/220 kV feeders
  Proposed:- Centralized as well as Local, Load disconnection based on Real-time VAR drawl

- **ICT/Line Loading**
  - **Presently:- Manual or through SPS based on off-line study**
  - **Proposed:- Automatic and Based on off-line study /Real-time Grid Inputs**

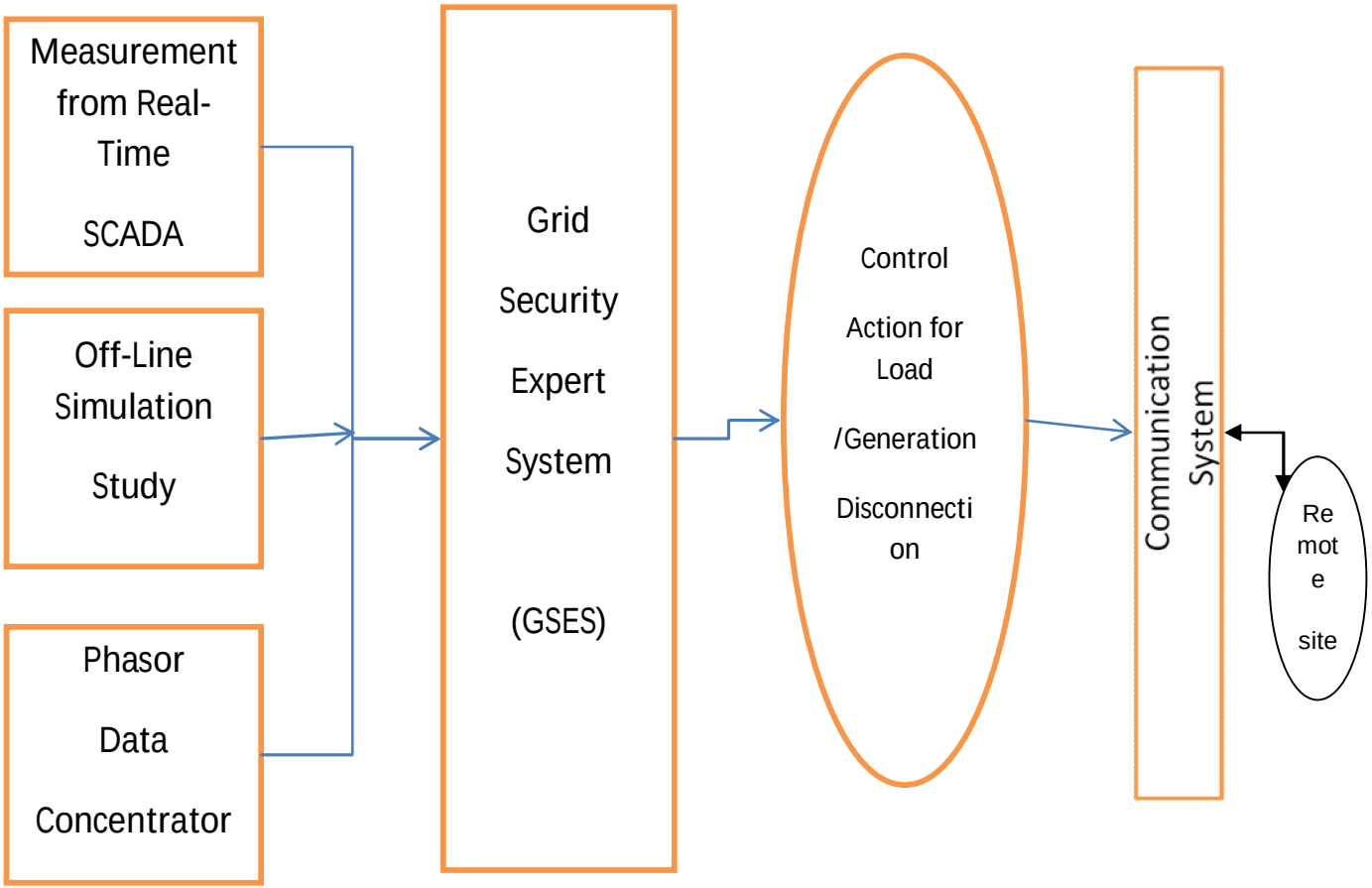
- **Overdrawl**
  - **Presently:- Manual and time consuming**
  - **Proposed:- Automatic and Based on Real-time Grid Inputs**
    - **Operation time from SLDC shall be reduced.**
    - **Can be customized to operate from SLDC centrally or automatically without manual intervention.**
    - **Rate of Load increase**

- **Over-Injection**
  - **Presently:- Manual or through SPS based on off-line study**
  - **Proposed:- Automatic and Based on Real-time Grid Inputs**

Low Voltage Conditions



GSES System


Measurement from Real-Time SCADA
Off-Line Simulation Study
Phasor Data Concentrator
Grid Security Expert System (GSES)
Control Action for Load /Generation Disconnecti on
Communication System
Re mot e site

GSES System- Implementation Methodology

- To Automate and reduce the time of operation of various commands which are presently being carried out manually by SLDC.
- Fully compliant to IEGC Code and the commands would be issued from SLDC. The command shall be executed by RLDC only as a backup if the scheme has failed to operate from SLDC.
- Scheme shall have the provision of the modification of the logics depending upon the System requirements and the Regulatory provisions.
- The Scheme shall have the facility to send the signals to the generator and it would be upto the Generator to implement the scheme so that the necessary relief to the grid could be immediately available as per different schemes.
- Although state generators have been mentioned in various templates for taking care of various state control areas but some of the SPS schemes/conditions would cover the Inter-State Generating Stations (ISGS) as well. Some of the ISGS stations are already part of functional SPS schemes in the country.

GSES System

The Grid Security Expert System scheme shall take the various inputs as follows:-

- **The load/generation relief expected –** The data of MW,MVAR, KV, Frequency, Voltage, UI calculation available from real-time SCADA system .
- **Simulation study save cases** for various conditions resulting into a knowledge based database for the actions required to be taken based on the prevailing conditions in real-time.
- **Phasor data:-** Through PDC installed at RLDC

GSES System- Equipments to be installed

- Substations
  - Numerical Relays/PLCs for all identified feeders
  - RTUs /Gateaways for remote monitoring and Control
- SLDCs/RLDCs
  - SCADA system
  - Knowledge base management System
    - **Case studies**
    - **Previous experience**
    - **Simulation studies etc.**
  - Integration with
    - PMU system
    - SCADA System
    - Off-Line simulation (PSSE) System
- Communication System
  - **OPGW cables**
  - **SDH equipments**
  - **NMS system**

GSES System- Inputs required from The Constituents

- The Feeders to be selected for GSES system operation for finding the number of Numerical Relays
- The Electrical connectivity of the Substations (where feeders has been selected for GSES system) to nearest Wide band Location for finding OPGW requirement.

पावरग्रिड

THANK YOU FOR YOUR KIND ATTENTION PLEASE