CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Petition No. 221/MP/2012

Coram:
Shri V.S.Verma, Member
Shri M. Deena Dayalan, Member

Date of Hearing: 09.04.2013
Date of order: 23.12.2013

In the matter of
Providing adequate load shedding through automatic under frequency and df/dt relays in the state systems of Northern region and keeping them functional in terms of Regulation 5.2 (n) of the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (First amendment), Regulations 2012 for ensuring security of the Northern regional grid as well as the interconnected Indian grid.

And
In the matter of:

Northern Regional Load Despatch Centre, New Delhi
18-A, Qutub institutional area, Katwaria Sarai,
Katwaria Sarai,
New Delhi – 110016

…. **Petitioner**

Vs

1. Punjab State Transmission Corporation Ltd.
   PSEB Head office, the Mall,
   Patiala- 147001

2. Haryana Vidyut Prasaran Nigam Limited,
   Shakti Bhavan, sector 6,
   Panchkula-134109

3. Rajasthan Rajya Vidyut Prasaran Nigam Ltd,
   Vidyut Bhavan ,Jaipur- 302005

4. Delhi Transco Limited,
   Shakti Sadan, Kotla Marg,
   New Delhi-110002

5. Uttar Pradesh Power Transmission Corporation Ltd.,
   Shakti Bhavan ,14 Ashok marg,
   Lucknow-226007

6. Himachal Pradesh State Electricity Board,
   Vidyut Bhavan , Kumar House,
   Complex building II,
   Shimla-171002

7. Power Transmission Corporation of Uttarakhand Ltd.,
   7-B, Lane-1, Vasant Vihar Enclave,
   Dehradun

8. Power development Department,
   Grid Substation complex,
   Jammu and Kashmir

9. Electricity Department,
   Sector-9D,
   Union Territory of Chandigarh,
   Chandigarh-160019

10. State Load Despatch Centre,
    SLDC Building, near 220 kv grid,
    Ablowal (Patiala), Punjab- 147001

11. State Load Despatch Centre,
    Haryana Vidyut Prasaran Nigam Limited,
    Shanti Bhavan, sector- 6,
    Panchkula, Haryana- 134109

12. State Load Despatch Centre,
    Vidyut Bhavan Janpath,
    Heeprapur, Rajashthan Jaipur- 302005

13. State Load Despatch Centre,
    SLDC Building, 2nd Floor,
    33 Kv Substation, Minto Road,
    New Delhi -110002

14. State Load Despatch Centre,
    Shakti Bhawan, Ashok Marg,
    Lucknow- 226001

15. State Load Despatch Centre, Power Transmission Corp. of Uttarakhand Ltd.,
    Virbhadra, Rishikeksh, Uttarakhand- 249202

16. State Load Despatch Centre,

SLDC Complex, Totu,
Shimla – 171011

17. State Load Despatch Centre,
SLDC Building, Narwalbala,
Gladini, Jammu – 180016. **……..Respondents**

1. Member Secretary, Northern Regional Power Committee
Grid bhawan, rail head complex,
Jammu- 180012

2. Executive Director (NR-1), Power Grid Corporation of India Ltd
B-9, Qutub institutional area, Katwaria Sarai,
Katwaria Sarai,
New Delhi – 110016

3. Executive Director (NR-2), Power Grid Corporation of India Ltd
18-A, Shaheed Jeet Singh Sansawal Marg,
Katwaria Sarai
New Delhi – 110016

……. Proforma Respondents

The following were present:

Shri V.V. Sharma, NRLDC
Shri Rajiv Porwal, NRLDC
Shri Vikas Sharma, NRLDC
Shri Raghav Chandha, Advocate, J&K, PDD
Shri Vikas Sharma, J & K
Shri S.K. Sharma, DTL
Shri Paritosh Joshi, DTL
Shri B.S. Bairwa, NRPC
Shri Vijay Kumar, NRPC
Shri Satish Kumar, PTCUL
Shri Darshan Singh, SLDC, Delhi
Shri Kavindra Singh, UPPTCL
Shri M.K Tomar, RRVPNL

ORDER

Consequent to the major grid disturbances in the Region on 30.7.2012 and 31.7.2012, Northern Regional Load Despatch Centre has filed this petition with the following prayers:

"(a) To direct the State utilities in Northern Region to carry out testing of all the existing UFR and df/dt relays installed in their respective systems on

emergent basis so as to ensure their healthiness and functionality at all times in terms of regulation 5.2 (n) of the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulation, 2010 (hereinafter referred to as "the Grid Code") ;

(b) To direct the State utilities in Northern Region to install and commission UFR and df/dt relays at the designated substations so as to provide adequate relief as recommended by NRPC from time to time in terms of regulation 5.2 (n) of the Grid Code;

(c) To direct the Northern Regional Power Committee to carry out a thorough review of the safety net and defense plans in Northern Region in terms of regulation 5.2 (n) of the Grid Code so that it meets the requirement of the present and the likely system size in near future; and

(d) To pass such other order or directions as deemed fit in the circumstances of the case."

2. Gist of the submissions of the petitioner is as under:

(a) There was a major grid disturbance in Northern Region at 02.33 hrs on 30.7.2012. Northern Regional Grid load was about 36,000 MW at the time of disturbance. Subsequently, there was another grid disturbance at 13.00 hrs on 31.7.2012 resulting in collapse of Northern, Eastern and North-Eastern regional Grids. The total load of about 48,000 MW was affected in this black out.

(b) The Enquiry Committee set up by the Ministry of Power to investigate the above grid disturbances has stated in its report that the relief obtained through the UFR and df/dt load shedding scheme in NR was inadequate. In this connection, Para 3.4 (XIV), Para 4.4 (XIII) and Para 9.3 from the report of the enquiry committee are extracted herein below:

> *Para 3.4 "XIV. The NR system was thereby isolated from the rest of the grid. In the NR system, there was loss of about 5800 MW import and resulted in decline of frequency. NR system has Automatic Under*

Frequency Load Shedding Scheme (AUFLS), which can shed about 4000 MW of loads, and df/dt relays scheme, which can shed about 6000 MW of loads to improve the frequency and save the system under such emergency situations. However, not adequate load relief from the AUFLS and df/dt relays was observed and the NR system collapsed except for a few pockets at Badarpur and NAPS."

Para 4.4 "XIII. Further the loss of import from about 3000 MW import from WR resulted in decline of frequency in the rest of the NEW grid, which has Automatic Under Frequency Load Shedding Scheme (AUFLS), that can shed about 5600 MW of loads, and df/dt relays scheme, which can shed about 6020 MW of loads, to improve the frequency and save the system under such emergency situations. However, not adequate load relief from the AUFLS and df/dt relays was observed on 31st July 2012 also."

"***9.3 Ensuring proper functioning of defence mechanism***

All STUs should immediately enable under frequency and df/dt based load shedding schemes, Central Commission should explore ways and means for implementation of various regulations issued under the Electricity Act, 2003. Any violation of these regulations can prove to be costly as has been the case this time. RPCs need to take up the matter for compliance. In case non-compliance persists, POSOCO should approach Central Commission."

(c) Consequent to the above grid disturbances, NRPC vide its letter dated 22.8.2012 directed POWERGRID to assist the collection of information regarding UFRs and df/dt relays installed in the NR constituents. Accordingly, a survey was conducted by POWERGRID with site visits for collection of field data of 175 stations where UFRs and df/dt relays have been installed in Rajasthan, Uttar Pradesh, Punjab, Delhi, Haryana, Uttrakhand, J&K, Himachal Pradesh and Chandigarh in NR. Thereafter, vide their letter ref: C/POWERGRID/UFR/666 dated 10.9.2012, POWERGRID submitted the report to the Member Secretary, NRPC with a copy to CEO, POSOCO.

(d) From the above stated survey report, it has transpired that the total load shedding actually obtained from UFR was only 19% of the expected

quantum on 30th July 2012 and 18% on 31st July 2012. Likewise the load shedding through df/dt relays was 9% of the expected quantum on each of the two days viz. 30th and 31st July 2012.

(e) This has exposed serious inadequacy in the safety net by revealing that the Northern Regional Grid and other grid connected synchronously with the Northern grid are insecure due to the inadequacy of automatic load shedding through UFRs and df/dt relays. In the absence of adequate protection through the above safety, the entire power system is vulnerable to grid disturbance similar to those that occurred on 30th and 31st July 2012.

(f) While the inadequacy of automatic load shedding through under UFRs and df/dt relays in case of contingencies is as such a serious threat to grid security, this also constitutes violation of Regulation 5.2 (n) of the Grid Code as amended vide its First Amendment Regulations, 2012 and thereby warranting urgent corrective measures by all the State utilities to ensure the security of the Grid System. For ease of reference Regulation 5.2 (n) of the Grid Code consequent to the 2012 amendment is reproduced below:

> *"All SEBS, distribution licensees / STUs shall provide automatic under-frequency and df/dt relays for load shedding in their respective systems, to arrest frequency decline that could result in a collapse/disintegration of the grid, as per the plan separately finalized by the concerned RPC and shall ensure its effective application to prevent cascade tripping of generating units in case of any contingency. All SEBs, distribution licensees, CTU STUs and SLDCs shall ensure that the above under-frequency and df/dt load shedding/islanding schemes are always functional. RLDC shall inform RPC Secretariat about instances when the desired load relief is not obtained through these relays in real time operation. The provisions regarding under frequency and df/dt relays of relevant CEA Regulations shall be complied with. SLDC shall furnish monthly report*

of UFR and df/dt relay operation in their respective system to the respective RPC.

RPC Secretariat shall carry out periodic inspection of the under frequency relays and maintain proper records of the inspection. RPC shall decide and intimate the action required by SEB, distribution licensee and STUs to get required load relief from Under Frequency and df/dt relays. All SEB, distribution licensee and STUs shall abide by these decisions. RLDC shall keep a comparative record of expected load relief and actual load relief obtained in Real time system operation. A monthly report on expected load relief vis-a-vis actual load relief shall be sent to the RPC and the CERC."

(g) There is an urgent need to carry out immediate inspection of all the installations, where the under frequency and df/dt relays were designated to be put in place as recommended by the NRPC, as mandated in Regulation 5.2 (n) of the Grid Code.

(h) Further, the existing scheme of automatic load shedding through UFRs and df/dt relays was devised based on the load pattern that existed in 2008-09. Since then, the demand has grown manifold and the interconnection size also has increased substantially. In view of the above and considering the rapid capacity addition in the power system, there is a need for immediate review of the existing scheme. Thereafter, the review should be carried out on periodic intervals so as to ensure that the system has adequate safety net in place in the present as well as the future system. Further, in order to facilitate setting of the relays, monitoring of the performance of the relays, checking of healthiness of the relays, log keeping etc., there is a need to deploy state of the art technology in the defence mechanism through the under frequency and df/dt relays.

(i) POWERGRID had carried out the audit after the Grid disturbances and found that df/dt and under frequency relays at 175 sub-stations of 9 constituents, the status of the relays are as follows:

State	Peak load typical	Expected Flat UFR load relief	Total Expected Load Relief with df/dt relays	Expected combined Flat UFR and df/dt load relief	Installed as per NRPC/ Constituents (Total Stations)	No. of stations where df/dt relays are not provided	No. of stations where UFRs & df/dt relays not-operated as per NRPC recommendations	No. of Stations with UFRs & df/dt relay operation as per NRPC recommendation	% of UFRs & df/dt relay operation as per NRPC recommendations %
	MW	MW	MW	MW	NOs	NOs	NOs	NOs	%
Punjab	6588	650	1410	2060	28	12	11	5	18%
Haryana	4201	400	900	1300	20	0	13	7	35%
Rajasthan	4946	495	1070	1565	50	9	26	15	30%
Delhi	3736	400	810	1210	24	0	17	7	29%
UP	7531	705	1060	1765	30	7	20	3	10%
Uttarakahand	991	110	210	320	11	4	4	3	27%
HP	873	115	190	305	3	0	3	0	0%
J&K	1309	165	270	435	7	4	3	0	0%
CHD	247	10	100	110	2	0	2	0	0%
TOTAL	30392	3050	6020	9070	175	36	99	40	23%

(j) As may be seen from the above, out of total 175 stations of various constituents of NR, the UFRs and df/dt relays operated at 40 numbers of stations which were set as per the NRPC recommendations. Relief during the grid disturbances on 30th and 31st July 2012 came from only 23% of the total number of stations in the region. Against the total targeted load relief of 6020 MW through df/dt relays, 14% was reported on 30.7.2012 and the same was only 9 % on 31.7.2012. Where time delays have been provided in the df/dt relays the same may be reviewed for instantaneous settings.

(k) The load relief under UFR was reported to be 25% on 30.7.2012 incident and 24 % on 31.7.2012 against the total targeted relief of 3050 MW. The combined UFR & df/dt load relief on 30th and 31st July 2012 were 18%

and 14% respectively against the target relief of 9070 MW. It was also observed during the site visits that the testing of UFRs was initially done during commissioning only. Records of any periodic testing were not evident from the site feedback reports. Worse still, non-availability of the test kits was reported from the sites in a number of places.

(l) In view of the above, POWERGRID has suggested the following remedial measures:

(i) The UFR and df/dt relays which have not operated during the July 2012 grid incidents are required to be tested to make them functional on emergent basis.

(ii) The balance UFRs and df/dt relays are to be installed and commissioned by the constituents at the designated sub-stations to provide the desired relief urgently as committed at NRPC meetings.

(iii) The installed relays are required to be relooked for fresh settings and re-commissioning with instantaneous tripping of df/dt as per the recommendation of NRPC without any time delay.

(iv) Review of flat UFRs and df/dt settings considering present load scenario.

(v) Review of load relief at each substation with feeders details for various voltage levels.

(vi) The UFRs and df/dt may be replaced with numerical type so that following features can be achieved:

- Storage of past data
- Remote programming and status monitoring at ALDC/SLDC/RLDC
- Remote on-line real time load flow of each feeders for local shedding
- Time synchronization from remote
- Tripping from remote under special protection scheme
- Easy for developing islanding scheme for the constituents by monitoring the relay condition with trip circuit healthy and real time load flow on feeders

(vii) Installation of OPGW / Fiber optic for direct speech (hot line) / data communication with ALDC/SLDC/RLDC.

3. NRPC vide submission dated 20.11.2012 has reported that the issue of inadequate response from UFR and df/dt relay based load shedding was deliberated on 3.9.2012 and further in 79th and 80th OCC meetings on 14.9.2012 and 19.10.2012 respectively, wherein it was decided that all STUs would ensure load relief as per target. Self certification to this effect was to be submitted by 31.10.2012. It was further agreed that mock exercise for healthiness of UFRs shall be carried out by utilities themselves on quarterly basis and report shall be submitted to NRPC Secretariat and NRLDC. All constituents were to plan for 20 % more than the agreed quantum for achieving full planned relief from UFRs.

4. NRPC further opined that as testing of UFRs is being carried out by NRPC Secretariat in accordance with the Grid Code, the relief as observed on SCADA system when frequency touches the threshold value at which UFRs operate is more reliable indicator of functioning of the UFR based load shedding scheme. The actual relief obtained on 30.7.2012 was much less than the desired one and no relief was obtained on 31.7.2012.

5. Replies have been submitted by HVPNL, Delhi Transco Ltd. (DTL), Punjab State Transmission Corporation Limited (PSTCL), UPSLDC and RRVPNL. Gist of the submissions by these State utilities is as under:

(a) HVPNL vide affidavit dated 19.11.2012 has submitted that it had checked the healthiness/operation of UFR, df/dt, RLSE installed at various Sub-stations. 9 nos. of UFR, df/dt, RLSE relays were found defective. Instructions have been issued to concerned officers for repair/replacement of defective relays.

(b) Delhi Transco Ltd. (DTL) vide affidavit 6.12.2012 has submitted that though the under frequency relays installed in DTL system are working satisfactorily for the functions configured, but for further improvement and also to include the advantages of numerical relays such as fast operating time, disturbance records, inbuilt GPS time synchronizing facility etc, DTL is in the process of replacing all the existing relays by Numerical relays. The relays are being replaced as part of the Delhi Islanding Scheme approved by Ministry of Power, Govt. of India as per recommendations of the enquiry committee. The

relays are to be replaced by PGCIL within three months from the award of contract as per MoU signed between DTL and POWERGRID.

(c) Punjab State Transmission Corporation Limited (PSTCL) vide affidavit dated 6.12.2012 has submitted that all the under frequency and df/dt relays installed in the PSTCL network are healthy and functional except 5 No. UFR and 3 Nos. df/dt relays. The procurement process for replacement of these defective relays has already been initiated and replacement is expected to be completed by 31.3.2013.

(d) UPSLDC vide affidavit dated 12.12.2012 has submitted that it is clear from Regulation 5.2 (n) of the Grid Code as amended vide the First Amendment Regulations, 2012 that it is the duty of the SEBs, distribution licenses/STUs to keep automatic frequency and df/dt relay operational in their respective system and the role of SLDC is to collect the operational details of those automatic frequency and df/dt relay from SEBs, distribution licenses/STUs and to monitor the load relief and furnish monthly report of operation of UFR and df/dt relays in their system to the respective RPC. Having failed to get desired information from the STU, the SLDC has addressed letters dated 16.11.2012 and 5.12.2012 to all Chief Engineer of the STU (UPPTCL) to provide the said report so that same could be sent to NRPC, but in vain. Thus, the SLDC claims that it is not at fault.

(e) RRVPNL, Rajasthan vide affidavit dated 17.12.2012 has submitted that its system has 81 Nos. UFRs with sequential circuit and 10 Nos. RLSS relays with setting to trip all feeders at 48.2 Hz and 18 df/dt relays are installed. The

protection wing of RVPN has carried testing of all UFRs and df/dt relay installed in the system and Zonal C.E. (T&C) have been asked to ensure healthiness of these relays at all times. The protection wing found only 4 Nos. relays defective. RRVPNL has installed sufficient number of UFR and df/dt relays to provide adequate relief as recommended by NRPC. RRVPNL thus claims that it has already taken the steps as requested by the petitioner.

6. During the hearing of the case on 20.12.2012, the Commission took a very serious view of the non-submission of responses by some of the constituents of the Northern Region. Grid security being a very serious issue, all those responsible for non-compliance of the provisions of the Grid Code are to be held accountable. The Commission further observed that despite clear and repeated directions, the responses from the UFR and df/dt relays have been extremely poor as was evident from the report of the enquiry committee as well as the audit by POWERGRID and directed issue of show cause notices to the constituents who have not responded to the notice in the petition. The Commission also directed the petitioner to submit its responses to the replies received in a week's time including the extent of compliance of the provisions of the Grid Code by each of the constituents.

7. POSOCO (NRLDC) vide affidavit dated 4.1.2013 had submitted a common rejoinder covering the submissions by all the respondents. Gist of the submissions of POSOCO is as under:

(a) Assuming that the reply by Haryana STU covers the response the SLDC also, NRLDC has stated that the respondent STU and SLDC of Haryana have confirmed defective UFR, and df/dt relays as 9 in numbers. However,

compliance to be reported soon. Further, insufficient load relief from UFR and df/dt relays in Haryana State Control Area has been established and further there is no clear roadmap yet for completing the task.

(b) In response to the submissions of Rajasthan STU and SLDC, it has been stated that the said STU and SLDC have informed about increased number/quantum of UFR and df/dt relays than those recommended by NRPC. As per information given, Rajasthan State has 1493 MW UFR load shedding against the 1070 MW recommended by NRPC. It is further stated that despite additional planned load shedding scheme, actual load relief obtained on 30.7.2012 was 39 MW from UFR and 274 MW from df/dt relays. Similarly, relief on 31.7.2012 was 38 MW from UFR and 163 MW from df/dt. As per the POWERGRID survey report the relief from Rajasthan system was 52 MW from UFR and 175 MW from df/dt on 30.7.2012 and 38 MW from UFR and 153 MW from UFR on 31.7.2012. Against this, the expected relief as per the NRPC recommendation is 695 MW from UFR and 1070 MW from df/dt relay. Thus, it is evident that the relief obtained was inadequate. This may be due to either the relays are non functional, feeders are not radial in nature, load connected is not adequate or feeders are already opened under some other load shedding scheme.

(c) Assuming that the submissions of Delhi STU, covers the response of SLDC Delhi also, as copy has been marked to SLDC Delhi chief, NRLDC has observed that the STU in its statement has given a very high figure of load relief on both the days, which is not supported by the survey of POWERGRID.

Further, the frequency curves during both the disturbance days are not supportive of the claim of Delhi STU. It is further stated that Delhi STU has confirmed it is planning replacement of all the existing UFR and df/dt relays with numerical relays for fast operating time, GPS synchronization and availability of Disturbance Record (DR). NRLDC has questioned the submissions of the State observing that as per the report by POWERGRID, out of the three stages of UFR based load shedding recommended by NRPC the Stage –I (i.e. 48.8 Hz.) and Stage – II (48.6 Hz) were not configured in the 24 substations that were surveyed. The desired relief in Delhi from these two stages is 250 MW. Similarly, it has been reported by POWERGRID that the stage-I of the df/dt relays (i.e. 48.8 Hz and 0.1 Hz/sec) where in the desired relief is additional 250 MW was also not configured. Further, it also transpired from the POWERGRID report that the setting of some of the under Frequency Relays are at 48.0 Hz. or 47.9 Hz. or 47.7 Hz or 47/6 Hz which is much below the setting recommended by NRPC. Thus, these relays would not have been triggered at the frequency levels recommended by NRPC. Therefore, the submission by respondent is difficult to accept.

(d) In response to the submissions of STU of U.P. and SLDC Uttar Pradesh, NRLDC has stated that the STU of UP has reported the actions initiated by UPPTCL like plans for future procurement of under frequency relays, operation and monitoring of relief from UFR and df/dt relays, future relays to be numerical relays etc. It has further stated that an inspection of UFR at Sahibabad, Muradnagar, Sarojninagar and TRT (Lucknow) sub-stations was conducted by NRPC team in August/October 2012. The report

by NRPC indicates that feeders associated with relays are non-radial in nature hence the load relief is not available and in some cases load relief estimate may be high due to double counting of same load fed from more than one feed at different time and UFR being on all feeds.

(e) In view of above, it has been observed that as per the survey report of PGCIL, it may be concluded that the respondents who have sent their replies as well as those who have not sent the reply have failed to comply adequately with Regulation 5.2 (n) of the Grid Code. The Commission may accordingly take necessary action as per the Grid Code.

8. PTCUL (SLDC), Uttarakhand vide letter dated 15.1.2013 has submitted that in past SLDC, Uttarakhand was performing its duties from Rishikesh and since 27.11.2012 SLDC has shifted its entire operations to Dehradun. SLDC has attributed its failure to submit reply, to the above shifting and has stated that it was purely unintentional. Submitting its plan of action in reference to audit report carried out by POWERGRID, SLDC has requested for not issuing show cause notice against it.

9. During the hearing on 15.1.2013, the Commission took very serious view of the state of these relays which are essential for safety of the grid in the event of any untoward incident and directed all respondents to keep all UFR and df/dt relays in healthy conditions so that adequate relief to the grid is always available. The respondents were also directed to revive all defective relays expeditiously and to submit data in format attached with the ROP within two weeks on affidavit. The

Commission also directed to issue notice to the Secretary, NRPC to assist the Commission during the succeeding hearing.

10. With regard to the directions of the Commission vide 'Record of Proceeding' dated 15.1.2013, for submission of information related to UFRs and df/dt relays in the formats prescribed for proper monitoring at RPC level, UPPTCL vide its submission dated 12.2.2013 has forwarded the details as received from the Chief Engineers of different zones where UFR and df/dt relays are installed. As regards Format-2, UPPTCL has submitted that frequency band of operation of grid has now become quite stable and does not warrant operation of under frequency relays or df/dt relays. Accordingly the information with regard to actual operation of under frequency relays shall be submitted to SLDC which would forward it to NRPC in accordance with preset procedure of reporting.

11. We also take note of the fact that UPPTCL has placed order for supply of additional 76 Nos. of numerical under frequency relays, scheduled to be supplied from March 2013. Based on the various initiatives taken as intimated vide letter No. 4485/Director (Op)/CERC dated 21.12.2012 and commissioning of additional under frequency relays in the system, we are inclined to believe that UPPTCL may be capable of providing at least 20% additional load relief as per the directions of NRPC.

12. PSTCL, Punjab vide letter dated 12.2.2013 has stated that it has submitted the required information in the prescribed format.

13. Delhi Transco Ltd. (DTL), New Delhi in its submission dated 13.2.2013 stated that all the UFR and df/dt relays in Delhi Transco Ltd. System are in healthy condition as the defects have been rectified. Though the U/F relays installed in DTL system are working satisfactorily for the functions configured, but for further improvement and also to include the advantages of Numerical relays such as fast operating time, disturbance records, inbuilt GPS time synchronizing facility etc, DTL is replacing all the existing Under Frequency and df/dt relays by Numerical under frequency and df/dt relays.

14. RRVPNL in its submission dated 14.2.2013 stated that sufficient numbers of UFR and df/dt relays are provided in the Rajasthan system as per report of protection wing. Only four-numbers of relays were found defective which have also been rectified and now they are also healthy. The SLDC is regularly furnishing monthly report of UFR and df/dt relay operation to NRPC regularly in compliance to clause No. 5.2 (n) of the Grid Code. It has further been submitted that in Rajasthan system total 81 numbers of UFRs, 10 nos. of RLSS relays (UFRs) and 18 nos. of df/dt relays are installed. Out of these relays, 52 UFRs and 17 df/dt relays are numerical type and balance 29 UFRs, 10 RLSSS (UFRs) and 1 df/dt relay are to be changed to numerical relays for which purchase process has been commenced.

15. HVPNL in its submission dated 28.02.2013 stated that it has also conducted an internal protection audit in which UFR / df/dt / LSE relays at 9 Nos. S/S (i.e. 220 kV Rewari, 220 kV Narnaul, 220 kV Palwal, kV Kaithal, 220 kV Pehowa, 132 kV Dadri-ll, 132 kV PTPS, 132 kV Karnal and 132 kV Fazilpur) were found defective. Out of these, 5 Nos. have already been rectified and procurement action for

remaining 4 Nos. (220 kV Narnaul, 132 kV Dadri-ll, 132 kV PTPS and 132 kV Karnal) is under process. Further, the status regarding replacement/repair of defective relays is updated in every OCC meetings held by NRPC.

16. NRPC in its submission dated 21.3.2013 has stated as under:

(a) With regard to direction vide Record of Proceedings dated 05.03.2013 that RPC secretariat should monitor and ensure corrective action within time frame, attention is invited to the details of inspection carried out since 01.07.2010 as enclosed to its earlier submission; a few more inspections have been carried out thereafter.

(b) The issue of timeframe to correct the non-operational UFR and df/dt relays was discussed in 84th Operation sub-committee meeting of NRPC held on 19.2.2103 and it was decided that if a deficiency is observed in operation of UFR or df/dt relay during inspection, corrective action shall be taken within15 days.

(c) As stated in the earlier submission, certain deficiencies were observed during the inspection carried out after 17.11.2012 and the utilities concerned were advised to take corrective action.

(d) Whenever any deficiency is observed during inspection the matter is taken up with the utilities concerned. Thereafter, the matter is taken up in various meetings of NRPC forum so as to persuade the utilities to take requisite action. However, the ultimate responsibility to take corrective action lies with utilities.

(e) With respect to the direction "NRPC shall take up the issue in the next NRPC meeting and submit the time schedule for procurement/rectification of all the relays in the NR and submit compliance report by 15.3.2013 as per Regulation 1.5 of the Grid Code", it has been intimated that the status of functioning of UFR and df/dt relays and time schedule for procurement/rectification of all the relays is regularly discussed in the various meeting of NRPC forum. Regulation 1.5 of the Grid Code is reproduced below:

"1.5 ***Compliance Oversight***

(i) RLDCs shall report to the Commission instances of serious or repeated violation of any of the provisions of the IEGC and incidences of persistent non-compliance of the directions of the RLDCs issued in order to exercise supervision and control required for ensuring stability of grid operations and for achieving the maximum economy and efficiency in the operation of the power system in the region under its control.

(ii) The Regional Power Committee (RPC) in the region shall also continuously monitor the instances of non-compliance of the provisions of IEGC and try to sort out all operational issues and deliberate on the ways in which such cases of non-compliance are prevented in future by building consensus. The Member Secretary RPC may also report any issue that cannot be sorted out at the RPC forum to the Commission. The RPC shall also file monthly reports on status of UI payment and installation of capacitors by states vis-à-vis the requirement/targets, as decided in the RPC.

(iii) The Commission may initiate appropriate proceedings upon receipt of report of RPCs or RLDCs referred to in (i) and (ii) above respectively.

(iv) In case of non-compliance of any provisions of the IEGC by NLDC, RLDC, SLDC, RPC and any other person the matter may be reported by any person to the CERC through petition.

(v) *Notwithstanding anything contained in these regulations, the Commission may also take suo-motu action against any person, in case of non-compliance of any of the provisions of the IEGC."*

17. POSOCO (NRLDC) in its submission vide affidavit dated 25.3.2013 stated that in compliance of direction of the Commission, NRLDC has examined the submissions of the Respondents in accordance with Regulation 5.4.2(e) of the Grid Code (reproduced herein below for ease of reference) and has stated as under:

> *"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. In case of certain contingencies and/or threat to system security, the RLDC may direct any SLDC/ SEB/distribution licensee or bulk consumer connected to the ISTS to decrease drawal of its control area by a certain quantum. Such directions shall immediately be acted upon. SLDC shall send compliance report immediately after compliance of these directions to RLDC."*

(a) **Observation on the information submitted by PSTCL**: PSTCL has submitted data of 66 groups of feeders emanating from 220 kV or 132 kV S/S that are part of UFR or df/dt relays based on load shedding. There are 28 groups of feeders in UFR and 29 groups of feeders in df/dt relay based load shedding scheme. Only 11 of the 57 group of feeders are radial in nature. Further, these feeders are also used for manual load shedding. The telemetry of only 3 out of 57 groups of feeders used in df/dt or UFR based load shedding is indicated to be available at the SLDC level. 55 groups of feeders are installed with numerical relays. Thus the envisaged relief in Punjab system from df/dt and UFR based load shedding is inadequate.

(b) **Observation on the information submitted by RRVPNL**: RRVPNL has submitted data of 99 groups of feeders emanating from 220 kV or 132 kV

S/S that are part of UFR or df/dt relays based on load shedding. There are 81 groups of feeders in UFR and 18 groups of feeders in df/dt relay based load shedding scheme. 47 out of 81 groups of feeders in the UFR scheme are operated through numerical relays while 17 out of 18 groups of feeders in df/dt scheme are operated through numerical relays. The operation of only 23 out of 95 was reportedly checked after the Grid Disturbance in July 2012. The status of healthiness is difficult to make out from the submitted information. Hence, likely relief obtained from the scheme is difficult to ascertain. The telemetry of the feeders used in the df/dt or UFR scheme is unavailable at the SLDC (except for 132 kV Bidasar-Sujangarh).

(c) **Observation on the information submitted by UPPTCL**: UPPTCL has submitted data of 245 groups of feeders emanating from 220 kV or 132 kV S/S that are part of UFR or df/dt relays based on load shedding in U.P. There are 41 groups of feeders in UFR based load shedding scheme and 14 groups of feeders in the df/dt relay based load shedding scheme. The relays for the remaining 190 groups of feeders are either not yet installed or they are non-functional/defective. In 2012 and 2013, the relays for only 34 out of the 56 groups of feeders have been tested. Out of 41 groups feeders envisaged for UFR based load shedding, 35 groups of feeders are also part of manual load shedding/Emergency Rostering programme. Likewise, out of 14 groups feeders envisaged for df/dt relays based load shedding, 10 groups of feeders are also part of manual load shedding/Emergency Rostering programme. Thus it may be seen that the envisaged relief in U.P. system from df/dt and UFR based load shedding is inadequate.

(d) **Observation on the information submitted by DTL**: The df/dt and under frequency based load shedding scheme adopted in Delhi region is a Rotational Load Shedding Scheme. The feeders are divided in three groups viz X, Y and Z. the feeders in these groups get through Programmable Logic Controller (PLC). The healthiness of the PLC and the correctness of setting adopted are vital for providing effective load relief at the time of frequency excursion beyond the threshold limits. The relay setting adopted in several sub-stations are in variance with the settings recommended by NRPC.

18. SLDC, Uttarakhand in its submission dated 25.3.2013 has stated that it has submitted information in the required format as per Record of Proceeding dated 28.1.2013.

19. With regard to direction "NRLDC and NRPC may file, any discrepancy detected on the submissions filed by the respondents, on affidavit, with copy to the respondents, by 1.4.2013", NRPC in its submission dated 8.4.2013 has stated that, NRPC Secretariat has received information about UFR and df/dt relays from following utilities: RRVPNL (12.1.2013), PSTCL (19.3.2013), PTCUL (22.3.2013), UPPTCL (12.2.2013). The discrepancies noticed in the information submitted by these utilities are as given below:

(a) RRVPNL: The relays have been checked by the utility from 2010 to 2013. However, in accordance with decision taken in 79th meeting of OCC, which was approved by NRPC in its 27th meeting, checking is to be carried out on quarterly basis. This issue was again taken up in Protection Sub-

Committee meeting held on 5.4.2013 and utilities were requested to comply with the decision taken in NRPC meeting. RRVPNL has submitted the list of sub-station at which UFRs and df/dt relays have been installed. However, the 1st page of submission is not in the prescribed format and hence could not be scrutinized. RRVPNL had earlier submitted that they have 88 Nos. of UFRs and df/dt relays out of which 4 Nos. UFRs were non-functional. However, in the affidavit submitted to the Commission, total number of relays is found to be 109. Hence, there is slight discrepancy. Further, a few feeders are having both UFR as well as df/dt relays.

(b) PSTCL: That many of the feeders meant for tripping by UFR or df/dt relays are also covered for scheduled power cut/load shedding. Some of the feeders covered under defense mechanism are not radial. However, in accordance with decision taken in 79th meeting of OCC, which was approved by NRPC in its 27th meeting, checking is to be carried out on quarterly basis. This issue was again taken up in Protection Sub-Committee meeting held on 5.4.2013 and utilities were requested to comply with the decision taken in NRPC meeting. It is noted that the responsibility of up keeping and checking officer at a few S/S is not mentioned and the column has been left blank.

(c) PTCUL: It is noted that out of ten feeders, seven feeders are part of scheduled power cut/load shedding. It is noted that one relay at feeder namely 132 kV Mangalore-Roorkee is set for tripping of UFR as well as df/dt relay.

(d) UPPTCL: It is noted that a few of the feeders covered under defense mechanism are not radial. That some of the feeders covered under UFR and df/dt relays are also part of Emergency Rostering.

20. RRVPNL and SLDC, Rajasthan in their submissions dated 9.4.2013 have stated that Rajasthan has 109 group of feeders instead of 99 groups of feeders emanating from 220 kV or 132 kV S/S that are a part of UFR and df/dt relays based load shedding in Rajasthan control area. The missing 10 groups of feeders were with RLSS feature which should be replaced by flat UFR scheme and in this regard action has been initiated. The reported events pertain to the period 26.12.2012 to 23.1.2013 is the monthly tripping information which is being sent in the prescribed formats and the format does not have any column for reason of tripping, therefore reason of tripping has not been mentioned in the given format. The matter has been taken up the concerned for telemetry of the feeders used in df/dt under frequency scheme to show at SLDC through SCADA.

21. SLDC,Uttarakhand in its submission dated 9.4.2013 has stated that it has submitted information in the required format attached with Record of Proceeding dated 28.1.2013.

22. P.D.D., J&K in its submission dated 9.4.2013 has stated that there are no UFR and df/dt relays installed at the Grid Stations of System & Operation Wing, J&K except one UFR installed at Grid Station, Udhampur on 33 kV side on rural feeder. As per grid code, the proposal to install the UFR and df/dt relays has been framed and sent to NRPC for an amount of Rs. 158.40 crore for J&K State. The UFR and

df/dt relays shall be installed as and when the requisite funds are made available by the NRPC or State Sector.

23. DTL, New Delhi in its submission dated 9.4.2013 has stated that the df/dt and under frequency based load shedding scheme adopted in Delhi region is a Rotational Load Shedding Scheme. The feeders are divided in three groups viz. X, Y and Z. the feeders in these groups get through Programmable Logic Controller (PLC). The healthiness of the PLC and the correctness of setting adopted are vital for providing effective load relief at the time of frequency excursion beyond the threshold limits. The existing U/F relays do not have 0.1 Hz per second slope, so the same is not implemented. Now, DTL has procured and installed new Numerical relays with 0.1 Hz per sec slope and the same will be implemented soon. New Numerical relays are being commissioned and the settings in line with NRPC guidelines are being implemented.

24. We have considered the submission of the petitioner, respondents and NRPC taking into consideration the survey report conducted by POWERGRID after the grid disturbances in July, 2012. We are convinced that the constituents of the Northern Region have not provided adequate load relief. Consequently, we hold that all the constituents of the NR namely Punjab, Haryana, Rajasthan, Delhi, Uttar Pradesh, Uttarakhand, Himachal Pradesh, UT of Chandigarh and J&K have failed to comply with the Regulation 5.2 (n) of the Grid Code.

25. NRPC Secretariat was directed to monitor and ensure that corrective actions were taken within the time frame. NRPC Secretariat has stated that constituents have agreed to take corrective action where the deficiency was observed. Further,

NRPC was directed to take up the issue at appropriate level and to submit the time schedule for procurement/rectification of all relays in the NR and submit compliance report by 15.03.2013 as per Regulation 1.5 of the Grid code.

26. Compilation of the constituent-wise status of UFR and df/dt relays made by NPRC, based on information submitted by concerned utilities is as under:

State	**Nos. of UFR and df/dt relays installed**	**Nos. of UFR and df/dt relays non-functional (as per self-certification by SLDCs/STUs)**	**Action taken/proposed for reviving defective/non-functional relays**
U.P.	UFR-148 df/dt-08	UFR-90 Df/dt-02	18 nos. of UFR have been procured and 13 nos. out of those have been commissioned. Further, orders for 76 nos. of UFR have been placed with a delivery schedule up to May, 2013
Rajasthan	UFR-88 df/dt-18	UFR-04	All 04 nos. of defective relays shall be made functional by 31.03.2013
Haryana	UFR-28 df/dt-06	UFR-09 (as on 9.1.2013)	UFRs. 05 nos. UFRs have been made operational. Work order has been place for procurement of 04 nos.
Punjab	UFR-31 df/dt-28	UFR-05 df/dt-03	3 nos. of UFR and 01 nos. of df/dt have been made operational. Balance 02 nos. of UFR and 02 nos. of df/dt shall be replaces by 28.2.2013
Delhi	UFR-24 df/dt-13	All are Functional	-
Uttarakhand	UFR-15 nos. df/dt-0	Status not submitted. Matter has been taken up with PTCUL.	-
J&K	UFR-07nos. df/dt-0	Status not submitted. Matter has been taken up with PDD, J&K	-

Himachal Pradesh	UFR-03 df/dt-03	All relays are functional. (However, during the inspection carried out on 29.01.2013, df/dt relay at Kunihar was found non-functional)	During the 84 the meeting of OCC held on 14.03.2013, HPSEB Ltd informed that OEM is likely to visit Kunihar sub-station shortly to rectify the defect.
Chandigarh	UFR-2 df/dt-0	Self-certification not submitted (During inspection, these relays were found Operational but with time delay of 10 sec whereas feeder should trip instantaneously)	The issue had been taken up with Electricity Department, Chandigarh. No response received.

27. Although, the States have claimed in their submissions that they are attending to discrepancies pointed out in the survey of report of POWERGRID, clear cut time line has not been mentioned. Besides, the proposed measures are far from satisfactory and the grid is continued to be exposed to disturbance, as seen from the following:

(a) DTL has stated that the existing under frequency relays do not have 0.1Hz/sec setting so that the settings have not been implemented. Now they are procuring new numerical relays that 0.1Hz/sec relays and the same would be implemented soon.

(b) Haryana has stated that 5 No. of UFRs nave been made operational and procurements action for 4 Nos. of under frequency relays has been started. However, no time line has been mentioned.

(c) Rajasthan has stated that all 04 Nos. of defective relays shall be made functional by 31.03.2013.

(d) Punjab has stated that 3 Nos. of UFR and 01 Nos. of df/dt have been made operational and balance 02 Nos. of UFR and 02 Nos. of df/dt shall be replaced by 28.2.2013.

(e) UP has stated that 18 Nos. of UFRs have been procured and 13 Nos. out of those have been commissioned. Further, orders for 76 Nos. of UFR have been placed with a delivery schedule up to May, 2013.

(f) Further as given in the above table, HPSEB Ltd informed that OEM is likely to visit Kunihar sub-station shortly to rectify the defect. However, no time line has been mentioned.

(g) NRPC Secretariat intimated that the issue was taken up with Electricity Department, Chandigarh. But, no response received.

(h) Uttarakhand and J&K have not submitted status of UFRs and df/dt relays installed in their respective systems.

28. It has also been reported that UFR and df/dt relays do overlap and these feeders also form part of Emergency Rostering. It is reported that in Uttarakhand out of 10 feeders 7 feeders are part of schedule power cut/load shedding and 1 feeder is for tripping in UFR as well as df/dt relays. It may be seen that Regulation 5.4.2(e) of

the Grid Code, extracted hereunder, clearly stats about arranging the feeders in 4 groups without any other loading:

> *"(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. In case of certain contingencies and/or threat to system security, the RLDC may direct any SLDC/ SEB/distribution licensee or bulk consumer connected to the ISTS to decrease drawal of its control area by a certain quantum. Such directions shall immediately be acted upon. SLDC shall send compliance report immediately after compliance of these directions to RLDC."*

29. We are constrained to remark that we are thoroughly dissatisfied with the defense mechanism in terms of UFR and df/dt. Hard reality which stares us on the face is that these have not been provided and maintained as per Regulation 5.2 (n) and 5.4.2 (e) of the Grid Code by NR constituents. Accordingly, we hereby direct as follows:

(a) Issue notices to the heads of SLDCs and MD/CMD of the STU of Punjab, Haryana, Rajasthan, Delhi, Uttar Pradesh, Uttarakhand, Himachal Pradesh, Jammu and Kashmir and head of Electricity Department, UT of Chandigarh and to explain why action should not be initiated under Section 142 of the Electricity Act, 2003 for non-compliance of the Grid Code.

(b) Member Secretary, NRPC to submit the latest status of UFRs and df/dt installations in NR within 1 month from the issue of this order.

(c) UFRs and df/dt relays also be mapped on the SCADA system of each state so that they can be monitored from SLDC/NRLDC.

(d) All STUs and SLDCs to map/network the UFR and df/dt on their SCADA system.

(e) NRLDC to submit the compliance report on the progress of installation of additional UFR and df/dt relays and quantum of load relief expected during contingency by 31.3.2014.

(f) The staff shall examine the reports of the Member-Secretary, NRPC and NRLDC and shall submit to the Commission within one month of the receipt of the reports of NRPC and NRLDC.

30. The petition is disposed of with the above directions.

Sd/-

(M Deena Dayalan)
Member

sd/-

(V. S. Verma)
Member