

Before the
MAHARASHTRA ELECTRICITY REGULATORY COMMISSION
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Case No. 16 of 2007

In the matter of
Grid Disturbance and Disruption of Power Supply during 25th February 2007.

Dr. Pramod Deo, Chairman
Shri A. Velayutham, Member
Shri S. B. Kulkarni, Member

ORDER

Dated: 27th June, 2007

1. In exercise of the power conferred by clause (zp) of Section 181 read along with clause (h) of Section 86 of the Electricity Act, 2003, the Maharashtra Electricity Regulatory Commission has notified vide the MERC State Grid Code (SGC) Regulations, 2006. Section 29.2.4 of SGC stipulates that,

“Events affecting a generation capacity or a load of more than 1000MW shall immediately be reported in writing to the Commission by the State Load Dispatch Centre, Transmission Licensee or User, as the case may be:

Provided that a summary document including brief detail of the event, extent and probable causes of the event shall be sent across to the Commission within 24 hours of occurrence of such event.”

2. On February 25, 2007 at 16:34 hours, wide scale disruption of power supply took place in western region of Maharashtra, including Mumbai. Subsequent to the disruption of power supply, the Commission suo-moto issued a notice dated February 26, 2007 to all licensees seeking compliance of Section 29.2.4 of SGC Regulations, 2006. The utilities were directed to submit the following information:

- i) System conditions prior to the occurrence (pre-fault).
- ii) Brief description of the occurrence, sequence of events and the areas affected thereof.
- iii) Generation loss and unit tripped during Occurrence.
- iv) Restoration of normalcy and the chronological steps taken thereof.



The utilities were also directed to provide following additional information:

- (i) Details and extent of standby support (MVA) availed by Tata Power Co. Ltd. during the day on an hourly basis.
- (ii) Details of load met and extent of load shedding on an hourly basis from the start of the problem and restoration of the normalcy

The utilities were directed to furnish the Preliminary report regarding the occurrence by February 27, 2007 and detailed report by March 9, 2007.

3. Accordingly, the licensees including generating companies, namely, MSETCL, MSPGCL, TPC, BEST and REL submitted their “Preliminary reports” pertaining to effect of the disturbance in their respective systems and recovery thereafter. MSEDCL, however, did not submit any report to the Commission

4. MD-MSETCL appointed a committee headed by Director (Operations), MSETCL to investigate the matter and submit the detailed report regarding the occurrence. The committee accordingly went into the details of the occurrence and submitted their report, which was forwarded on March 2, 2007 by the MD, MSETCL to the Commission. In the said report the investigative committee has concluded that while charging the 400 kV Padgha Nagothane line, after maintenance work, an earth fault occurred due to snapping of earth conductor, which made intermittent contacts with the phase wires of the charged line, resulting in “high resistance fault”. As the Primary protections on the line were not equipped to act fast on such kind of fault and as there was no back-up protection on the line, there was delayed tripping by upstream protection which caused system swings, sharp decrease in system frequency, tripping of generating sets and isolation of sections of grid.

5. The committee recommended that the Main 2 protection installed on the EHV transmission lines should be based on different measuring principle than that of Main 1 protection and that the lines should also be provided with back-up protection relays. The committee has also made suggestions to provide flexibility and bus sectionalisation facilities to quickly and automatically isolate faulty sections of InSTS.

6. Subsequently TPC and REL submitted their “Detailed reports” on disruption of power supply along with detailed Fault Disturbance Recorder (FDR) records which indicated a graphical representation of the chronology of events earlier submitted by the utilities.

7. Main purpose of the MERC (State Grid Code), Regulations 2006, issued by the Commission is to specify and enforce the standards with respect to quality, continuity and reliability of service by licensees in the State. The reports of the Investigation Committee and the detailed reports submitted by the utilities clearly indicated that the wide spread power failure in the state, causing inconvenience and hardship to a large section of consumers in the State was caused due to failure of primary protection relays on the EHV system in the State. The Commission, therefore, called for a hearing in the matter, which was held at 11:30 hours on 17th April 2007.



8. During the hearing, MSETCL submitted that subsequent to the failure of the Primary protection relay as above, internal investigations were conducted in co-ordination with the Protection relay manufacturer and it was found out that the Primary protection relay was not equipped to protect against the type of “high resistance fault” which had occurred on the transmission line.

9. The Commission had emphasized during the hearing that failure of Primary protection relay is a matter of grave concern as far as safe grid operation is concerned. In this connection, the Commission draws the attention of all the utilities to **Clause 16.3.1 of the State Grid Code**, which stipulates that,

“Protection system shall be provided by all Transmission Licensees and Users to isolate faulty equipment and to protect the other components against all types of faults, internal / external to them, within specified fault clearance time with reliability, selectivity and sensitivity”.

Thus the failure of the Primary protection of Padgha-Nagothane line, in the above incidence of a “high resistance fault” is failing to meet the provisions of the SGC.

10. The Commission recalls that similar types of occurrences had taken place in Maharashtra in the past, when non-operation of the Primary protection was attributed to the “typical” nature of those faults. The Commission notes that the occurrence under reference, had taken place at the time of test charging the line, which exposes the weakness in the protection scheme. In order to spare the consumers from the wide spread inconvenience and hardships due to such failures, the Commission directs the STU and other transmission utilities to take definite steps with the help of the protection relay manufacturers to improve the protection system on EHV lines and sub-stations, so that the Primary protection shall meet it’s obligation under all circumstances, which are meant to be sensed and acted upon, for any types of faults.

11. During the hearing it was explained by TPC and REL that consequential to the fault and system disturbance, the Electrical power system of Mumbai area got islanded from the power system of rest of the Maharashtra state. It was further explained that shortly thereafter the islanded Mumbai system got separated further, causing failure of power supply in parts of Mumbai area as the under-frequency load trimming scheme provided in the area did not act correctly. Similar failures were observed in some of the past grid disturbances.

In this connection, the Commission draws the attention of all utilities to **clause 22.18 of the State Grid Code**, where it is specified that

“Users and Transmission Licensees shall provide automatic under frequency and df/dt based load shedding / islanding schemes in their respective systems , wherever applicable, to arrest frequency decline that could result in collapse / disintegration of the state grid.....”



and further **clause 22.19 of the State Grid Code** states that,

“Users and Transmission Licensees shall ensure that under frequency and df/dt relay based load shedding/islanding schemes, mentioned in Regulation 22.18 are always functional. ”

12. In view of the above, the Commission directs to analyze wide scale power failure in part of Mumbai in the wake of Grid disturbance as above, review the islanding as well as load trimming schemes in the respective areas of the utilities for all probable operating conditions at the time of grid failure and ensure their successful operations whenever called for. Improved system frequency profile and successful islanding during past occurrences shall have to be kept in view. Apart from other technical requirements, smooth restoration of the system with minimum possible outage time shall be the criteria for the ideal islanding scheme, de-linking commercial considerations which are to be addressed separately.

13. The Commission observed that while Islanding schemes have been implemented in Mumbai area, there are no such islanding schemes elsewhere in the state. The Commission is aware that, while, too many fragmented islanding schemes may not be in the best interest of the power system, it would be worthwhile to explore the plan for islanding of generating stations with regional block of loads etc., so as to save them from tripping consequential to a wide-ranging grid disturbance. This would help restore the system smoothly and the outage time would be minimized. MSETCL had stated during the hearing, that a Committee has already been formed to look into the matter and they were expected to submit report in 3 to 4 months.

14. The Commission directs that STU (MSETCL) may take up with the appropriate State, Regional and National Committees dealing with Grid management, to address the issues highlighted in para 10, 12 and 13 above, related to Relay performance, review of Mumbai islanding scheme and formulating islanding schemes for rest of Maharashtra system. The progress achieved regarding the same shall be furnished to the Commission at the time of their application for ARR, as a part of improvement in Grid performance. TPC and REL shall also furnish the details of related action initiated towards better Grid performance, in their ARR applications.

Sd/-
(S.B.Kulkarni)
Member

Sd/-
(A. Velayutham)
Member

Sd/-
(Dr Pramod Deo)
Chairman



Secretary, MERC