BEST PRACTICES IN MARKET OPERATION AND MAINTENANCE - WHITE PAPER (NPCC)

The main purpose of this paper is to share the new concepts/skills learned from US Electric Market during the exchange visit and highlight the prospective challenges in implementing these practices in NTDC/NPCC. What roadmap can NTDC be following to achieve a successful energy market on competitive basis besides other steps for improvement of reliability of the power system on basis of knowledge exchange during visiting the US Electric Market e.g. areas of Generation/transmission scheduling, commercial operations, load forecasting techniques and demand response methods etc. Firstly at following, let us provide a basic introduction of fundamental ideas of the US Electric Market; day-ahead energy market and real-time energy market. Some of the challenges and solutions are as follows:

Connect generators through AGC and use EMS /SCADA system for real time power system operations

SCADA system of power system has been recently upgraded. But unfortunately, most of the applications of SCADA system are not meant for the operator at the moment. Therefore, the system operator is facing issues to operate the system without using latest techniques on real time basis. Moreover, the gap between supply and demand creates a great deal of difficulty for system operator to control frequency that continuously threats the reliability of system. The system frequency must be within the permissible limits as defined in NEPRA's grid code, whereas the ground situation is very critical.

Recommended solution

Frequency of Power System fluctuates continuously and goes beyond the permissible limits. There is no spinning reserve sand operating margins for handling such situation. Following are some suggestions and recommendations for above stated challenge:

1. All the applications should be activated so that system could be run with real time data and reliability can be enhanced by connecting all the plants on the AGC.
2. A suitable spinning reserve should be decided that will compensate the emergency outages on the system. If spinning reserve is not possible at some extent in the presence of existing huge power shortfall round the year, then it is suggested that operating margin of about 200 to 300 MW should be decided for stability of the power system. This operating margin can be accommodated on the closing hours of a day/revision of indent time by lifting load management of high recovery feeders etc. The Frequency will remain within the permissible limits of grid code.

Up-gradation/maintenance of grid system besides removal of prevailing network constraints

NTDC Network

As per operational history of last summer (peak season), load of more than half of Power Transformers has been seen running at 80% and above of the capacity during greater part of the day. The numerous

transmission lines of 220kV level are operating without N-1 contingency particularly primary transmissions lines of 220kV and 132 kV.

DISCOs Network

Severe overloading is being observed at 132kV and lower voltage levels under the jurisdiction of Discos. Similarly contingencies of the transformers and transmission lines are not available.

Recommended solution

In United States, NERC and Reliability councils make sure that the utilities follow the codes and principles. All the utilities and RTOs assure that the contingencies of N-2 for primary network and N-1 for the secondary network must be available. In the case when a utility fail to provide the committed contingencies and transmission capacity, it has to pay the congestion charges. Furthermore, live line crew be trained with the latest techniques to handle the emergent situations without any congestion. (EPP's trained all 9 DISCOs and provided them with latest tools and plants)

Low Voltages

Voltage is another issue that NTDC system has to face during peak times in summer and winter seasons. In summer voltage are low due to high reactive demands and non-availability of VAR compensators. Sometimes voltage reaches beyond the permissible limits cause load shedding in addition to generation shortfall is carried out to avoid voltage collapse. Similarly, in winters the voltages become very high during less load hours (especially at night). The system operators open the 500 and 220 kV transmission lines due to non-availability of VAR compensators. The openings of lines are very critical for system stability and this practice is not exercised in the US power system.

Recommended solution

We should procure the latest VAR compensators equipment (SVCs, Statecom, Shunt Reactors and capacitor banks) that are operated by smart grid techniques in US. These automated VAR compensators will not only support the reliable integration of renewables into the system but will help Grid maintain load during peak demand seasons.

Capacity Building

132Kv and down below system have no real data available due to absence of SCADA system. Operators are using traditional telephonic communication. Due to this, authentic planning is not possible for load management and demand forecast etc. As an example, if the overloading or tripping occurs, operator cannot observe or guess the problem until or unless the staff person of grid under problem contacts by himself telephonically. Following suggestions are furnished to take necessary measures which will reduce the supply interruption timings besides system stability and causalities.

Recommended solution

1. Forced load shedding can be avoided by authorizing the shift in-charge to change the quota in case of any emergency outages. (SOP is needed to be for quota allocation and forced load management).

2. An automated program i.e. SCADA system for 132kV network can be the very helpful to record operational data and updating of electronic mimic board.
3. Communication system can be improved by establishing control room as well as staff for prompt communication purpose. By doing this restoration can be done within minimum time and load shedding will be reduced.
4. An additional desk be introduced in control room for short term load forecasting

Administrative Restructuring

System operators are under administrative controls of a transmission company that has its own standard operating procedures. Resulting in forced circumstances where NPCC is compelled to run the power system in critical conditions and to overlook the operating standards for better system reliability.

Recommended solution

NPCC should gradually be transformed into an independent system operator which will follow the protocols/grid codes issued by NEPRA. This will improve the performance and operational concerns rather than being influenced by policy matters and non-professional practices.