UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Reliability Technical Conference	Docket Nos. AD15-7-000
North American Electric Reliability Corporation	RR15-2-000

Commissioner-Led Reliability Technical Conference

Panel II: Emerging Issues

Presentation

Anjan Bose
Regents Professor
School of Electrical Engineering & Computer Science
Washington State University
Pullman, WA 99164

June 4, 2015
Washington DC

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The impact of changing fuel sources and power supply portfolio on grid planning and operations

Anjan Bose
Washington State University

<u>Introduction</u>

The emerging issues from increasing renewable resources and natural gas in the nation's electric power supply portfolio have been well documented by FERC/NERC and the power industry. It is also recognized that changes in regulations and planning/operations standards will be necessary as evidenced by this technical conferences and the activities of the NERC task force on Essential Reliability Services (ERSTF). What is less understood is whether the procedures, methods and tools used for planning and operation today are able to cope with the changing environment and more importantly, what changes need to be made in these areas. Needless to say, the changes required in regulatory policy and operational standards are dependent on the availability of the appropriate computational/control tools and the best engineering practices.

In this presentation, we raise some issues about better planning and operation tools and practices.

<u>Planning</u>

Generation adequacy – the ability to have enough generation capacity to fail to meet the load demand only one day in ten years – has always been the metric for planning generation capacity. Probabilistic computation tools are available as long as the forced outage rates of generators are known. The traditional wisdom of 15% generation reserve for planning purposes is no longer valid because the availability rates of renewable generation are significantly less than the traditional generating plants. Using this calculation approach, the backup reserve margins for renewable generation are so much higher that cost justifications are impossible without demand response and storage options. Thus, probabilistic tools that can handle demand response and storage are much needed.

In addition, the NERC report that generation reserves in some areas are trending downwards is a result of inadequate construction of new capacity. Obviously, the computation tools can only indicate what capacity needs to be built but actually building it takes other incentives.

Despite significant R&D efforts, practical probabilistic computation tools to determine transmission adequacy have not been available. Although such R&D must continue, for the time being we have to live with deterministic tools which have been the exhaustive simulation of (mainly single, n-1) contingencies on the worst loading scenarios. With the increase in both variable generation capacity and variation of scheduled interchanges, the worst loading scenarios are more difficult to identify. Better guidelines for constructing worst-case scenarios are needed to accommodate not just the changing generation portfolios but also the other changes in new technologies, market rules and policies; these guidelines may vary from region to region.

An additional complication for transmission planning is that more of the generation sources are being located at distribution voltages. Moreover, load shedding and demand response are becoming part of the adequacy calculation, and these loads and microgrids are on the distribution systems. Thus the modeling of the low voltage parts of the grid, usually ignored in present day planning studies, becomes more important. Again, guidelines are needed on how to do this.

Operations

The interconnected grid has had decades of experience in automatically balancing load with generation and performance standards and best practices have evolved to do this well. The increasing use of gas turbines actually helps because their response is faster than the coal plants that they displace. The main issue is that the increase in generation variability from renewables adds to the 'rate of load change' thus adding to the regulation, load-following and contingency reserves needed. This issue has been well recognized by the NERC reports and measures for these reserves have been suggested. What is needed are guidelines for measuring these reserves in real time and the tools (software) for keeping track in the SCADA-EMS of the availability of these reserves. It should be pointed out that the addition of demand response and distributed generation increases measurement points on both sides of the load-generation equation by several times the present day measurement points.

The real time contingency analysis (RTCA) has been a standard tool for secure grid operations. As the loading patterns are changing more rapidly with higher penetrations of renewables, the guidelines for the use of RTCA (e.g. how often this should be run in real time) should be looked at. More importantly, the operator should have better guidance on what to do if the RTCA issues alerts. At present, the operators are trained and written procedures are available for handling such conditions but the future is expected to bring up situations that are more complex.

Markets

In most parts of the country, the operating reserves (regulation, load-following, spinning, non-spinning, supplemental) are acquired through various capacity markets. The planning process should ensure that enough of these different types of reserves will be available for a competitive market. The operations planning must ensure that adequate reserves have been acquired but guidelines are needed when the market cannot procure enough. In operations, clear guidelines are needed if and when the reserves are not available to meet the standard requirements.

Conclusions

The procedures, methods and tools used in planning and operation of the power grid has not changed significantly in the last three decades. The planning process is clearly inadequate to guarantee the same level of reliability for the future. The operation of the grid is under stress and without changes the operator will face more occasions of emergency conditions.

Although there is nothing wrong with the reliability standards in use today, these standards don't always have clear metrics and are open to variable interpretation. This is not to say that standards should be overly prescriptive, but they certainly should have a common engineering understanding.