Nuclear Plant – Transmission System Interface

John Gyrath
Senior Staff Engineer – Exelon
Degraded Voltage Relay Meeting
February 13, 2015
NRC Offices
Rockville, Maryland

Energy Policy Act

- Energy Policy Act of 2005 provided for the creation of an Electricity Reliability Organization (ERO) with the authority to enforce mandatory reliability standards. In 2006 FERC approved the North American Electric Reliability Corporation (NERC) as the ERO.
  - This transformed NERC from a "voluntary compliance" organization to a regulatory entity with powers of enforcement.
  - NERC performs the following functions:
    - Establishes Reliability Standards
    - Monitors and Enforces Compliance
    - Evaluates Reliability Readiness (readiness of system operators to maintain safe operations)
    - Maintains Situational Awareness and Critical Infrastructure Security (physical and cyber threats)

NERC Reliability Standards

- Enforceable NERC Reliability Standards address fourteen functional areas of transmission system operations and planning including:
  - System Operations
    - Voltage and Frequency Control
  - System Planning
    - Modeling
  - Protection and Control
    - Protective System Maintenance
  - Nuclear Plant Interface

Nuclear Plant Interface Coordination

- NERC Standard NUC-001 effective 4/1/2010
- Coordination between Nuclear Plant and Transmission Entities to ensure nuclear plant safe operation and shutdown
  - Offsite power supply to enable safe shutdown of the plant during an electric system or plant event
  - Avoiding preventable challenges to nuclear safety as a result of an electric system disturbance, transient, or condition

Drivers for NUC-001 Standard

- NRC & Industry concerns due to Electric Industry Deregulation / Breakup / Market Pressures
- Grid and switchyard related events impacting nuclear power plants increased significantly in 2003/2004 compared to the previous three years.
- August 2003 blackout magnified interest

  (Impacted 9 US and 11 Canada nuclear units)
- Need to ensure the roles and responsibilities of the transmission organizations and nuclear plants are clearly understood and documented.

NRC Generic Letter 2006-02

- GL 2006-02 (2/06): Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

Issues include:

- The use of protocols between the nuclear plants and the grid operators and the use of grid operator analysis tools to aid the plant in assessing offsite power operability and in performing maintenance risk assessments.

NUC-001 Standard Focus

- Clear Understanding of and Agreement on the Nuclear Plant's Interface Requirements (NPIRs)
- Agreements that include the mutually agreed to NPIRs and document how the NPIRs will be met
- Incorporate NPIRs into Transmission Planning Studies, System Operation & Operating Limits, and Reliability Analyses
- Coordination of Outages, Maintenance, and Design Changes

Nuclear Plant Interface Requirements

- Offsite power source configuration (number of lines, independence, etc.)
- Voltage (includes minimum actual and post trip contingency)
- Real Time Monitoring (e.g. State Estimator)
- Frequency
- Offsite power source load (MVA)
- Offsite power source restoration (voltage, frequency, load, configuration)
- Notification protocols
- Outage Coordination
- Switchyard Maintenance (Maintenance Rule)
- Planning Studies (unique based on NPP licensing requirements)
- Communication of station and transmission system design changes

NUC-001: Transmission Entity Requirements

- Operations: Incorporate NPIRs into operating analyses (e.g. state estimator and contingency analyses) and operate the transmission system to meet the NPIRs.
  - Real Time State Estimator continually monitoring NPP offsite power source voltage and post trip contingency voltage. Must notify station if limits are violated.
  - Operating analyses performed in advance (e.g. day ahead studies) contain NPP limits to ensure NPP requirements are addressed in outage planning.
- Planning: Incorporate NPIRs into planning analyses and provide results to NPP. These analyses include:
  - Unique planning studies to address NPP licensing requirements and the studies required to comply with the NERC Planning Standards
  - Steady state and dynamic studies

Industry Interface Initiatives

- North American Transmission Forum (NATF) has formed a Transmission/Nuclear Power Plant Interface Practices Group to promote the use of industry superior practices
  - Scheduling and coordination of work, maintenance activities and risk assessment
  - Risk Assessment tools
  - Human Performance tools
  - NPP Switchyard peer reviews
  - NPIR template and NPIR peer reviews
  - Offsite Power Restoration
  - Sharing of Operating Experience

Nuclear Plant – Transmission System Interface

QUESTIONS