

Exelon Learnings from Extended Power Upgrades

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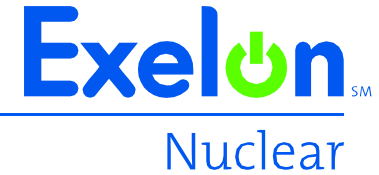
- **Operational Challenges from EPU**
- **Vibration Monitoring and Actions**
- **EPU Vulnerability Review and Actions**
- **Steam Dryer Repairs and Replacement**

Operational Challenges from Dresden / Quad Cities EPU

- **Increased steam and feed flow velocities have caused increased pressure pulsations and vibration levels, leading to equipment failures and degradation.**
 - Steam Dryer Failures
 - Main Steam Relief Valve Failure
 - Main Steam Line Low Pressure Switch Failure (1/2 Group Isolation)
 - Turbine Control Valve Pressure Switch Failure (1/2 Scram)
 - HPCI Test Tap Connection Failure
 - Main Steam Drain Line Failure
 - Feedwater Sample Probe Failure
- **Industry data indicates that nearly all EPU related problems are caused by increased vibration.**

- **Reduction of margin has affected several systems**
 - Reduction in available Main Steam Safety Valve set point tolerance
 - Reduction in Feedwater Heater Drain Emergency Valve capacity
 - Previous Standby Feedwater and Condensate Pumps are normally operated
 - Reduction in Main Condenser margin

Exelon Response to EPU Lessons Learned



- **Teams were established to address three major impact areas**
 - Vibration Impact Resolution
 - EPU Vulnerability Review and Actions
 - Steam Dryer Repair and Replacement
- **Exelon established Technical Human Performance Initiative**

- **Monitoring and Performance Evaluations for Critical Subcomponents**
 - Accelerometers to collect actual vibration data for piping, valves and actuators
 - Shaker table testing at Wyle Labs
 - Analytical Modeling of affected components
- **Resulting Actions**
 - Adjust PM scope and frequency based on results
 - Implemented focused / detailed outage walkdowns
 - Identify subcomponent wear and implement modifications for ERV and Target Rock Valves

- **Comprehensive and rigorous review of systems and components**
 - Utilized multiple industry organizations
 - For the purpose of this review, every component in the plant was assumed to be susceptible to failure, unless proven otherwise
 - Evaluated changes in operating parameters post EPU for all 4 units
 - Flow rates, temperature, pressure, radiation levels, vibration levels, wear
 - Review was conducted both at the system and component levels
 - 53 systems included
 - Identified potential vulnerabilities due to the changed parameters
 - Provided recommendations to address the potential vulnerabilities

- **Reviews confirmed that adequate safety margin exists**
- **101 recommendations were made**
 - 60 require outage inspections over next 4 years
 - 9 involve non-outage work
 - 32 involve additional analyses or studies
 - 27 are Exelon specific
 - 74 have potential BWR fleet applicability
- **Review results were subject to three independent challenges**
 - Internal Team Challenges
 - Executive Challenge Board
 - BWROG Challenge review
- **Actions are in progress and Dresden and Quad Cities**

- **Enhanced repairs implemented at Dresden 2/3 and Quad Cities 2**
- **Dryer Replacement Project Initiated**
 - Develop advanced steam dryer design
 - Implement design features to minimize stresses
 - Qualify the replacement dryer through testing and analysis
 - Instrument the first dryer to verify design loadings
 - First installations will be at Quad Cities units 1 & 2
Spring 2005

- **Adverse effects have been and are being addressed**
- **Safety margins were confirmed adequate**
- **Exelon experience has been shared with the industry and with the NRC**
- **Implementation of recommended actions continues**