

Byron / Braidwood Auxiliary Feedwater Cross-tie License Amendment Request

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Exelon Generation®

Agenda

- Auxiliary Feedwater (AF) System Design and Cross-tie Operation
- AF Cross-tie History
- License Amendment Request (LAR)
 - General Design Criteria (GDC) 5
 - Application of Plant Technical Specifications (TS)
- Summary

Auxiliary Feedwater System

- Design Basis Safety Function to supply feedwater to the Steam Generators (SG) to remove decay heat from the Reactor Coolant System (RCS)
 - Mitigates the consequences of a loss of normal feedwater event
- Each unit contains two independent, 100% capacity trains capable of supplying feedwater to all four SGs
 - 'A' Train consists of a motor driven pump with power supplied by Class 1E source
 - 'B' Train consists of a diesel driven pump with power supplied by an independent diesel generator
 - One pump at full capacity is sufficient to remove decay heat and cool the RCS to the Residual Heat Removal (RHR) entry conditions
- Design redundancy conforms to GDC 34 requirement to be capable of performing safety function under accident conditions assuming a single active failure

‘A’ Train AF Cross-tie Between Units

- Installed cross-tie connects the discharge lines of the Unit 1 and Unit 2 ‘A’ AF Train Pumps
 - Cross-tie normally isolated by two closed, locked manual valves
- Does not support or accomplish any AF system safety function, design basis function, or normal operating function
- Provides an improvement in safety for a unit experiencing a beyond design basis loss of heat sink (i.e., loss of all unit specific normal feedwater and both trains of safety related AF)
 - Procedures require pressurizer power operated relief valves (PORVs) and Reactor Head Vents to be opened as part of the RCS feed and bleed strategy
 - Feed and bleed strategy challenges integrity of RCS and creates potential radiological consequences
 - Use of AF Cross-tie provides an additional capability to supply feedwater to the SG, thereby reducing the potential for a total loss of heat sink and need to invoke RCS feed and bleed strategy

AF Cross-tie History

- AF Cross-tie was installed at Byron and Braidwood in 2009 and 2010 at a cost exceeding \$2 million
 - Installation and subsequent Emergency Operating Procedure changes were performed in accordance with 10 CFR 50.59
- In 2011 the NRC issued a Severity Level IV Non-cited Violation of 10 CFR 50.59 for failure to obtain NRC approval prior to installing the AF Cross-tie
 - Inspectors concluded that use of the cross-tie resulted in a more than minimal increase in the likelihood of a malfunction of equipment important to safety
 - NRC Inspection Report noted that Exelon planned to submit a LAR as a corrective action
 - License Amendment Request submitted in January 2012
- Procedural Guidance was removed due to NRC violation
 - Presently, operating crews have no guidance on use of the cross-tie

License Amendment Request

- Purpose of proposed changes are to describe the Cross-tie capability and system functional restoration strategy in the Updated Final Safety Analysis Report
- NRC approval requested since the AF System has not been previously licensed as a system shared between Unit 1 and Unit 2
 - Seeking approval for non-accident unit to donate 'A' Train to beyond design basis accident unit
 - Not requesting approval to use the AF Cross-tie to mitigate loss of heat sink event on accident unit since this event is beyond the design basis requirements
- Justification supporting non-accident unit donating its 'A' Train is based on:
 - Continued AF System compliance with GDC 34 for all design basis events
 - AF System compliance with GDC 5 requirements for sharing systems, structure, and components (SSC) between units
 - Non-accident unit operation continues to comply with approved TS

GDCs / TS Relationship

- NRC guidance on the relationship between GDCs and TS supports the proposed change (NRC IMC 0326)
 - GDC require redundancy of function for safety systems (i.e., two independent, full capacity trains)
 - TS permit operation for a specified time with only one train operable
 - In these cases, GDC are met because the system design provides the necessary redundancy
- Consistent with this guidance, the AF System design remains capable of withstanding a single failure while the unit is allowed to operate for 72 hours with one AF train inoperable in accordance with TS

Conformance with GDC

- AF System design conforms with single failure requirements of GDC 34
 - Design includes redundant, full capacity AF trains, with diverse power supplies - each capable of independently performing the AF safety function
- GDC 5 allows sharing of SSCs between units under specified conditions – With the 'A' AF Train donated to (i.e., cross-tied to) the beyond design basis accident unit, all GDC 5 design requirements are met
 - AF System safety function is not impaired since the 'B' AF Train is operable and capable of independently performing the safety function
 - Consistent with NRC guidance a significant impairment of AF System safety function would require a loss of both trains (Appendix A to 10 CFR 50, 10 CFR 50.72)
 - Non-accident unit remains capable of an orderly shutdown and cooldown
 - Design and operation does not require the AF System to supply feedwater to the SG during normal unit start-up, operation, shutdown, and hot standby operation

Criterion 5-Sharing of structures, systems, and components. Structures, systems and components important to safety shall not be shared among nuclear units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

Technical Specification Requirements (NUREG-1431)

- TS LCO for the AF System require both trains to be OPERABLE during Modes 1, 2, and 3
 - TS 3.7.5 Condition A allows operation for 72 hours with one train inoperable
 - Constitutes a “temporary relaxation” of the single failure criterion (GL 80-30)
- To ensure compliance with TS 3.7.5 Condition A, proposed change requires ‘A’ AF Train to be declared inoperable and the ‘B’ AF Train to be OPERABLE during Cross-tie use
- TS LCO 3.0.2 establishes requirements when a TS LCO is not met
 - Intentionally not meeting an LCO and relying on the TS Conditions is allowed for reasons that include, but are not limited to, performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems
 - Entering TS Conditions for these reasons must be done in a manner that does not compromise safety
- Entry into TS 3.7.5 Condition A on the non-accident unit to support AF Cross-tie operation is consistent with the TS
 - Intentional entry in this manner is not restricted by TS LCO 3.0.2
 - Safety is not compromised since one AF Train remains operable and capable of performing AF System safety function
 - TS 3.7.5 Bases and Conditions are complied with through out operation with the AF Cross-tie open

Summary

- Utilization of the AF Cross-tie improves overall plant safety by providing additional operational flexibility to reduce the potential for beyond design basis loss of heat sink events
 - Maximum benefit is derived with operator training and procedure implementation
 - Probabilistic Risk Assessment of safety to the general public is improved through this station initiative
- AF System design and sharing of 'A' Train between units conform with all GDC requirements
 - Design remains capable of withstanding a single failure
- Unit donating 'A' Train complies with TS to ensure no loss of safety function and limited time in TS 3.7.5 Condition A
 - Intentional entry into TS Condition consistent with TS examples and intent
- Operation of a system, structure or component in accordance with TS does not change the fact that a system design remains compliant with the GDCs,
- Approval of this LAR is appropriate because a regulatory path exists and the AF Cross-tie improves plant safety

'A' Train AF Cross-tie Between Units

