Oconee Nuclear Station

Tornado License Amendment Pre-Application Meeting

One White Flint, Rockville, MD

August 1, 2018

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Attendees

Duke Attendees:

- David A Baxter (Dave) ONS Regulatory Projects
- Timothy D Brown (Tim) ONS Regulatory Projects
- Jason A Patterson (Jason) ONS Regulatory Projects
- Philip J North (Phil) ONS Regulatory Projects
- David A Wilson (David) ONS Design Basis
- Lee M Kanipe (Lee) Fleet Probabilistic Risk Assessment
- Michael E Henshaw (Eric) Fleet Safety Analysis

Agenda

- Opening Remarks
- Oconee Tornado Current License Basis (CLB)
- 2018 Tornado License Amendment Request (LAR)
- Discussion of LAR
- Closing Remarks

Opening Remarks

- To clarify the tornado license basis, ONS intends to submit a license amendment that will seek NRC review and approval of the following:
  - Crediting the standby shutdown facility (SSF) as the assured mitigation path following a tornado with damage from the tornado assumed to be loss of all alternating current (AC) power to all units with significant damage to one unit.
  - Formal incorporation of the use of tornado missile probabilistic methodology (TORMIS) in the ONS tornado license basis and associated UFSAR changes.
  - Elimination of the spent fuel pool (SFP) to high pressure injection (HPI) flow path for reactor coolant makeup (RCMU) from the license basis.

Tornado CLB

- Tornado is not defined as a design basis event, or scoping event in the CLB.
- In the original licensing of the plant, no event analysis for tornado was completed and no safe shutdown sequences were determined.
- Protection from the effects of a tornado is established as a design criterion for select systems, structures, and components (SSCs).
- Physical tornado protection of Class 1 structures (e.g. reactor building, and portions of the auxiliary building) is provided.
- Redundancy, diversity, and physical separation credited to assure:
  - Source of power and associated pathway to the unit.
  - Source of secondary side decay heat removal and associated pathway to the unit.
  - Source of primary makeup and associated pathway to the unit.

Proposed Tornado LB

- Protection from the effects of a tornado will remain as a design criterion for credited systems, structures, and components (SSCs).
- However, analyses have been completed that demonstrate the plant's ability to mitigate a tornado using the SSF and procedures will be revised to reflect this capability.
- Physical tornado protection of Class 1 structures (e.g. reactor building, and portions of the auxiliary building) will remain.
- Redundancy, diversity, and physical separation of mitigating components/systems will no longer be credited, however redundant/diverse components/systems may be used if available.

Proposed 2018 Tornado LAR

- Proposed LAR supersedes LAR submitted in 2008.
- Credits the SSF as the one deterministically protected path for tornado mitigation within its 72 hour mission time.
- All units experience a loss of AC power with one unit experiencing significant damage from the tornado.
- Significant damage defined as either a main feedwater line break (overheating event) or main steam line break (overcooling event).

Proposed 2018 Tornado LAR

- Implementation of TORMIS as an acceptable method for evaluating systems and components necessary for the SSF to fulfill its credited mission that are not physically protected from tornado induced missiles:
  - SSF related systems and components located in the west penetration and cask decontamination tank rooms (WPR and CDTR, respectively).
  - Other systems and components required for the SSF to fulfill its design function (MSRVs, spent fuel cooling piping, CCW surge lines, etc.).
  - Committed modifications routed in areas of the WPR and CDTR.
  - Results: All units $<1x10^{-06}$ per reactor year with conservatisms.

Proposed 2018 Tornado LAR

- Credits completed modifications:
  - Protection of BWST for tornado wind and missiles.
  - Protection against wind loads and ΔP using fiber reinforced polymer (FRP) on the west penetration rooms (WPRs) and cask decontamination tank rooms (CDTRs).
  - Protection of SSF south side double doors for tornado missiles.
  - Protection from tornado missile impacts through the SSF south side personnel access stairwell on the SSF ASW lines.
  - Protection from tornado missiles through miscellaneous SSF exterior penetrations.
  - Protection of SSF north end cable trench cover and SSF trench crossover of CT-5 trench for tornado missiles.
  - Protection of SSF diesel service water discharge piping for tornado missiles.
  - Protection of SSF diesel fuel oil tank vent for tornado missiles.
  - Unit 2 & 3 SSF RCMU replacement pulsation dampeners.

Proposed 2018 Tornado LAR

- Credits future modifications:
  - Missile protection of the SSF diesel fuel oil tank vent and fill lines to prevent shear/perforation of the piping and potential rain water intrusion.
  - Unit 1 SSF RCMU replacement pulsation dampener.
  - New SSF letdown line for each unit.
  - Enhanced SSF system instrumentation, including:
    - Individual steam generator pressure.
    - Core exit thermocouples.
    - Wide range neutron flux.
    - Pressurizer temperature.
  - Does not seek NRC review and approval of these modifications (they will be evaluated via 50.59).

Proposed 2018 Tornado LAR

- Licensing Document Changes
  - Significant rewrite of UFSAR description of tornado mitigation:
    - Establishes initial condition of significant tornado damage to one unit with all units experiencing a loss of all AC power.
    - Credits SSF as assured mitigation path.
    - Establishes success criteria for RCS conditions following a tornado.
    - Applies TORMIS to evaluate SSF support systems and components that are not physically protected for tornado missiles.
    - Eliminates SFP suction source for HPI from license basis.
  - No anticipated changes to Technical Specifications.

Proposed 2018 Tornado LAR

- Thermal hydraulic success criterion for the RCS following a tornado:
  - Main feedwater line breaks (overheating events):
    - Core remains intact and in a cool-able geometry.
    - RCS pressure < 2750 psig.
    - Minimum departure from nucleate boiling ratio (DNBR) meets specified acceptable fuel design limits.
  - Main steam line breaks (overcooling events):
    - Core remains intact and in a cool-able geometry.
    - The steam generator (SG) tubes remain intact.
    - The RCS remains within acceptable pressure and temperature limits.
    - Minimum DNBR meets specified acceptable fuel design limits.

Discussion of Tornado LAR

- LAR Composition (NEI 06-02 guidelines)
  - Cover Letter
  - Enclosure
    - 1.0 Summary Description
    - 2.0 Detailed Description
      - SSF System Description
      - Tornado CLB
      - Reason for Proposed Changes
      - Description of Proposed Changes
      - UFSAR Changes

Discussion of Tornado LAR

- LAR Composition / continued
  - Enclosure / continued
    - 3.0 Technical Evaluation
      - RCS T-H Analysis
      - Revised Tornado LB
      - Operations Tornado Response, Training, and Procedures
      - Other Safety Considerations
      - Corrosion Effects
      - TORMIS Methodology
      - Elimination of SFP Suction for HPI from License Basis
      - Passive Civil Features
    - 4.0 Regulatory Evaluation

Discussion of Tornado LAR

- LAR Composition / continued
  - Attachments
    - Attachment 1 Regulatory Commitments
    - Attachment 2 UFSAR Markups
    - Attachment 3 UFSAR Retypes
    - Attachment 4 Tornado Missile Probabilistic Methodology (TORMIS)
    - Attachment 5 Thermal Hydraulic Models (Proprietary)
    - Attachment 6 Thermal Hydraulic Models (Non Proprietary)
    - Attachment 7 Thermal Hydraulic Transient Analysis
    - Attachment 8 Duke Proprietary Affidavit
    - Attachment 9 Framatome Proprietary Affidavit

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