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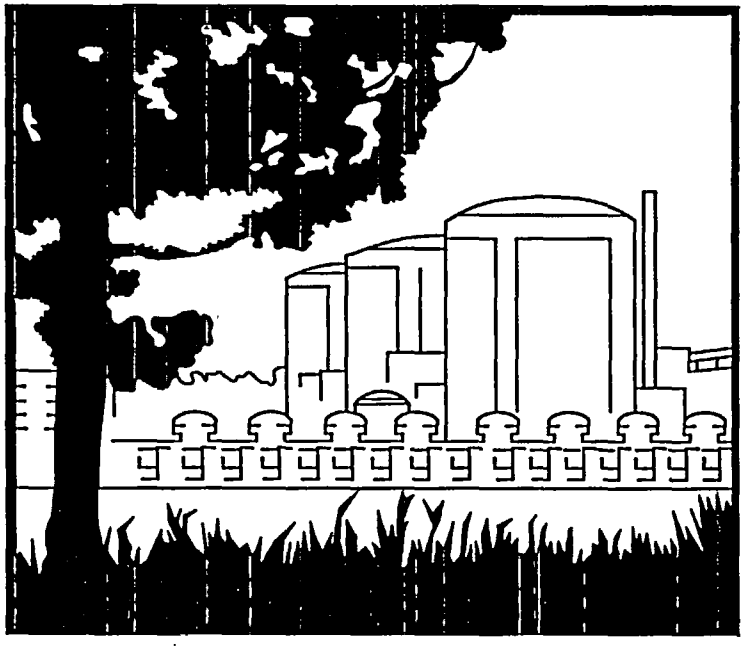
Oconee Nuclear Site



NRC public meeting to discuss Oconee tornado mitigation strategy

November 16, 2004

Agenda

- Purpose of Meeting
- Oconee Tornado PRA Status Report
- Risk Reduction Team (RRT) - Charter
- RRT Findings
- Summary
- Schedule

Purpose of Meeting

- Provide a tornado risk model status update.
- Present results from Oconee Tornado Risk reduction team whose mission is to evaluate modifications that would improve PRA, defense-in-depth, and equipment reliability/availability.
- At this point, leave the Staff with a better understanding of the Oconee direction with regard to those modifications being evaluated.

Oconee Tornado PRA Status Report

Major Tornado Analysis Updates Since 2002 LAR

- SSF Diesel Generator Reliability Data
- Human Error Dependency Analysis
- Updated Oconee Tornado Missile Analysis
- Steam Generator Replacement

SSF D/G Reliability

- Conducted Detailed Review of
  - Failure Data
  - Start Demands & Loaded Run Hours
- Resulted in Lower Failure Estimated Rates
  - 2 re-classified events
  - Undercounted start demands and run hours
- Conclusion: Oconee SSF Diesel Generator Reliability is very comparable to average industry diesel reliability except for the maintenance unavailability caused by Unit 2 CCW outages.

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Human Reliability Analysis

- The Oconee PRA Rev. 2 was criticized in its PRA Peer Review for not adequately addressing Human Error Dependencies when multiple human actions occur in the same accident sequence.
- Duke recently completed implementation of a new human error dependency model to address Oconee human error combinations.
  - Results in an increase in the estimated CDF.
  - This addresses an important PRA quality issue affecting the tornado analysis results.

Tornado Missile Analysis

For Tornado Missile Damage:

- Duke seeks to justify U3 CR North Wall design based on low damage probability.
- Updated TORMIS model developed to evaluate tornado missile damage probability for
  - U3 CR North Wall
  - BWST
  - Other Targets of Interest
- Unit 3 Control Room North Wall Found Acceptable

Tornado Missile Analysis

BWST Modeling Changes

- Old TORMIS model used an arbitrary tank thickness (1/8 inch) instead of actual tank thickness.
- BWST constructed of 7 tiers of welded steel plates
- New model uses thickness 0.3125 (sides) and 0.25 (dome)
- Correction results in significantly lower damage probabilities. (and still very conservative)

Updated BWST Results

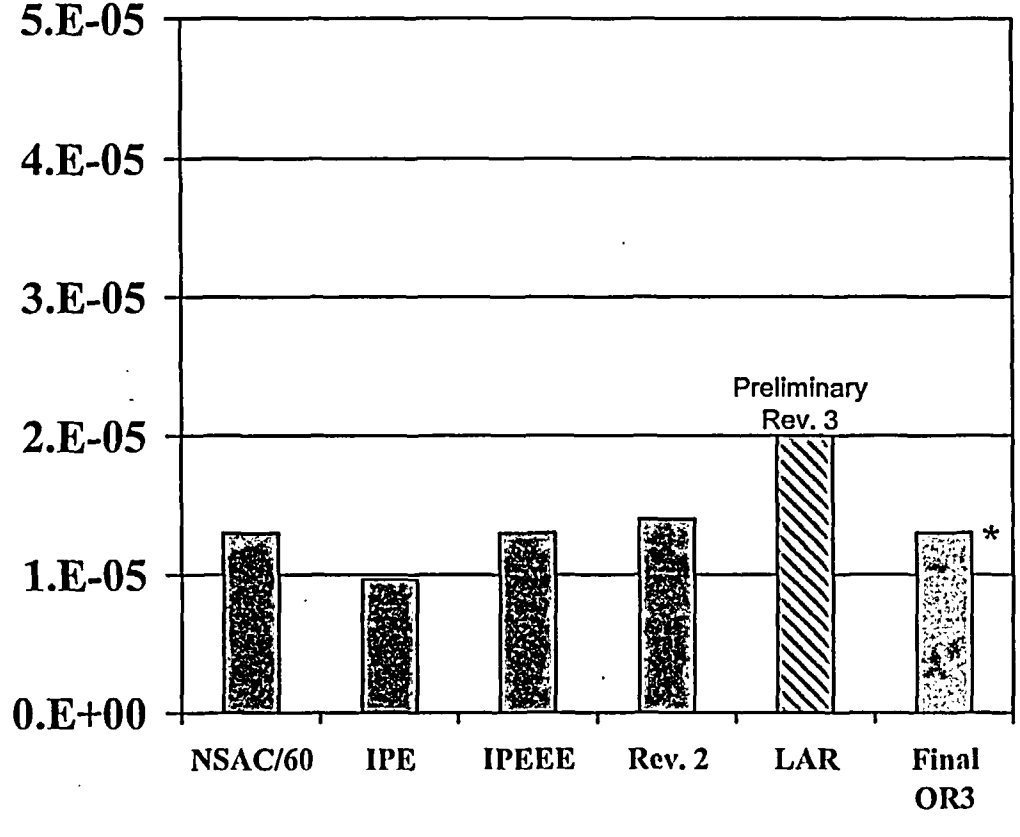
F-Scale	Basic Event	Initiator Freq	Conditional Prob.	Old Values (2002 LAR)	% Change
F-2	BF2BWSTDEX	5.37E-05	0.020	0.071	-72%
F-3	BF3BWSTDEX	4.12E-05	0.037	0.166	-78%
F-4	BF4BWSTDEX	3.59E-05	0.051	0.316	-84%
F-5	BF5BWSTDEX	1.71E-06	0.073	0.439	-83%
		Total Frequency	4.56E-06	2.3E-05	-80%

Steam Generator Replacement

- Replacement SG design improvements
  - Higher Compressive Tube Stress Capacity
- Analysis Improvements
  - Higher Initial SG Operating Level
- PRA Impact
  - Increased Time Available for Feedwater Recovery
  - Improved Human Reliability Estimates for TDEFWP Recovery and SSF ASW Alignment

Tornado Risk Results

- Historical Estimates of Tornado CDF have produced consistent results relative to the uncertainty associated with tornado data and modeling techniques, and general PRA uncertainties
- Current Oconee tornado risk remains consistent with historical estimates, but with less modeling uncertainty.



*Results based on WOG2000 Seal LOCA model. CEOG model is worth approximately 3E-06/yr reduction in overall CDF.

CDF Reduction Benefits

- "Public" Benefits estimated using methodology similar to SAMA methodology (~$40,000 to ~$50,000 per 1E-06/yr CDF reduction)

➢ Major Plant Modifications are not cost justified based on PRA benefit alone.

Risk Reduction Team (RRT) - Charter

- Gather subject matter experts from various plant organizations, from the general office, and outside consultants to serve on the RRT.
- Improve Mitigation Strategies for Risk Significant Design Basis Issues
- Consider current design basis initiatives and their impact to the overall risk profile.
- Consider, as appropriate, potential modifications that would significantly reduce risk, without creating additional operator burden.

PRA Insights

Review of ONS PRA provided the following insights into current plant vulnerabilities:

- Reliance on the Standby Shutdown Facility (SSF) or Station Auxiliary Service Water (ASW) for event mitigation.
- Majority of top postulated equipment failures are related to the SSF.
- Majority of top postulated operator failures are related to actions associated with the SSF or Station ASW.

Risk Reduction Strategy

- Improve Availability and Reliability of the SSF

- Provide a Reliable back-up to the SSF

Tornado Mitigation Risks

- Issues with Secondary Side Heat Removal (SSHR).
  - Potential Loss of Station ASW Pump Flow Control.
  - Ability to Operate the Atmospheric Dump Valves (ADVs).
  - Steam Generator Compressive Tube Stresses.
  - Pressurizer Safety Valve Reseating.

Tornado Mitigation Risks (cont.)

- Issues with Primary Side Volume and Pressure Control.
  - Potential missile damage to Borated Water Storage Tank (BWST).
  - Ability to Access LP-28 (BWST Outlet Valve).
  - Potential Failure of Main Steam Branch lines.
  - Potential Loss of Spent Fuel Pool Suction for High Pressure Injection (HPI).

Tornado Mitigation Risks (cont.)

- Structural Protection Issues
  - Potential missile damage to BWST.
  - Potential Structural Failure of Unit 3 Control Room Wall.
  - Potential Structural Failure of West Penetration Room.

Tornado Mitigation Risks (cont.)

- Potential Loss of 4kv Power and Control Power.
  - Failure of 4kv Bus
  - Loss of Control Power

Potential SSHR Modifications

- New High Head Station ASW pump with replacement of existing piping and addition of necessary flow control.
- Use existing Station ASW pump, with addition of motor operated valves (MOVs), flow control instrumentation, and replacement of current ADVs with MOVs.
- New Emergency Feedwater (EFW) system outside of Turbine Building.
- *Provide alternate SSF ASW pump suction source (Increase SSF availability).*

Potential Primary Side Modifications

- Protect Sufficient BWST Volume.
- Ensure Letdown Storage Tank (LDST) make up from Bleed Holdup Tank and Concentrated Boric Acid Storage Tank
- Improve Power Supply to HPI Pumps.

Potential Structural Modifications

- Provide Missile Protection for BWST and Wind Protection for West Penetration Room and Cask Decontamination Room.
- Provide Wind Protection for West Penetration Room and Cask Decontamination Room (assumes that BWST absorbs missiles)
- Provide Wind and Missile Protection for Main Feeder Bus and associated switchgear in Turbine Building.
- *Provide Wind (dp) Protection for Unit 3 Control Room Wall (This item previously committed).*

Potential 4kv and Control Power Modifications

- Upgrade Protected Power Path from Standby Bus 1 to ASW Switchgear.
- New Onsite Power Source: Either New Combustion Turbine or Diesel, with all required support systems and protected power path to ASW switchgear.
- Protect Power Path from Main Feeder Bus (including TC, TD, TE switchgear).
- Provide Protected power path to battery chargers from ASW Switchgear.
- *Provide Back Up Power to SSF from a Protected Power Source (Improve SSF Availability).*

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Summary

- Updated PRA model shows significant tornado risk reduction
- Initiated Overall Risk Reduction Effort in order to identify modification alternatives that would improve Oconee's mitigation strategies, PRA, defense in depth, equipment reliability and availability
- Modification Alternative to be selected will effectively address issues discussed

Schedule

- Risk Reduction Team meeting
  - Complete
- Present findings to plant management
  - Mid-December 2004
- Plant Management approval
  - January 2005
- Feasibility study completed
  - July 2005
- Detailed scoping and cost estimate completed
  - July 2006
- LAR submitted
  - October 2006