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Sent: Tuesday, April 19, 2011 5:50 AM
To: Chappell, Coley
Cc: STPCOL
Subject: STP Chp 19 Advanced SE ACRS slides April 21 2011
Attachments: STP Chp 19 Advanced SE ACRS slides April 21 2011.pptx

Coley,

I'm not sure if I've already shared our slides for the Chapter 19 ACRS presentation for April 21, 2011 but here they are.

Thanks,

Rocky

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From: Foster, Rocky

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"STPCOL" <STP.COL@nrc.gov>
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Presentation to the ACRS Subcommittee

South Texas Project Units 3 and 4 COL Application Review

**Advanced SE Chapter 19
Response to Severe Accident Policy Statement**

April 21, 2011



Chapter 19 - Response to Severe Accident Policy Statement

Staff Review Team

- **Project Managers**

- George Wunder, Lead PM, DNRL/BWR
- Rocky Foster, Chapter PM, DNRL/BWR

- **Technical Staff**

- Dr. Todd Hilsmeier, Reliability & Risk Analyst, DSRA/SPRA
- Dr. Edward Fuller, Senior Reliability & Risk Analyst, DSRA/SPRA
- Marie Pohida, Senior Reliability & Risk Analyst, DSRA/SPRA
- David Jeng, Senior Structural Engineer, DE/SEB2
- Jason Dreisbach, Senior Fire Protection Specialist, DSRA/SBPA



Chapter 19 - Response to Severe Accident Policy Statement

Open/Confirmatory Items Status

- All Chapter 19 open items are closed
- Notable confirmatory items (19-15, 17.04-9)
- Multiple LOLA confirmatory items
- No ACRS action items



Chapter 19 - Response to Severe Accident Policy Statement

- **Closure of Open Item 19-12 (RAI 19-30)**
- RAI 19-30 - address justification of the external probabilistic flooding analysis due to postulated main cooling reservoir (MCR) breach with significant watertight doors being normally open
- June 8, 2010, staff discussed with ACRS sub-committee this open item and its resolution (i.e., change the status for all watertight doors and hatches to be normally closed in FSAR)
- Final RAI Response (July 28, 2010):
 - Changed status for all watertight doors and hatches to be normally closed in FSAR (e.g., FSAR Sections 2.4S.10 and 2.4S.14)
 - Screened external flood scenarios from detailed quantitative evaluation using criterion (a) in ASME/ANS RA-Sa-2009, Section 6-2.3, “The Fundamental Criteria for Screening External Events Other Than Fire and Seismic Events”



Chapter 19 - Response to Severe Accident Policy Statement

- **Closure of Open Item 19-9 (RAI 19.01-31)**
- RAI 19.01-31 - provide the shutdown and full-power hurricane risk assessment that considered the shared fire water system under departure STP DEP 1.1-2
- Applicant provided a simplified quantitative assessment to evaluate:
 - Hurricanes at or below design basis wind speed (≤ 134 mph; frequency 0.01/yr)
 - Hurricanes above design basis wind speed (> 134 mph; fails fire water pump house and combustion gas turbines)
- Assessments met Commission guidelines for new reactors:
 - Crediting the compensatory measures to be documented in FSAR Section 19.4.6, “ABWR Shutdown Risk” and Commitment COM 19.4-1 (**Confirmatory Item 19-15**)
 - Assumed LRF \leq CDF
- Key Compensatory Measures



Chapter 19 - Response to Severe Accident Policy Statement

- **Closure of Open Item 19-8 (RAI 19-3)**
- RAI 19-3 – concerning startup and shutdown operations when the containment would not be inerted.
 - Hydrogen combustion during severe accidents
 - Impacts on LRF and CCFP from low-power and shutdown scenarios.
- RAI 19.01-31 (Open Item 19-9) related to the shared fire water system.
 - Description of the dominant sequences contributing to the shutdown and full power hurricane CDF and LRF estimates.
- The staff concluded the hydrogen recombiners would be ineffective for low power and shutdown severe accidents with the containment de-inerted. Staff does not assume that the risk associated with these conditions is very low since a shutdown Level 1 and Level 2 PRA was not performed for ABWR design certification.
- Because Open Item 19-9 is now resolved , Open Item 19-8 is also resolved.



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- **Closure of Open Item 19-5 (RAI 19-05)**
- Open Item 19-5: Information in Section 19.9.14 is insufficient to establish the technical basis for developing accident management procedures:
 - Must address consequences of flooding the lower drywell (LDW)
 - Confirmatory assessment indicates that LDW temperatures may exceed 533 °K before vessel breach
 - The accident management strategies may have to consider the consequences of premature LDW flooding, including steam explosions
- The staff concluded that the existing containment flood guideline in the BWROG's EPGs and SAGs will be revised as necessary to consider actions to address flooding the lower drywell, including ex-vessel steam explosions and the need to continue to provide water to the suppression pool in a controlled manner until AC power is restored.
- Since meeting commitment COM 19.9-30 would address these concerns, the staff considers that Open Item 19-5 is resolved.



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- **Closure of Open Item 19-13 (RAIs 19-1 & 19-28)**
- Open Item 19-13
 - The LDW fusible plugs will melt at a temperature of 533 °K (500 °F), after molten core debris enters the lower drywell
 - Valves would remain open to allow water to flow through each floodler pipe into the LDW and cover the core debris
 - Debris coolability by an overlying water pool has not yet been conclusively demonstrated
 - Staff concern that the containment liner failure may not be averted for 24 hours after core damage. Staff performed a confirmatory assessment using the MELCOR 1.8.6 and MAAP 4.0.7 computer codes



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- **Closure of Open Item 19-13 (continued)**
- Confirmatory assessment confirmed that liner failure would be averted for 24 hours after core damage. Could not be averted for more than 3 or 4 days unless more water was added to the containment.
 - Adding water within two days after core damage would minimize fission product releases.
- Use of the ACIWA system to provide firewater to the suppression pool, preferably via the drywell sprays is the best option.
- The staff concluded that adding this action to the BWROG RPV and Containment Flooding SAG, as applied to the ABWR, as part of meeting COM 19.9-30, resolves Open Item 19-13.



Chapter 19 Seismic Margins Analysis

- **Open Item 19-14 (RAIs 19-24 & 19-33)**
- STD DEP T1 2.15-1 reclassified Radwaste Building from Seismic Category I to Non-Seismic per Reg Guide 1.143
 - RAI 19-33 - requested details on the analysis procedures used for II/I analysis.
 - FSAR Sec 3H.3 was revised to show that the RWB be designed not to collapse on adjacent Seismic Category I structures for SSE, DBT and DBF specified in DCD.
 - Stability against sliding and overturning evaluated using site-specific loading parameters.
- STP RAI response was accepted and the Open Item was closed.



Chapter 19 Seismic Margins Analysis

- **Open Item 19-17(RAI 19-27)**
- STP COL license information item 19-4 to include an update of the system model developed in the DCD to incorporate capacity reductions due to site-specific effects and site-specific SSC.
 - STP committed to perform the following prior to fuel load:
 - Site specific and as-built HCLPF capacities
 - Assess margins against soil failures (e.g., liquefaction)
 - Update the systems model for site-specific capacities of SSCs to obtain sequence-level and plant-level seismic HCLPF capacity.
- STP response was accepted and the Open Item was closed.



Chapter 19 Seismic Margins Analysis

Open Item 19-16 (RAI 19-22) AC-Independent Water Addition (ACIWA) Building Capacity (COL Information Item 19.19b)

- RAI requested more detailed information on approach, methods of analysis and seismic structural analysis.
- Fire Water Pump House is not a safety-related structure
- The staff finds the procedures for assessing against site-specific external events in PRA (i.e., earthquake, flooding, tornado and hurricane) to be acceptable.
- STP response was accepted and the Open Item was closed.



Chapter 19 Loss of Large Areas of the Plant Due to Explosions or Fires

50.54 hh (2)

- Submitted May 2009 under 52.80
- RAIs October 2010-February 2011
- Confirmatory Items
- Commitments
- License condition related to implementation schedule and maintain strategies
- Staff find strategies and commitments acceptable



Chapter 19

Loss of Large Areas of the Plant Due to Explosions or Fires(Cont.)

50.54 hh (2) (i)

- **Fire fighting**
 - On site capabilities
 - Off site resources with MOUs
 - Communications
 - Fire Protection yard main backup supply

50.54 hh (2) (ii)

- **Mitigate fuel damage**
 - Portable pump (1000GPM) for SFP and RPV
 - SFP configuration
 - EDGMs
 - Makeup sources
 - Manual operation



Chapter 19

Loss of Large Areas of the Plant Due to Explosions or Fires (Cont.)

50.54 hh (2) (iii)

- **Minimize radiation release**
 - Vent (active and passive means) to stack
 - Sprays for scrubbing using portable pump
 - Injection to drywell and wetwell



Chapter 19 - Response to Severe Accident Policy Statement

- **Conclusions**
- All Chapter 19 open items are closed.
- With the exception of the confirmatory items, the applicant has addressed the required information relating to Response to Severe Accident Policy Statement and Loss of Large Areas of the plant due to Explosions or Fires.
- With the exception of the confirmatory items, the staff concludes that STP FSAR Chapter 19 is acceptable and conforms to regulatory requirements.



Chapter 19 - Response to Severe Accident Policy Statement

- **List of Risk-Significant SSCs**
- Staff's review of STP FSAR, Appendix 19K (i.e., list of risk-significant SSCs), will be discussed under Chapter 17 (**Confirmatory Item 17.04-9**)



Chapter 19 - Response to Severe Accident Policy Statement

Questions/Comments