

# Oconee Nuclear Station

Standby Shutdown Facility (SSF)  
Flood Barrier Breach Violation  
SDP Assessment



# Nature of Violation/Performance Deficiency and SDP

- Open penetration access cover in the SSF exterior wall for approximately 2 years.
- No evaluation done by licensee.
  - Licensee required to do 10CFR50.65(a)(4) or 10CFR50.59 assessment whenever a barrier is breached as per RIS-2001-09, Control of Hazard Barriers.
- Opening below 5-ft max. flood height identified by licensee in IPTEE.
- Susceptible to site flooding from rupture of Jocassee Dam 11-miles upriver.
- Licensee commissioned study from FERC concluded that floods can exceed 12-feet.
  - Licensee claimed that FERC study was conservative.
  - Despite that, licensee used the 5-ft height for IPTEE with a split fraction of 20% to account for floods exceeding that value.

# **Nature of Violation/Performance Deficiency and SDP**

- Region II SRA performed analysis based on information from the licensee and apportioned flood height based on split fractions to arrive at a quantitative WHITE finding.



# SDP Results

Jocassee Dam Failure Mode	Increase in CDF (per Reactor-Year)
Random	$1.84 \times 10^{-6}$
Seismic	$1.44 \times 10^{-6}$
Total	$3.28 \times 10^{-6}$



# Summary Timeline

- SERP meeting of August 17, 2006 assessed as preliminary WHITE with choice letter sent to licensee.
- Licensee waived regulatory conference.
- Final significance determination of WHITE sent to licensee on November 22, 2006 based on quantitative CDF and qualitative erosion of defense-in-depth.
- Licensee appealed the final significance determination on December 20, 2006 based on un-docketed and unreleased contractor information.
- Appeal panel convened on January 9, 2007.
- Licensee contractor seismic fragility analysis of Jocassee issued January 29, 2007.
- Appeal panel recommendations issued on February 22, 2007.
- Region II office issued the final determination of WHITE on March 1, 2007.
- Licensee issued further appeal on May 3, 2007.
- Seismic fragility analysis was evaluated with follow up telecom to licensee on June 28, 2007.
- Licensee response to analysis questions by email on July 17, 2007.



# Jocassee Dam Random Failure

- Licensee computed random failure frequency based on operating industry history of failures for rockfill dams of over 50-ft in height
- Discrepancy exists on counting the denominator of total operating dam-years.
  - Licensee lumped operating years of other dam types but, did not count their corresponding failures in the numerator.
- Random frequency could be higher which might offset any uncertainty in the resultant flood height difference between the bottom of the opening and the 5-ft height of the wall.
- Resultant  $\Delta$ CDF could range from WHITE to RED in severity.



# Risk-informed Regulation and Defense in Depth

- Used as a way to account for uncertainties in equipment and human performance.
- The independence of barriers have been degraded.
- Licensee has an exclusive reliance upon the SSF to prevent core damage without redundancy or diversity of mitigation.
  - Any functional degradation of the SSF flood barrier from these initiating events directly increased the failure probability of the SSF and therefore, increased the likelihood of core damage.
- Using a blended qualitative and quantitative perspective, the NRC's final Significance Determination remains low to moderate (White)".



# Alternate Appeal Panel Evaluation

- Seismic fragility review did not endorse licensee's conclusions completely but felt that the frequencies were sufficiently "low". Therefore, only random dam failures were considered.
- Epistemic uncertainty in Jocassee rupture frequency
  - Licensee and NRC cannot resolve resultant flood height fractions resulting from below opening to 5-ft.
- Assume that mean dam rupture frequency producing a 4.71-ft flood identical to a mean frequency producing a 5-ft flood.
- Using licensee's minimal IPFEE SSF failure cutsets results in  $\Delta CDF$  of  $8.22 \times 10^{-6}$  per year.

