Oconee SSF Flood Barrier Breach SDP – Lessons Learned

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Objectives

- Purpose
  - To inform the ET and LT of the lessons learned from the disposition of the Oconee Standby Shutdown Facility (SSF) wall SDP finding.
- Measure for Success
  - ET and LT members understand safety and security issues of this finding.
  - ET and LT members understanding of the continuous improvement of the SDP appeal process.

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Discussion Topics

- Background of finding.
- Technical lessons learned.
- Process lessons learned.
- Actions taken.
- Considered future actions.

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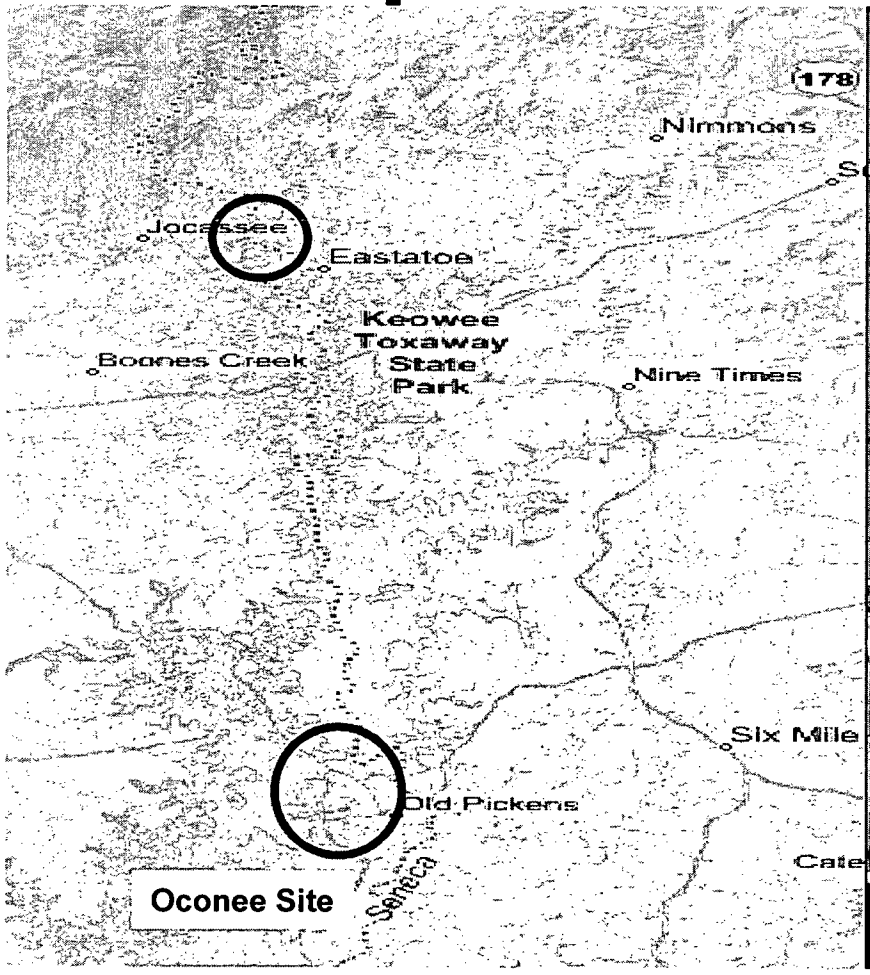
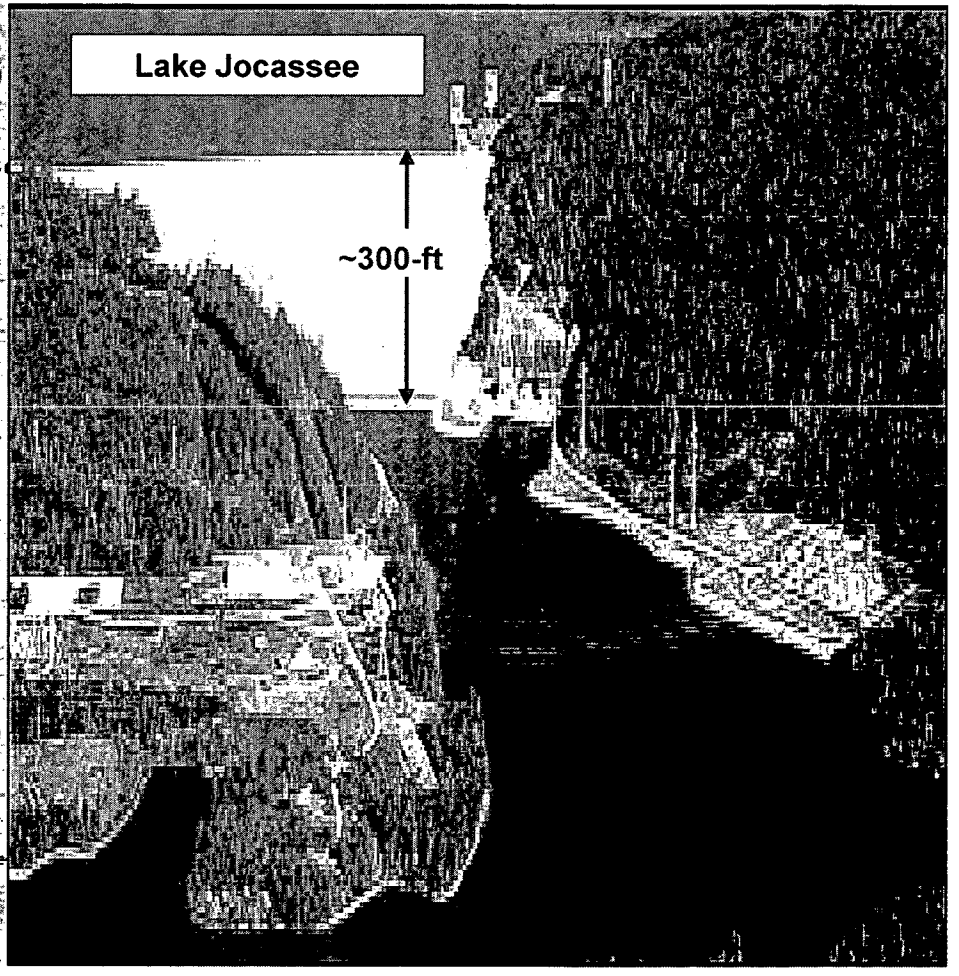
The Flood Scenario
Rupture of Jocassee Dam





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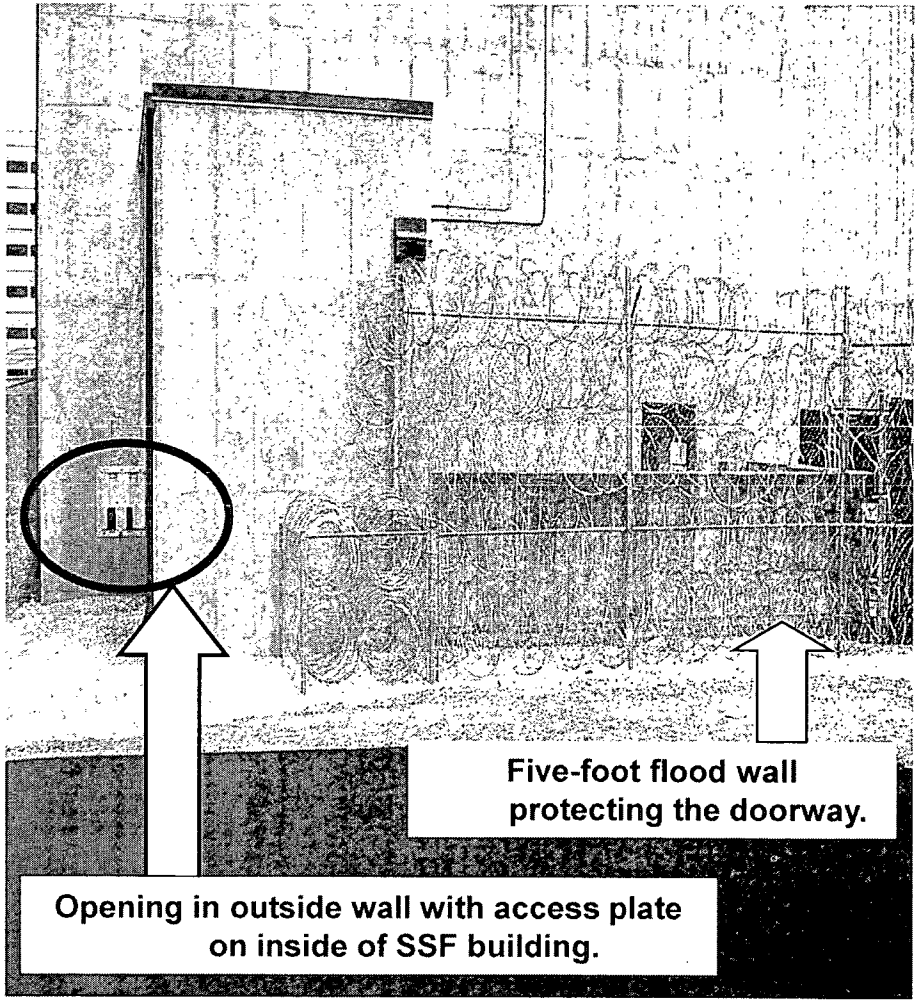
The Flood Barrier Finding



- Licensee opened an access cover uncovering a previously cut hole in the wall on August 13, 2003.
  - Should have done a 10CFR50.65 (a)(4) assessment immediately.
  - Should have done a 10CFR50.59 evaluation after 90 days.
- Licensee opportunities to identify issue
  - June 2, 2005 NRC inspectors notified the licensee of condition. Licensee issued PIP (condition report in their corrective action system). Corrective action not taken.
  - August 3, 2005 NRC inspectors questioned lack of corrective action and licensee issued a further PIP.
- Opening sealed on August 3, 2005.

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Background

- August 17, 2006 - SERP meeting assessed as preliminary WHITE based on a blended qualitative and quantitative risk-informed approach (pre-IMC 0609 App M).
- August 31, 2006 - Choice letter sent to licensee.
- October 5, 2006 – Licensee provided written response to choice letter and waived regulatory conference.
- Nov. 22, 2006 - Final significance determination issued. WHITE based on qualitative erosion of defense-in-depth, but includes quantitative CDF based on apportioning flood frequency to flood height.
- December 20, 2006 - Licensee appeals the final significance determination. Requests NRC to accept incomplete, un-docketed new information.
- March 1, 2007 – Appeal panel upholds WHITE finding.
- May 3, 2007 – Licensee requests reassessment of final significance determination.
- June, 2007 – Assembled a team to review new information. Flooding expert review of data on random dam failure.
- June 28, 2007 - Follow up telecom with Licensee on dam failure questions and comments.
- July 17, 2007 - Licensee response to analysis questions by email.
- October, 2007 - Final Determination Letter pending.

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Jocassee Dam Random Failure Frequency

- Licensee developed random dam failure frequency for IPEEE submittal based on rockfill dam failures per population of earthen, rockfill, and composite dams.
  - Severely underestimated frequency by an order of magnitude at 1.4E-5 per year.
- As part of the second appeal, DRA/APOB investigated the derivation of this frequency.
  - Found that 2 failures in 14,425 dam-years was more appropriate for Jocassee which yielded a frequency of **1.8×10^{-4} per year** 90% credible interval of [6.5×10^{-5}/yr, 3.4×10^{-4}/yr]

Technical Lessons Learned
Investigation of Dam Failure Frequencies

http://crunch.tec.army.mil/nid/webpages/nid.cfm
http://npdp.stanford.edu/index.html

	Failures	Dam-years	Mean
All Arch Dams	2	9101	2.1E-04
All Buttress Dams	2	9819	1.9E-04
All Concrete Dams	10	110227	9.3E-05
All Earth Dams	366	2240403	1.6E-04
All Gravity Dams	28	122798	2.3E-04
All Masonry Dams	5	21692	2.2E-04
All Multi-Arch Dams	0	240	1.5E-04
All Rockfill Dams	7	55872	1.3E-04
All Stone Dams	2	11365	1.7E-04
All Timber Crib Dams	3	6536	3.6E-04
Total	425	2605987	1.6E-04

	Failures	Dam-years	Mean
Buttress Dams Over 50 Feet	0	1876	2.0E-04
Arch Dams Over 50 Feet	2	5667	2.8E-04
Concrete Dams Over 50 Feet	0	19215	8.2E-05
Earth Dams Over 50 Feet	56	144810	3.8E-04
Gravity Dams Over 50 Feet	7	19542	3.2E-04
Masonry Dams Over 50 Feet	0	1987	2.0E-04
Multi-Arch Dams Over 50 Feet	0	77	2.4E-04
Rockfill Dams Over 50 feet	4	19900	2.1E-04
Total	69	213184	2.4E-04

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Licensee Evaluations

- Only two IPEEEs addressed dam failure floods quantitatively – Ft Calhoun and Diablo Canyon. Everyone else only addressed probable maximum precipitation and screened out dam failure as low probability.
- Unfortunately, there were few dam failure data sources around back then, so many plants used the estimate published in NUREG/CR-5042. The data source for the estimate in NUREG/CR-5042 was the Oconee PRA - NSAC/60. The estimate of 2.5E-05/dam-year in NSAC/60 was done in error by an order of magnitude and it propagated throughout the industry.
- **References**:
  - NUREG/CR-5042, "Evaluation of External Hazards to Nuclear Power Plants in the United States.
  - NSAC/60, "Oconee PRA"

Process Lessons Learned

- Process did not account for situations where licensee did not communicate to the regional office and waived participation in a regulatory conference.
- Process did not accept new information prior to final determination.
- Without a regulatory conference, communication was impacte to program office and regional management of potential greater-than-green SDP findings.

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Actions Taken

- IMC0609 in draft revision to account for:
  - Licensees may present new information provided that they informed the agency either during a regulatory conference or in writing before the final significance determination is made.
  - New information has to be submitted within the 30-day appeal period.
  - Using best available information to determine final significance in a timely manner.
  - NRR concurrence with regional management on accepting an appeal.

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Actions Taken (cont'd)

- Training conducted to regional Senior Reactor Analysts (SRAs) in recent counterparts meeting.
- Met with NSIR to inform DHS on potential dam and other outside infrastructure vulnerability.

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Considered Future Actions

- NRR Program Office Director and/or Deputy Director should be informed of all greater-than-green findings.
- Exploration of licensing and potential backfit requirement for protection against most likely flood.
- Generic communication to licensees on flooding.

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