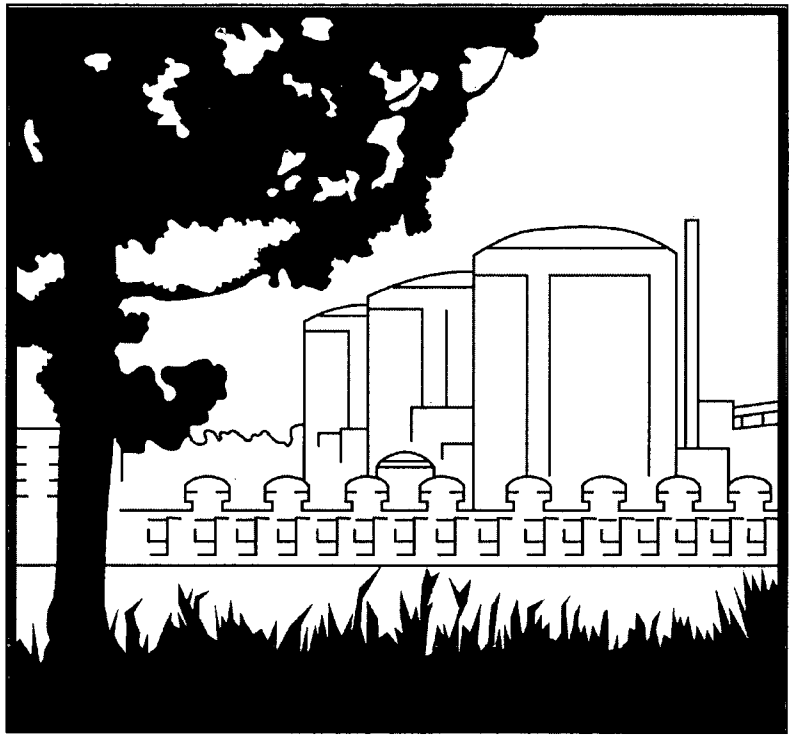
Duke Energy SM



Duke Energy
Oconee Nuclear Station
Tornado/HELB Mitigation
Strategies Meeting

NRR Offices
Rockville, MD
March 5, 2007
10:00 a.m. – 4:00 p.m.

Duke Energy SM

Duke Attendees

- Larry Nicholson
- Rich Freudenberger
- George McAninch
- Jeff Robertson
- Tim Brown
- Allen Park
- Lee Kanipe
- Jim Sumpter

Duke Energy SM

Agenda

- Opening Remarks
- Meeting Objectives
- Tornado
- Lunch Break
- HELB
- Next Steps
- Closing Remarks

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Resolution Categories

1. Common Understanding - No further action required

2. Common Understanding - Additional information/detail to be provided in a LAR

3. Common Understanding - Additional information/detail to be provided in a Supplement to the 11/30/06 Letter

4. Open Item

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
C1	**Design Considerations for PSW/HPI** a. "...the commitment should specify that the PSW/HPI and related switchgear modifications will satisfy safety-related, seismic Category 1 criteria, and will be controlled and maintained in accordance with 10 CFR 50, Appendix B criteria." "The 'PSW System would be designed and constructed to meet Duke's standards for a safety-related system (QA-1).' Why isn't this characterized as a commitment (see Page 10 of Attachment 3, "Regulatory Commitment Table," fifth bullet)?" "While the licensee seems to suggest that the PSW/HPI system will be installed as safety-related, seismic Category 1, and will be controlled in accordance with 10 CFR 50 Appendix B requirements, this needs to be clearly stated to assure that there is no misunderstanding." b. "Why aren't PSW/HPI design criteria and time critical actions included similar to HELB commitments that were made?" "...why aren't these PSW/HPI design considerations reflected in the tornado commitments?"	a. The intent was to include the PSW/HPI System and the East Penetration Room flood prevention modifications to be designed and constructed to meet Duke's standards for a safety-related system (QA-1) per the Duke Quality Assurance Program Topical Report and described as such on the LAR. b. This was simply an attempt to reduce duplication within the letter.	a. Common Understanding – No Further Action Required b. Common Understanding – No Further Action Required
C2	**GL 91-18 Actions** a. "While HELB and tornado mitigation strategies are being implemented, any future issues that are identified as a result of these activities will be entered into Oconee Nuclear Station (ONS) corrective action program - no mention of GL 91-18 actions to address issues of this nature, or other actions that will be taken to assure that NRC requirements are satisfied."	a. The Duke Corrective Action Program requires items entered into the corrective action program to be evaluated for applicability of Operability and actions needed to address compliance with NRC requirements (NRC Inspection Manual Part 9900).	a. Common Understanding – No Further Action Required
C3	**SSF Risk Reduction Effort** **a.** "In parallel with this, a risk reduction effort has been initiated that is intended to improve the reliability and availability of the standby shutdown facility (SSF) - there was no mention of a commitment or follow up with the NRC for this item."	a. The SSF risk reduction effort was initiated in 2005 in order to improve the reliability and availability of the SSF independent of resolution of tornado and HELB licensing basis issues.	a. Common Understanding – No Further Action Required

	NRC ISSUE	DUKE COMMENTS	Resolutions
T1	**USE OF TORMIS** a. "Page 2, second paragraph: Any differences in the design of Units 2 and 3 that could compromise the proposed tornado mitigation strategy that is based on Unit 1 design considerations need to be specifically identified and addressed." b. "The use of TORMIS must be requested in a LAR, and the TORMIS analysis should be applied to all SSCs that can adversely impact the tornado mitigation strategy, not just those SSCs that perform the functions that support the updated tornado mitigation strategy. For example, if a tornado missile ruptures an ammonia tank in the vicinity of the ADVs making it impossible to access the ADVs, then the ammonia tank would have to be included in the TORMIS analysis. Another example: if tornado missiles cause a structural failure of the TB that impacts the tornado mitigation strategy (such as by causing a failure of MS or other high energy piping), this would have to be included." c. "Pages 3/4, second bullet: The TORMIS analysis should be applied to all structures, systems, and components (SSCs) that can adversely impact the tornado mitigation strategy, not just those SSCs that perform the functions that support the updated tornado mitigation strategy. For example, if a tornado missile ruptures an ammonia tank in the vicinity of the ADVs making it impossible to access the ADVs, then the ammonia tank would have to be included in the TORMIS analysis. Another example: if tornado missiles cause a structural failure of the turbine building (TB) that results in a failure of main steam (MS) or other high energy piping that can compromise the tornado mitigation strategy, this would have to be included." d. "Second bullet: the use of TORMIS for must be requested in a LAR and the TORMIS analysis should be applied to all SSCs (safety and non-safety related) that can adversely impact the tornado mitigation strategy, not just those SSCs that perform the functions that support the updated tornado mitigation strategy (a complete listing of SSCs included in the TORMIS analysis is required). The NRC staff will allow the use of TORMIS provided it is consistent with what has been approved for use by other licensees. Any exceptions to the approved methodology, including modeling or analyses that are not included within the scope of TORMIS, will not be approved unless adequately justified." e. "Page 10, Section 5.2: *The TORMIS analysis must include all SSCs that can adversely impact the tornado mitigation strategy, not just those SSCs that perform the functions that support the updated tornado mitigation strategy, and "significant damage" would apply to all of these SSCs (e.g., damage to SSCs that can result in a main steam line failure and excessive cooldown; damage to SSCs that can prevent operators from taking required actions). *The proposed use of TORMIS must be requested and justified via an LAR; the previous approval does not apply to the current situation. *The TORMIS LAR will have to address anything that is beyond the scope of TORMIS approval, such as modeling considerations and damage assessment of specific SSCs (to the extent that this is utilized)." f. "Issue No. 1, "Use of TORMIS": *The proposed use of TORMIS must be requested and justified via an LAR; the previous approval does not apply to the current situation.* The TORMIS analysis must include all SSCs (safety-related and non-safety related) that can adversely impact the tornado mitigation strategy, not just those SSCs that perform the functions that support the updated tornado mitigation strategy; and "significant damage" would apply to all applicable SSCs in this regard (e.g., damage to SSCs that can result in a	a) All configurations described in the LAR will be validated for all three units prior to transmittal to the NRC. Additionally, the TORMIS analysis is being performed for all three units (although bounding arguments will be applied as possible) and any multi-unit interactions and interdependencies. b-g) Duke will describe how it intends to apply the TORMIS methodology in the LAR. Those components that are not or will not be protected from tornado missiles in accordance with UFSAR Class I or SSF missile criteria, will be evaluated with TORMIS. Attachment 2 of the Nov 30, 2006 letter describes the SSCs that are not designed to UFSAR missile criteria and the degree to which these SSCs are vulnerable. Attachment 2, Section 5.2 of the letter indicates that, in general, the analysis will collectively assess the ability of the SSF and PSW/HPI systems to meet the TORMIS acceptance criteria with respect to three functions 1) Secondary Side Decay Heat Removal 2) Reactor Coolant Pump Seal Injection and 3) Integrity of the Reactor Coolant System Pressure Boundary. The use of TORMIS was previously approved by the NRC for resolution of the secondary side decay heat removal GL-4 issue at ONS. The previously approved analysis is being extended to the reactor coolant pump seal injection and reactor coolant pressure boundary functions. There was no previous requirement to address the latter functions. However, TORMIS is being extended to these functions to add clarity and consistency to the LB. The analysis will be consistent with the five conditions (with the exception of the modified F-Scale) outlined in the SER's generic approval of the EPRI TORMIS methodology (dated Oct 28, 1983). An evaluation of secondary effects was not previously required for the resolution of the GL-4 issue or the IPEEE (see March 15, 2000 TER). Nonetheless, per Section 5.2 of Attachment 2 of the Nov 30, 2006 letter, ONS has committed to evaluating secondary effects in accordance with engineering judgment. Credit will be taken for activation of emergency response organizations and the assessment of plant conditions for any additional actions not specifically delineated in emergency operating procedures. As a general note, the Turbine Building contains approximately 4000 members in each building. As such, extensive damage by tornado missiles is not considered credible. h) TORMIS will be used to determine if any metal shielding will be added to protect SSF cabling leading into and through the CDTR and WPR. It will also be used to address an elevated trench on the north side of the SSF that is protected by a cantilevered section of the SSF facility. i) Initial TORMIS results indicate that the SSF will meet TORMIS acceptance criteria without reliance on PSW/HPI. Otherwise, these areas will be explicitly modeled by TORMIS since they support PSW/HPI operation.	a) Common Understanding, additional information/detail to be provided in a LAR. The LAR will describe configurations for all 3 units. A list of SSCs (including mechanical, electrical and I&C components) that will be addressed by the TORMIS analysis will be included in the LAR. b-g) Common understanding, no further action required. Duke will request the use of TORMIS in the LAR. The LAR will describe the application of the TORMIS methodology at ONS and include a list of tornado missile targets that will be evaluated for primary effects. b-g) New issue Evaluation of secondary effects is a new requirement for ONS. Duke proposed to address secondary effects using a qualitative assessment. h) Common understanding, no further action required. i) Common understanding, no further action required.

	NRC ISSUE	DUKE COMMENTS	Resolutions
	main steam line failure and excessive cooldown; damage to SSCs that can prevent operators from taking required actions).* The TORMIS LAR will have to address anything that is beyond the scope of TORMIS approval, such as modeling considerations (including "secondary effects" modeling) and damage assessment of specific SSCs (to the extent that this is credited). g. "The TORMIS LAR will have to include a detailed listing of all SSCs that are included in the analysis, and address anything that is beyond the scope of the NRC staff's approval of TORMIS, such as modeling considerations and damage assessment of specific SSCs." h. "Commitments 3T and 4T: To what extent is TORMIS being used for this analysis?" i. "Page 9, Section 4: How will SSCs that are located in the cable spread, equipment, and control battery rooms be included within the scope of TORMIS? j. "The Oconee Updated Final Safety Analysis Report (UFSAR) states that the electrical equipment and cable rooms were constructed to UFSAR Class 1 structure tornado wind, differential pressure (DP), and missile criteria. This is a valid part of the plant licensing basis and it is consistent with the Oconee design criteria. The fact that these rooms were not constructed in accordance with the UFSAR description does not necessarily mean that the UFSAR is in error, but this may well be another licensing-basis discrepancy. Therefore, a change to the UFSAR in this regard must be properly evaluated and addressed in accordance with 10 CFR 50.59 requirements." k. Second bullet: the design details specified in the UFSAR that indicates that the electrical equipment and cable rooms were constructed to UFSAR Class 1 structure tornado wind, DP, and missile criteria is considered plant licensing basis and a change to the UFSAR in this regard must be addressed accordingly in accordance with 10 CFR 50.59 requirements." l. Page 9, Section 4: How will tornado missile capability to fail TB operating deck be addressed by the analysis?" m. "Page 3, first paragraph: the use of physical separation or physical barriers to protect one or more of the systems is not entirely accurate in that a TORMIS analysis will also be used." n. "Page 5, Section 1.5: How will the TORMIS analysis evaluate turbine building structural failures that are sufficient to cause MS pipe or other high energy pipe failures, thereby compromising the tornado mitigation strategy?" o. "Page 8, Section 3: what part of the CCW piping is not protected from tornado missiles, and is it being evaluated by TORMIS?" p. "Vulnerable CCW piping should be included in the TORMIS analysis." q. "Station modifications that provide reinforcement of an expansive portion of key structures to better withstand the effects of tornados - use of fiber reinforced polymer. What structures will be protected?" r. "Commitment 5T: How will a tornado missile strike that compromises the fiber reinforced polymer be addressed in the TORMIS analysis?" s. Page 5, Section 1.6: Is existing plant vital I&C power tornado protected; and are power sources for PSW/HPI vulnerable to tornado effects?"	j-k) In a September 15, 1986 letter, Duke stated that TORMIS analysis demonstrated that missile damage probability to all EFW and SSF ASW is less than the mean failure probability of 1E-6/rx-yr. The letter summarized the results of analyses assuming use of Station ASW. In the letter, Duke specifically noted that the Station ASW response time is 40 minutes, that the pressurizer safety valves (PSVs) will cycle to relieve pressure at 7 minutes and that the pressurizer will go water solid at 16 minutes. Additionally, the letter stated that "In light of the PRA result that the likelihood of EFW system failure due to tornado is very small, significant reliance on the Station ASW pump should not be considered necessary." Later, in a SER dated July 28, 1989, the NRC closed out the secondary side decay heat removal GL-4 issue. In the cover letter, the NRC stated that, "....the undamaged EFW system in one unit can supply feedwater to the steam generators in a unit with damaged EFW system cross-connections in the pump discharge piping." The cover letter concludes that, "Based on review of your probabilistic analysis, the staff concludes that the Oconee secondary side heat removal capability complies with the criterion for protection against tornadoes, and is therefore acceptable. This conclusion is primarily based on the availability of the SSF ASW system." For the purpose of tornado mitigation, the equipment and cable spread rooms support EFW and Station ASW. CLB depends on EFW from the unaffected unit but does not depend on Station ASW per the SER dated July 28, 1989 that resolved the secondary side decay heat removal GL-4 issue. The unaffected unit is not adversely impacted by the tornado. This will be addressed in accordance with 50.59 requirements. l) Given the construction and configuration of the Turbine Building operating deck, failure of the deck due to missiles is not considered credible. m) The discussion related to physical separation is included in the Nov 30 2006 letter to demonstrate why the addition of the PSW/HPI system reduces risk relative to tornado missile damage in a subjective manner. n) See Item l o-p) A limited amount of CCW piping in the basement of the Turbine Building is not protected from tornado missiles. An evaluation will be performed to demonstrate that failure of this piping is not credible. q) The WPR and CDTR walls will be upgraded via FRP. r) The FRP is being added as an enhancement for tornado wind and DP. It is not being credited for missile protection.	j-k) Common Understanding, additional information/detail to be provided in a LAR. l,n) Common Understanding, additional information/detail to be provided in a LAR. The LAR will include an evaluation for the Turbine Building Structure and Operating Deck for damage due to tornado missiles that could significantly impact the tornado mitigation strategy. m) Common Understanding, no further action required. o-p) Common Understanding, additional information/detail to be provided in a LAR. q) Common Understanding, no further action required. r) New issue.

	NRC ISSUE	DUKE COMMENTS	Resolutions
		s) The new switchgear for PSW/HPI will be enclosed in a tornado protected enclosure. There is a limited vulnerability to tornado missiles in the equipment, control battery and cable spread rooms. The rooms are largely protected by adjacent structures. The SSF vital I&C are fully protected in the SSF facility and provide redundancy to the PSW/HPI system. In general, PSW/HPI instrumentation enters containment through the EPR and SSF enters containment through the WPR. Exceptions relate to PSW to the SG through the WPR (however, this only provides backup to the other PSW train in the EPR and SSF ASW in the WPR).	s) Common Understanding, no further action required.
T2	**COLD SHUTDOWN** a. The PSW/HPI capability is the only means that can be relied upon for tornado and HELB mitigation beyond 72-hours, and it is the only means available for cooling down the Oconee units." b. "Fifth bullet: the licensing basis specifies the capability to place the Oconee units in cold shutdown condition and therefore, the licensee must be clear on what is being credited within the plant licensing basis in this regard such that the capability to achieve cold shutdown is assured." c. "Issue No. 2, "Cold Shutdown" * The plant licensing basis for both tornado and HELB includes the capability to achieve and maintain cold shutdown conditions. In the case of tornado, the station ASW system is credited for being able to maintain SSD for at least 30 days and the same capability should be provided by the PSW/HPI system. The submittal needs to explain how this capability will be assured, especially with respect to TS requirements. d. "Issue No. 2, "Cold Shutdown":** The licensing basis includes the capability to place the plant in cold shutdown and the mitigation strategy does not adequately address how this capability is assured relative to the extent of damage that can be experienced, recognizing that: a) it is critical to recover PSW/HPI within the 72-hour mission time of the SSF, and b) an assured source of cooling water that is good for at least 30-days is needed for the three Oconee units at the onset of tornado and HELB events." e. "Page 2, fourth paragraph: The manual alignment of the spent fuel pool (SFP) to HPI is a change to the original licensing basis that was not submitted for NRC review and approval." f. "Third bullet: the spent fuel pool (SFP) to the HPI pump flow path that was	a-d) ONS can find no evidence within the UFSAR or licensing correspondence with the NRC that would indicate that ONS has committed to achieve cold shutdown within specific time for tornado mitigation. Although the UFSAR does indicate that ONS has over 30 days of secondary heat removal inventory, it does not indicate that the SSF or other systems are capable of sustaining secondary heat removal without reliance on additional actions. The SSF mission time, for instance, is 72 hours in accordance with the SSF SER date April 28, 1983 and the GL-4 issue SER dated July 28, 1989. As indicated in Attachment 1, Commitment 7T, 5th bullet, ONS will enhance existing damage repair guidelines to extend the 72 hour safe shutdown capability of the SSF and to establish cold shutdown conditions. This enhanced capability will not be part of the LB. e-f) The SFP-HPI flow path will be removed by the LAR.	a-d) Common understanding, additional information/detail to be provided in LAR. Specific aspects of the damage repair guidelines to extend the 72 hour safe shutdown capability of the SSF and to establish cold shutdown conditions will be described in the LAR. e-f) Common understanding, no further action required.

	NRC ISSUE	DUKE COMMENTS	Resolutions
	established by Duke after initial licensing of the Oconee units was not submitted for NRC review and approval."		
T3	**TECHNICAL SPECIFICATIONS** a. TS requirements that assure the operability and availability of structures, systems and components (SSCs) that are relied upon for the tornado and HELB mitigation strategies must be established, such as for the standby shutdown facility (SSF), the PSW/HPI system, the Unit 2 condenser circulating water (CCW) system, and for reactor coolant system leakage. b. "No mention of establishing a Technical Specification (TS) requirement pursuant to 10 CFR 50.36 even though the licensee recognizes that the PSW/HPI modifications will "significantly" improve overall plant risk." c. "Tornado and HELB events at Oconee represent at least the same level of risk as associated with design basis accidents (DBAs)." d. "The licensee proposes to rely upon the PSW/HPI system in conjunction with the SSF for tornado and HELB mitigation, and the licensee's TORMIS analysis is predicated on this. Therefore, TS requirements should be established not only to assure the operability of the PSW/HPI system, but also to assure that both the SSF and PSW/HPI systems are not both rendered inoperable at the same time." e. "The existing TS AOT must be reconsidered accordingly recognizing the new tornado and HELB mitigation functions." f. Operability of the water inventory for the SSF and PSW/HPI must be addressed. The current SSF TS in this regard was based on the availability of other systems such as EFW for performing the SSDHR function, which is not valid for the proposed tornado and TB HELB mitigation strategies. Furthermore, both the SSF and the PSW/HPI systems rely upon the same water supply and the licensee has not addressed how the water supply will be assured for both tornado and HELB mitigation." g. "First bullet: licensing basis clarity should be reflected in the Updated Final Safety Analysis Report (UFSAR), and TS requirements should be established in accordance with 10 CFR 50.36 requirements." h. "Issue No. 3, "Technical Specifications" A TS is required for the PSW/HPI system in accordance with 10 CFR 50.36(c)(2)(ii)(D). As stated on Page 3 of the November 30, 2006, submittal, Duke indicated that "the installation of a new PSW system and HPI system improvements will reduce reliance on the SSF by providing a system capable of independently establishing safe shutdown conditions, and thereby significantly improve overall plant risk." TS requirements were required for the SSF to assure its SSDHR function (even though other sources of SSDHR were considered to be available). The risk significance of the PSW/HPI system is on the same order of magnitude as the SSF and in this case, other sources of SSDHR may not be available."	a-l) See HELB, Issue H10	a-l) See HELB, Issue H10

	NRC ISSUE	DUKE COMMENTS	Resolutions
	i. "Page 3, first bullet: Relative to the capability to power the submersible pump by the PSW switchgear, what TS operability and surveillance requirements are appropriate?" j. "How is capability of submersible pump (powered by either SSF or PSW/HPI) assured by TS requirements?" k. "Page 3, first bullet: SSF and PSW will both use the Unit 2 condenser circulating water (CCW) inlet piping as a water source. How will availability of this water source be assured? The current SSF TS requirements did not include consideration of the proposed mitigation strategy and the current 45 day allowed outage time (AOT) for the Unit 2 CCW inlet is of concern. This needs to be reconsidered since the basis for the 45 day AOT is no longer valid, and the AOT should be limited based on tornado and HELB considerations recognizing that there are not other sources of water." l. How is water supply from the Unit 2 CCW assured to be available?		
T4	**REACTOR COOLANT LETDOWN LINE** a. "It is the NRC staff's position that the plant licensing basis for postulated failures of the letdown line includes consideration of single active failures, and postulated failures of the letdown lines for the Oconee units must be addressed accordingly."	a) Section 5.2 of Attachment 2 of the Nov 30, 2006 letter indicates that TORMIS will be used to evaluate the integrity of the reactor coolant system pressure boundary.	a) Common Understanding, no further action required.
T5	**OPERATOR ACTIONS** a. "In order for the SSF to be credited, operators would have to be dispatched to the SSF during a tornado watch, not during a tornado warning as proposed. Once a tornado watch has been declared, the only question that remains is whether or not the tornado will touch down at Oconee or someplace else. If this is the one that hits Oconee, the SSF would not be accessible and it would be too late at this point to man the SSF until the tornado has passed." b. "Page 3, Section 1.2: Operators should be dispatched to the SSF during a tornado watch. A tornado warning means that the tornado has already touched down and it would be too late at this point to man the SSF if this turns out to be the tornado that hits the Oconee site. c. "Page 13, Section 7: The SSF should be manned upon declaration of a tornado watch. A tornado warning means that the tornado has already touched down and it would be too late at this point to man the SSF if this turns out to be the tornado that hits the Oconee site." d. "Why aren't PSW/HPI design criteria and time critical actions included similar to HELB commitments that were made?"	a-c) Response provided at Region II Pre-Decisional Conference Related to Unit 3 Control Room North Wall. Duke developed an event tree analysis to evaluate affects of tornado warning time. The ONS natural disaster procedure dispatches operators to the SSF upon receipt of tornado warning notification. The average response time is 3.6 minutes and the average travel time to SSF is 4 minutes. Based on National Weather Service (NWS) data, average tornado warning time is 13 minutes. Oconee believes there is minimal impact on overall SSF reliability. Note: Tornado warnings include identification via Doppler Radar. d) No comment.	a-c) New Issue. The average warning time subsequent to issuance of a tornado warning and the average operator response time required to man the SSF subsequent to a tornado warning will be described in the LAR. d) Common understanding, additional information/detail to be provided in LAR.
T6	**MSRV CYCLING** a. "Page 3, Section 1.2: The discussion indicates that steam pressure may be	a-c) See response to questions under HELB Issue H21.	See HELB Issue H21.

	NRC ISSUE	DUKE COMMENTS	Resolutions
	controlled using the ADVs to limit the number of MSRV cycles. What number of MSRV cycles are considered acceptable and why? What assurance is there that the MSRV cycles will be limited accordingly?" b. "What limitations are required relative to reactor coolant system (RCS) leakage when using the MSRVs and atmospheric dump valves (ADVs) for steam generator (SG) pressure control and crediting the SSF, and what changes are necessary to the TS in this regard?" c. "Page 2, Section 1.1: What are the maximum number of cycles the MSRVs will experience and why doesn't one or more MSRV sticking open pose a problem?		
T7	**PSW DESIGN ISSUES** a. "Page 3, Section 1.3: what impact does tornado missile damage to the PSW piping in one penetration room have on the capability of PSW/HPI to perform its functions?" b. "Page 6, Section 2.3: what impact does damage to piping/electrical/I&C in one penetration room have on tornado mitigation capability of PSW/HPI? What is the effect on other units? Similarly for SSF?" c. "Page 8, Section 2.5: is any of the PSW I&C power not tornado protected?" d. "Page 9, Section 5.1: In addition to protecting the SSF and PSW/HPI components "that perform the functions," what about any support equipment that is needed (I&C, ADVs, RCP SI, etc.)?" e. "The installation of a new protected service water (PSW) system with switchgear capable of providing an assured source of electrical power to (among other things) the high pressure injection (HPI) pumps. Contrary to the information that was provided, this PSW/HPI system is not totally independent of the standby shutdown facility because they share the same water source." f. "Indicates that installation of PSW and HPI improvements will reduce reliance on the SSF by providing a system capable of independently establishing safe shutdown conditions, thereby significantly improving overall plant risk - not truly independent due to shared water source and west penetration room (WPR) vulnerabilities." g. "Sixth and seventh bullets: the commitment should specify that the PSW/HPI and related switchgear modifications will satisfy safety-related, seismic Category 1 criteria, and will be controlled and maintained in accordance with 10 CFR 50, Appendix B criteria." h. "Clarifications Required Concerning the Tornado and HELB Mitigation Strategies: *While the licensee seems to suggest that the PSW/HPI system will be installed as safety-related, seismic Category 1, and will be controlled in accordance with 10 CFR 50 Appendix B requirements, this needs to be clearly stated to assure that there is no misunderstanding."	a) The PSW supply to each SG is physically separated by containment. Either supply is adequate for secondary heat removal. SSF ASW also provides defense-in-depth. b) Preliminary TORMIS analysis indicates that SSF meets TORMIS criteria without reliance on PSW/HPI. As such, PSW/HPI provides margin to uncertainties. The description of physical separation provides additional qualitative assurance of the added value of PSW/HPI. c-d) See Item s under Issue T1. e-f) See HELB Issue, H21. g-h) See Common Issue, C1.	a-b) Common Understanding, no further action required. c-d) See Item s under Issue T1. e-f) See HELB Issue, H21. g-h) See Common Issue, C1.

	NRC ISSUE	DUKE COMMENTS	Resolutions
T8	**CONCURRENT DAMAGE TO KHU/STATION SWITCHYARD** a. "Clarifications Required Concerning the Tornado Mitigation Strategy: *In addition to the specific tornado effects that the licensee referred to, the following additional considerations are also applicable: a complete loss of offsite power; and while the tornado is not assumed to cause tornado missile damage to the Keowee Hydro Units (KHU) and the Oconee units concurrently, it is assumed that both KHU and the Oconee units can be exposed to tornado force winds concurrently." b. In addition to the tornado effects that the licensee referred to, the following additional considerations also apply: the tornado effects include a complete loss of offsite power, and while the tornado is not assumed to cause tornado missile damage to KHU and the Oconee units concurrently, it is assumed that KHU is exposed to the tornado-force winds that would exist; and vice-versa for a tornado striking KHU. c. "Page 12, Section 6: The plant licensing basis includes the capability to achieve cold shutdown. The EDGs for other plants provide a 7-day capability to restore offsite power or to establish additional fuel oil inventory. The proposed 72-hour capability is not commensurate with the 7-day capability that is provided by other plants and the extensive damage that can be caused to the electrical distribution network in the vicinity of the Oconee station following a tornado strike at KHU could require well beyond 72-hours to restore a normal source of electrical power. Therefore, in order to assure the capability to maintain safe shutdown conditions and to subsequently achieve cold shutdown, the PSW/HPI mods should also include consideration of a tornado-protected capability to connect a temporary power source within 72-hours that is adequate for powering the PSW/HPI functions. Also note that there is no mention of how SFP makeup and boron addition will be accomplished over an extended period of time." d. "Page 2, first paragraph: In addition to the tornado effects that the licensee referred to, the following additional considerations are also applicable: a complete loss of offsite power; and while the tornado is not assumed to cause tornado missile damage to the Keowee Hydro Units (KHU) and the Oconee units concurrently, it is assumed that KHU is exposed to the tornado-force winds and vice-versa for a tornado striking KHU." e. Page 5, Section 1.6: * The capability to install (via a tornado protected connection) and use temporary power within 72 hours should also be considered since PSW/HPI is relied upon exclusively for maintaining SSD beyond 72-hours and for plant cooldown. f. Page 5, Third Bullet: This is taken out of context; the SSF auxiliary service water (ASW) system was specifically credited for mitigating the tornado that damages KHU with concurrent LOOP. Otherwise, the NRC SE accepted the licensee's analysis that credited station ASW and emergency feedwater (EFW) from the unaffected units." g. "Page 2, third paragraph: The Oconee current licensing basis (CLB) does not rely "extensively" on the SSF. This is only the case for when the tornado strikes KHU resulting in a loss of power to the Oconee station. Otherwise, Station ASW and EFW of the other unaffected units was relied upon in the CLB."	a-e) The original and current UFSAR refers to physically separated power supplies that include KHU and the station switch yard. As an enhancement, an alternate power supply is being installed from the Lee CT 100 KV line to the PSW protected switchgear to further reduce the probability of a loss of power to the PSW/HPI system in the event of a coincident strike of the Station and Keowee. The probability of coincident tornado damage to the Station and Keowee was previously assessed in the ONS IPEEE. See commitment 7T last bullet Attachment 1 and Sections 1.6 and 2.5 of Nov 30, 2006 letter. Cold shutdown aspects discussed under Issue T2. Spent fuel pool makeup is currently addressed by SSF operational procedures. f-h) See Items j-k under Issue T1 Note: In conclusion, from a licensing perspective, the PSW system will replace the EFW system from the unaffected unit. In addition, the tornado event will be conservatively considered a 3 unit versus a single unit event.	a-e) Common understanding, additional information/detail to be provided in LAR. The LAR will include information regarding the Lee CT 100 KV line. See July 12, 2006 NRC letter, Enclosure 2, Item 5. f-h) See Items j-k under Issue T1.

	NRC ISSUE	DUKE COMMENTS	Resolutions
	h. *"Issue No. 2, "Cold Shutdown" : The CLB relies upon SSF for providing secondary side decay heat removal (SSDHR) only when the tornado takes out KHU; otherwise station ASW is relied upon for long-term cooling."		

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H1	**Volumetric Inspections of Piping in lieu of Protection of Equipment** "In Attachment 4 to the November 2006 letter, Duke proposes to use periodic volumetric examinations in lieu of evaluating the effects of pipe rupture at most of the pipe rupture locations in the turbine and auxiliary buildings. The proposed alternative to use periodic volumetric examinations in lieu of pipe rupture evaluation is not part of the criteria contained in the Giambusso letter or the criteria contained in BTP MEB 3-1. BTP MEB 3-1 requires 100% volumetric examination of all welded connections between the containment isolation valves in addition to meeting the stress limits specified in B.1.b of the BTP MEB 3-1. The basis for the BTP MEB 3-1 criteria is to provide a high level of assurance that breaks do not occur in the critical area between the containment isolation valves. BTP MEB 3-1 does not contain a provision for performing periodic volumetric examinations as an alternative to postulating the pipe cracks and ruptures at the locations required by BTP MEB 3-1."	Oconee proposes that for those postulated break or crack locations that have the potential to affect systems and components necessary to reach safe shutdown, including those that could affect the main steam pressure boundary, and those locations that have the potential to affect the turbine building structure, periodic volumetric inspections would be instituted in lieu of providing protection (e.g. pipe whip restraints, jet shields, etc.). While the exact number of inspection locations is uncertain at this time, it is generally believed to be less than 50 locations per unit. More than four thousand break locations per unit have been evaluated, so the characterization of 'most' is inaccurate. Oconee believes that detection and prevention of a postulated break location is superior to providing physical protection. Further, such structural modifications would (1) not provide a risk benefit, (2) would hamper normal plant maintenance activities, and (3) limit inspection access to the very location(s) where the break(s) are postulated. There is some precedent in this area. Another B&W unit, similar to Oconee, has incorporated a similar inspection program into their technical specifications, although not to the scale proposed by Oconee. Finally, the proposed program is a logical extension of the in-service inspection plan, where periodic inspections are used to demonstrate the structural integrity of safety related piping.	
H2	**BTP MEB 3-1 USE** "Revision 2 to BTP MEB 3-1 also contains additional criteria not provided in the Giambusso letter. The staff has repeatedly requested Duke to compare its proposed HELB criteria with the full criteria contained in BTP MEB 3-1 in order for the staff to perform a thorough safety review of the Duke HELB proposal. The November 30, 2006, letter only addresses the criteria from BTP MEB 3-1 which provide relaxations to the Oconee licensing basis HELB criteria." "In order for the staff to perform this licensing amendment review, it will be necessary for Duke to clearly address how its proposed new licensing basis meets all the criteria in BTP MEB 3-1 or provide a basis for any deviations to the criteria. While most of the specific commitments proposed by Duke in the November 30, 2006, letter are considered to be acceptable, the staff does not fully agree with those that relate to the specific issues identified below." "Duke needs to provide a specific justification for each pipe rupture location it plans to deviate from the staff guidance in BTP MEB 3-1."	Oconee's HELB design basis will continue to be the Giambusso/Schwencer letters, as amended by GL 87-11 and our letter dated 11/30/06. Oconee does not plan to adopt MEB 3-1 except as noted below. GL 87-11 notes that "Licensees of operating plants desiring to eliminate previously required effects from arbitrary intermediate pipe ruptures may do so without prior NRC approval, unless such changes conflict with the license or technical specifications." Oconee believes no further justification is needed for the adoption of GL 87-11, beyond that prescribed by the GL. Other facilities have adopted GL 87-11 in a similar fashion. The 11/30/06 letter describes the use of MEB 3-1 on two occasions: (1) For piping that is not analyzed or does not include seismic loadings; intermediate breaks will be postulated as provided in MEB 3-1. This means that breaks will be postulated at all girth weld locations irrespective of the stresses in the pipe. This clearly is not a deviation from Giambusso/Schwencer, which stipulates that a minimum of two breaks per run be postulated. This approach is more conservative than Giambusso/Schwencer. (2) For equivalent Class 2 and 3 piping that is seismically analyzed, critical cracks will be postulated at axial locations where the calculated stress for the applicable load case exceed .4(Sa + Sh). This is a deviation from Giambusso/Schwencer, which stipulates that critical cracks be postulated at the most adverse location independent of stress. However, the 11/30/06 letter justifies this by noting that "Adoption of this provision will allow the station to focus attention to those medium and high stress areas that have a higher potential for leakage cracks to form."	

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H3	**Definition of High Energy System per Footnote 5 of MEB 3-1** "...the Duke letter does not indicate whether its proposal fully satisfies the position in footnote 5 of BTP MEB 3-1, Revision 2. Specifically, footnote 5 states that systems operated during PWR startup, hot standby, or shutdown qualify as high energy systems. Duke needs to clarify that it will satisfy the definition of high energy system contained in footnote 5 of BTP MEB 3-1."	Oconee has no plans to adopt any other portions of MEB 3-1, including footnote 5. As regards footnote 5, Oconee plans to eliminate systems that operate for short periods of time at high energy conditions due to the low probability of a break occurring during high energy operations. We previously communicated that we would provide historical information regarding system operating times in the LAR(s).	Common Understanding - Additional information to be provided in the LAR. (Reference NRC letter dated 7/12/2006, Enclosure 2, Item 18)
H4	**Postulation of Terminal End High Energy Line Breaks at Closed Ended Valves** "The Duke letter does not indicate whether its proposal fully satisfies the position in footnote 3 of BTP MEB 3-1. Specifically, footnote 3 states that for piping runs which are maintained pressurized during normal plant conditions for only a portion of the run (i.e., up to the first normally closed valve) a terminal end of such runs is the piping connection to this closed valve. This means that a pipe rupture would have to be postulated at the connection to the closed valve. Duke needs to clarify that it will satisfy the complete criteria contained in footnote 3 of BTP MEB 3-1."	Although not addressed by Giambusso/Schwencer, Oconee intends to postulate breaks/cracks at closed valves as follows: The postulation of terminal end breaks at the first normally closed valve(s) separating portions of a system maintained pressurized during normal operations and portions of a system not maintained pressurized depends on whether the system has a seismic analysis that is continuous across the valve. For system or portions of systems that are not seismically analyzed, breaks are postulated to occur at all piping girth welds in the system including those that attach to normally closed valves. For systems or portions of systems that are seismically analyzed, and the analysis is continuous across the normally closed valve, such that stresses can be accurately determined, break and crack locations are determined based on comparison to the break and crack stress thresholds. This interpretation for boundary valves in seismically analyzed lines has been previously approved by the staff for the LPI cross tie submittal (Oconee), for the revised pipe rupture analysis criteria (Crystal River), and for the "Determination of Break Locations and Dynamic Effects Associated with the Postulated Rupture of Piping" (Watts Bar).	New issue - Common understanding - No additional action
H5	**Treatment of the Letdown Line as a High Energy Line** "In Attachment 5 to the November 2006 letter, Duke argues that the reactor coolant letdown line outside the containment does not qualify as a high energy system in accordance with its licensing basis because the system does not exceed both 200 degrees F and 275 psig. However, the Oconee licensing basis criteria provided in Duke Report No. OS-73.2, "Analysis of the Effects Resulting from Postulated Piping Breaks Outside Containment for Oconee Nuclear Station, Units 1, 2, and 3, " clearly states that a higher energy lines are defined as those that have either a normal service temperature greater than 200 degrees or a pressure greater than 275 psig. This is the same criterion that is referenced in BTP MEB 3-1. Duke needs to treat the reactor coolant letdown line as a high energy line up to the isolation valve."	Oconee agrees that the Letdown line should be considered as high energy. However, upon rereading the original SER for Oconee, there seems to be some confusion on this point. The SER clearly notes the following, "The reactor coolant letdown is cooled before leaving the reactor building so this system is essentially a high pressure system rather that a high pressure and temperature system." Although not explicitly stated in the SER, it is believed by Oconee that this statement allowed some latitude in the postulation of single active failures, as follows:	Common Understanding - Additional information to be provided in the LAR.

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H6	**Single Active Failure Criterion for the Letdown Line Break between the Containment Penetration and the Outboard Containment Isolation Valve** "...the NRC staff does not agree with the licensee's characterization in this commitment of the plant licensing basis relative to the letdown line; the single failure criterion is applicable and must be considered..." "Contrary to Duke's position, the MDS Report (Section 3.1.9) indicates that the break is isolated by automatic closure of xHP-3, xHP-4, and xHP-5; and Duke did not take exception to the single failure criterion for this break scenario. In fact, for those break locations where the MDS report did find that the single failure criterion was not satisfied, the condition was specifically recognized and interim compensatory measures and plant modifications were identified for resolving the single failure discrepancies that were found. Furthermore, Duke indicated that the NRC criteria that were specified for addressing HELB were satisfied. Therefore, the plant licensing basis for postulated failures of the letdown line includes consideration of single active failures." "It is the NRC staff's position that the plant licensing basis for postulated failures of the letdown line includes consideration of single active failures, and postulated failures of the letdown lines for the Oconee units must be addressed accordingly."	It is clear that no single active failure was postulated in the original MDS report. The report noted that valves HP-3, 4, & 5 could be used to isolate the break. However, HP-3 and 4 are located in parallel lines downstream of their respective Letdown Coolers, upstream of the break location. HP-5 is located outside containment, downstream of the postulated break location. So, a failure of HP-3 or 4 to close would result in an un-isolated break. Closing HP-5 was and is not important, since it is downstream of the break location. However, HP-1 & 2 can be closed, by manual operator action inside the control room to isolate the break. Oconee will include, as part of the LAR(s), a description of the dose re-analysis of this break scenario, crediting closure of HP-1 & 2 to isolate the break.	
H7	**Location of Terminal End Breaks at Small Bore Reactor Building Penetrations** "In Attachment 4 to the November 2006 letter, Duke indicates that breaks will not be postulated at the penetration anchors for small bore piping penetrations because the penetration anchors are located inside the containment. Instead, Duke indicates that breaks are postulated in the piping run outside the containment wall and remote from the anchor. This is not consistent with the criteria provided in Section 2.1 of Duke Report No. OS-73.2 which requires break locations at the terminal end of the piping run. BTP MEB 3-1 also requires postulation of breaks at the terminal end. The basis for the criteria is that breaks are expected to occur at locations that provide rigid constraint to the piping, such as anchor points. Duke needs to either evaluate the effect of pipe breaks at the terminal end (anchor point) as required by the criteria or provide justification as to why the alternative location it selected is the most likely location for a HELB."	The MDS report provided drawings of break locations at the small bore Reactor Building penetrations. These locations were clearly inside the penetration rooms, beyond the piping to reactor building liner welds. In addition, the aforementioned SER provides the following: "The staff agrees with the applicant's selection of pipe failure locations and concludes that all required accident situations have been addressed appropriately by the applicant." The consequences of the small bore break locations at the RB penetrations documented in the MDS report would be very similar as to those postulated at the piping to liner welds, except in one respect, their affect on containment integrity. However, other analyses evaluated the affect on containment should a break occur at the pipe to liner weld, as part of the containment design. The design basis for these analyses is described in Section 3.6.1.1 of the UFSAR. The design basis is as follows: (1) All penetrations are designed to maintain containment integrity for any loss of coolant accident combination of containment pressures and temperatures. (2) All penetrations are designed to withstand line rupture forces and moments generated by their own rupture as based on their respective design pressures and temperatures. (3) All primary penetrations, and all secondary penetrations that would be damaged by a primary break, are designed to maintain containment integrity. (4) All secondary lines whose breaks could damage a primary line and also breach containment are designed to maintain containment integrity. In conclusion, Oconee does not believe that it is necessary to change the licensing basis for postulation of breaks at small bore penetrations.	Common understanding - No additional action

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H8	**Location of Terminal End Break at the Main Steam Reactor Building Penetration** "In Attachment 5 to the November 2006 letter, Duke indicates that breaks were not postulated at the east penetration room main steam terminal end anchor point because the penetration anchor is located inside the containment. Instead, Duke indicates that the break is postulated in the piping run outside the containment wall and remote from the anchor. This is not consistent with the criteria provided in Section 2.1 of Duke Report No. OS-73.2 which requires break locations at the terminal end of the piping system. Duke needs to either evaluate the effect of a pipe break at the terminal end (anchor point) as required by the criteria or provide justification as to why the alternative location it selected is the most likely location for a HELB."	The MDS report provided drawings of the two Main Steam break locations at the Reactor Building penetrations. These locations were clearly inside the penetration rooms, beyond the MS rupture restraints and the Reactor Building liner welds. As noted for the small bore breaks at the RB penetrations, the SER agreed with the selection by Oconee of the pipe failure locations and further concluded that all required accident situations had been appropriately addressed. The consequences of a MS break at the locations depicted in the MDS report would be very similar to those postulated at the MS rupture restraint. The rupture restraint, which forms part of the containment boundary, is connected to the MS piping by two welds. These welds connect the MS piping to a collar plate that is in turn welded to the rupture restraint. The inboard weld (RB Side) is designed such that should a break occur at the outboard weld (EPR side) containment integrity would not be threatened. Similarly, the outboard weld is designed such that should a break occur at the inboard weld containment integrity would not be threatened. The design of MS penetration and rupture restraint form part of the overall containment design. In conclusion, Oconee does not believe that it is necessary to change the licensing basis for postulation of breaks at the Main Steam penetrations.	Common understanding - No additional action
H9	**Water Hammer Loads** "How are water hammer loads addressed?"	For those piping systems where water hammer is a concern (Main Steam & Main Feedwater), the calculation of Equation 9 (occasional loads) is based on the greater of OBE seismic or water hammer stresses.	Common Understanding - Additional information to be provided in the LAR.
H10	**Technical Specifications for PSW & SSF** "...licensing basis clarity should be reflected in the UFSAR, and TS requirements should be established in accordance with 10 CFR 50.36 requirements." "Operability of the water inventory for the SSF and PSW/HPI must be addressed. The current SSF TS in this regard was based on the availability of other systems such as EFW for performing the SSDHR function, which is not valid for the proposed tornado and TB HELB mitigation strategies. Furthermore, both the SSF and the PSW/HPI systems rely upon the same water supply and the licensee has not addressed how the water supply will be assured for both tornado and HELB mitigation." "Indicates that installation of PSW and HPI improvements will reduce reliance on the SSF by providing a system capable of independently establishing safe shutdown conditions, thereby significantly improving overall plant risk - not truly independent due to shared water source and west penetration room (WPR) vulnerabilities; no mention of establishing a Technical Specification (TS) requirement pursuant to 10 CFR 50.36 even though the licensee recognizes that the PSW/HPI modifications will "significantly" improve overall plant risk." A TS is required for the PSW/HPI system in accordance with 10 CFR 50.36(c) (2) (ii) (D). As stated on Page 3 of the November 30, 2006, submittal, Duke indicated that "the installation of a new PSW system and HPI system improvements will reduce reliance on the SSF by providing a system capable of independently establishing safe shutdown	Oconee agrees that licensing basis for HELB will be reflected in the UFSAR. As documented in our 11/30/06 letter, the PSW has been evaluated regarding inclusion into the TS, and that evaluation concluded that the PSW operability requirements should be incorporated into the Selected Licensing Commitments (SLC) Manual and its Bases. This conclusion was based on 10CFR50.36 requirements, preliminary Oconee PRA results, and the applicability of NUREG 1430 for standard technical specifications. Regarding the assurance of the water supply for both SSF and PSW/HPI, see issue H12. The SSF will remain risk significant and its TS will remain as currently written. As noted in the 11/30/06 letter, the new PSW system will not mitigate any Oconee UFSAR Chapter 15 design basis events. Further, preliminary PRA indicates that the risk impact of PSW intended functions are lower than those of SSF.	

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	conditions, and thereby significantly improve overall plant risk."		
	TS requirements were required for the SSF to assure its SSDHR function (even though other sources of SSDHR were considered to be available). The risk significance of the PSW/HPI system is on the same order of magnitude as the SSF and in this case, other sources of SSDHR may not be available.	The addition of PSW/HPI actually reduces the safety significance of the SSF. Additionally, preliminary PRA analysis indicates that the AOT for the PSW/HPI system would be ~21 days as compared to the 7 day AOT of the SSF.	
	* Tornado and HELB events at Oconee represent at least the same level of risk as associated with design basis accidents (DBAs).		
	* The licensee proposes to rely upon the PSW/HPI system in conjunction with the SSF for tornado and HELB mitigation, and the licensee's TORMIS analysis is predicated on this. Therefore, TS requirements should be established not only to assure the operability of the PSW/HPI system, but also to assure that both the SSF and PSW/HPI systems are not both rendered inoperable at the same time.		
	*The PSW/HPI capability is the only means that can be relied upon for tornado and HELB mitigation beyond 72-hours, and it is the only means available for cooling down the Oconee units.	Currently, the limiting condition for RCS leakage is maintained in accordance with TS 3.4.13 and the limiting condition for operation of the SSF is maintained in accordance with TS 3.10. The Commitment relative to operation of the Station ASW and SSF for the purpose of tornado mitigation is in accordance with SLC 16.9.9. The Maximum Allowed Total Combined RCS Leakage Rate was chosen to ensure that the seal leakage rate for all four (4) RC pumps plus other RCS leakage during normal operation remains low enough to allow the SSF RC Make Up System to maintain adequate inventory in the RCS to sustain natural circulation flow during an SSF event.	
	"What limitations are required relative to reactor coolant system (RCS) leakage when using the MSRVs and atmospheric dump valves (ADVs) for steam generator (SG) pressure control and crediting the SSF, and what changes are necessary to the TS in this regard?"		
	"The plant licensing basis for both tornado and HELB includes the capability to achieve and maintain cold shutdown conditions. In the case of tornado, the station ASW system is credited for being able to maintain SSD for at least 30 days and the same capability should be provided by the PSW/HPI system. The submittal needs to explain how this capability will be assured, especially with respect to TS requirements."	The original Station ASW system, that also takes suction form the CCW header, is governed by SLCs, not TSs. The combined PSW/HPI and SSF tornado and HELB mitigation functions will be monitored using a revised version of SLC 16.9.9.	
	"TS requirements that assure the operability and availability of structures, systems and components (SSCs) that are relied upon for the tornado and HELB mitigation strategies must be established, such as for the standby shutdown facility (SSF), the PSW/HPI system, the Unit 2 condenser circulating water (CCW) system, and for reactor coolant system leakage."		
	"The current SSF TS requirements did not include consideration of the proposed mitigation strategy and the current 45 day allowed outage time (AOT) for the Unit 2 CCW inlet is of concern. This needs to be reconsidered since the basis for the 45 day AOT is no longer valid, and the AOT should be limited based on tornado and HELB considerations recognizing that there are not other sources of water."		
	"Page 3, first bullet: Relative to the capability to power the submersible pump by the PSW switchgear, what TS operability and surveillance requirements are appropriate?"	The limiting condition for the submersible pump is outlined in TS 3.10.1.b. The submersible pump provides long term makeup to the reservoir. The submersible pump is stored in the SSF facility. The surveillance requirements will remain the same. (See 1st bullet, Page 3 of Attachment 1 and Sections 1.1 and 1.2 of Attachment 2 in the November 30, 2006 letter)	

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H11	**72 Hour Mission Time of the SSF** "The plant licensing basis is to be able to mitigate HELB events, including consideration of single active failures, and to place the plant in cold shutdown condition. The onus is on the licensee to demonstrate that the 72-hour mission time of the SSF is adequate for this purpose (e.g., extent of damage and time required to make necessary repairs and to resolve postulated failures of the PSW/HPI must be addressed)." "The 72-hour mission time of the SSF does not establish what the mission time is for mitigating HELB scenarios. Adequate assurance must be established that the PSW/HPI and SSF are capable of mitigating the HELB event to the point of establishing cold shutdown conditions, irrespective of the SSF mission time. The 30-day capability of the PSW/HPI system can be credited in this regard, but assurance that sufficient water inventory will be available and that the PSW/HPI can be restored within 72-hours is required."	The proposed HELB design basis is predicted on the ability to reach safe shutdown(1) within 72 hours. The SSF can adequately provide this function. Within the 72 hour timeframe, damage repair measures will be credited to insure the required systems and components are available such that an orderly progression to cold shutdown can begin. Oconee agrees that more detail should be provided (i.e. PSW single failure mitigation) on the scope and detail of these repair measures. Such detail and scope can be provided in the unit specific LAR(s). Regarding the availability of the water source to the SSF and PSW/HPI, there are no direct threats to the supply from postulated HELBs. With the use of the submersible pump discussed elsewhere in this presentation, the CCW can be replenished from the Lake Keowee source indefinitely. Again such detail can be provided in the LAR(s).	Common Understanding - Additional information to be provided in the LAR.
H12	**Assurance of Suction Source** "Contrary to the information that was provided, this PSW/HPI system is not totally independent of the standby shutdown facility because they share the same water source." Furthermore, both the SSF and the PSW/HPI systems rely upon the same water supply and the licensee has not addressed how the water supply will be assured for both tornado and HELB mitigation." "How is water supply from the Unit 2 CCW assured to be available? The existing TS AOT must be reconsidered accordingly recognizing the new tornado and HELB mitigation functions." "The licensing basis includes the capability to place the plant in cold shutdown and the mitigation strategy does not adequately address how this capability is assured relative to the extent of damage that can be experienced, recognizing that: a) it is critical to recover PSW/HPI within the 72-hour mission time of the SSF, and b) an assured source of cooling water that is good for at least 30-days is needed for the three Oconee units at the onset of tornado and HELB events." SSF and PSW will both use the Unit 2 condenser circulating water (CCW) inlet piping as a water source. How will availability of this water source be assured?	Oconee agrees that the water source for both SSF and PSW/HPI is not redundant. However, given that either system, but not both, will draw on this source, and given the available inventory, HELBs in the TB that result in the loss of 4160V, can be adequately mitigated such that safe shutdown(1) can be maintained for 72 hours following the event by use of the submersible pump. Following that period, there remains adequate CCW inventory to support an orderly cooldown to cold shutdown. Should the cooldown period exceed the capacity of the available inventory, the submersible pump can be used to refill the CCW from Lake Keowee. This activity can be easily achieved before depletion of the available inventory.	Common Understanding - Additional information to be provided in the LAR.

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H13	**Main Steam HELBS** "...the SSF cannot be credited as backup if the non-MS HELB results in a plant cooldown that exceeds SSF reactor coolant system (RCS) makeup capability, such as the turbine bypass valve (TBV) and feedwater control valve (FWCV) failures that are referred to on page 10 (for example). Also, it would seem that if this is a problem for non-MS HELBs, that it would be a problem for MS and main feedwater (MF) HELBs (also see Page 11, third paragraph)? Per Page 10, third paragraph, Duke to confirm the adequacy of previous analysis that the MS HELBs in the turbine building satisfies the specified criteria (no damage to protection systems, Class 1E electrical systems, or ES equipment on the affected unit, plus single failure consideration) such that the PSW/HPI and SSF do not have to be credited "The SSF cannot be credited for backup mitigation if the non-main steam (MS) HELB results in a plant cooldown that exceeds SSF RCS makeup capability (which appears to be the case for postulated turbine bypass valve (TBV) and feedwater control valve (FWCV) failures as referred to in Attachment 4, page 10, of the submittal (for example)."	Oconee recognizes that the SSF RCMU has limited capacity for RCS inventory control. As noted in Oconee's response to Information Notice 79-22 and reiterated in our letter dated 11/30/06, the profile considered for the environmental evaluation of the turbine bypass valve and feedwater control valve was based on a MS break. Oconee has no information, at this time, that indicates that these valves fail open for non-Main Steam breaks. As indicated in the 11/30/06 letter, work continues on the mitigation strategy for MSLBs and other HELBs that may result in a compromise of the MS pressure boundary. This analysis will consider non-safety control system malfunctions induced by environmental effects, the validity of the assumed environmental profile in the TB and the capabilities of the PSW/HPI system and the SSF to mitigate these HELBs.	Common Understanding - Additional information to be provided in the LAR.
H14	**HELB's and an Uncontrolled Blowdown of Either Steam Generator** "The consequences of HELB is determined based upon appropriate analyses, and the assumption that HELBs do not result in an uncontrolled blowdown of either SG (or excessive cooldown for that matter) must be justified accordingly, as well as any other assumptions that are credited in the HELB analyses. The HELB analyses must also address single failure considerations without exception." "The consequences of HELB are determined based upon appropriate analyses, and the assumption that HELBs do not result in an uncontrolled blowdown of either steam generator (SG), or excessive cooldown for that matter, must be justified accordingly (as well as any other assumptions that are credited in the HELB analyses)."	The unit specific LAR(s) will provide information and or references that demonstrate the consequences of all postulated HELBs. Information regarding a potential uncontrolled SG blowdown and the potential mitigation strategy will also be reported in the LAR, as appropriate. The postulation of single active failures will be addressed.	Common Understanding - Additional information to be provided in the LAR.
H15	**Control Room Cooling System & Main Steam Line HELBs in the Turbine Building** "...why isn't this sort of thing a problem for the MSLB in the TB (i.e., HELB in the TB can cause a loss of chilled water and power for HVAC; loss of colored buses)?"	As stated in the 11/30/06 letter, analysis has shown that the main CR would remain habitable and the equipment located there would there would remain functional for a prolonged loss of HVAC. The route of the Main Steam lines is not proximate to the CR. In addition, the TB is a large structure with numerous openings. As such, should a MSLB occur in the TB, the jet flow would be sufficiently far away from the CR such that the CR would continue to function, even with a loss of chilled water. Regarding the 4160V power, all direct interactions from HELBs postulated to occur in the TB are being evaluated, including interactions with the 4160V power.	Common Understanding - Additional information to be provided in the LAR. (Reference NRC Letter dated July 12, 2006, Enclosure 2, Item 21)

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H16	**Justification of 100% Humidity Non-Condensing** "The environmental profile is determined based upon analysis of the actual conditions that will exist following the pipe break, and the assumption that the environment is "non-condensing" must be justified and supported by the analysis." "The environmental profile is determined based upon analysis of the actual conditions that will exist following the pipe break, and the assumption that the environment is "non-condensing" must be justified and supported by the analysis."	As noted in Oconee's response to Information Notice 79-22 and reiterated in our letter dated 11/30/06, the profile considered for the environmental evaluation of the turbine bypass valve and feedwater control valve was based on a MS break. During normal operation, the SGs produce at least 60 degree superheated steam. Under such conditions, the amount of condensation is negligible.	Common understanding - No additional action
H17	**Restoration of PSW/HPI** "No flood protection will be provided for systems and components in the TB that are necessary to reach cold shutdown (CSD). This could require the plant to be maintained in safe shutdown (SSD) conditions for an extended period of time which places additional importance on the PSW/HPI capability since the SSF is only good for 72-hours. The extent of potential damage and single failures must be considered and addressed such that the capability to restore/use the PSW/HPI system is assured." "The licensing basis includes the capability to place the plant in cold shutdown and the mitigation strategy does not adequately address how this capability is assured relative to the extent of damage that can be experienced, recognizing that: a) it is critical to recover PSW/HPI within the 72-hour mission time of the SSF, and b) an assured source of cooling water that is good for at least 30-days is needed for the three Oconee units at the onset of tornado and HELB events."	As noted in our letter date 11/30/06, single active failures will be postulated, as appropriate, for initial event mitigation, to reach safe shutdown[1]. Should a single active failure occur in the PSW system during initial event mitigation, the SSF will be credited for initial event mitigation. Repair guidelines will be credited to restore the PSW system within the mission time of the SSF. Oconee agrees that the scope and detail of such repair guidelines needs to be described. These items will be provided in the LAR(s)	Common Understanding - Additional information to be provided in the LAR.
H18	**Seal Between the Reactor Building and the Auxiliary Building** "What is being done to assure that the seal between the reactor building (RB) and auxiliary building (AB) is properly maintained and does not leak excessively so that that flood mitigation features are not compromised?"	The seal between the RB and AB has been refurbished. This seal, as well as all other components required to prevent flooding of the AB following a MFDW break in the east penetration room, will be maintained as part of the station's civil passive features program (which is currently under development).	Common understanding - No additional action

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H19	**Ability to Reach Cold Shutdown for Postulated HELBs** "...the licensing basis specifies the capability to place the Oconee units in cold shutdown condition and therefore, the licensee must be clear on what is being credited within the plant licensing basis in this regard such that the capability to achieve cold shutdown is assured." "The plant licensing basis is to be able to mitigate HELB events, including consideration of single active failures, and to place the plant in cold shutdown condition. The onus is on the licensee to demonstrate that the 72-hour mission time of the SSF is adequate for this purpose (e.g., extent of damage and time required to make necessary repairs and to resolve postulated failures of the PSW/HPI must be addressed)." "The plant licensing basis for both tornado and HELB includes the capability to achieve and maintain cold shutdown conditions. In the case of tornado, the station ASW system is credited for being able to maintain SSD for at least 30 days and the same capability should be provided by the PSW/HPI system. The submittal needs to explain how this capability will be assured, especially with respect to TS requirements." "The 72-hour mission time of the SSF does not establish what the mission time is for mitigating HELB scenarios. Adequate assurance must be established that the PSW/HPI and SSF are capable of mitigating the HELB event to the point of establishing cold shutdown conditions, irrespective of the SSF mission time. The 30-day capability of the PSW/HPI system can be credited in this regard, but assurance that sufficient water inventory will be available and that the PSW/HPI can be restored within 72-hours is required." "The plant licensing basis is to be able to mitigate HELB events, including the capability to place the plant in cold shutdown and consideration of single active failures. Loss of power is also postulated for those HELB events that can reasonably be expected to cause a loss of power, such as causing a trip of the main turbine." "The proposed licensing basis for HELB induced damage inside the TB indicates that no time-critical actions are required. The basis for this position is not obvious in that the SSF is only credited for 72-hours and the capability restore/use the PSW/HPI system prior to exceeding 72-hours is required. Also, the licensee needs to explain how a source of water for mitigating the HELB event is assured."	Adequate assurance will be provided in the unit specific LAR(s) that SSF or PSW/HPI can sustain the unit at safe shutdown[1] until cool-down can commence to cold shutdown. The LAR(s) will further demonstrate that an adequate source of water for SSF systems or PSW/HPI will be protected from HELBs and that the water inventory is adequate to sustain the function. It should be noted that for HELB events, crediting use of the submersible pump, the water can be supplied indefinitely (e.g. Lake Keowee). Should a single active failure occur on PSW/HPI, the SSF will be credited for initial event mitigation. Appropriate measures will be instituted and described in the unit specific LAR(s) to demonstrate that PSW/HPI can be restored within 72 hours. The equipment located inside the Turbine Building relied upon to establish cold shutdown is not protected from the effects of a HELB inside the Turbine Building. Subsequent to a HELB inside the Turbine Building, either the SSF or PSW/HPI system would be capable of providing secondary side decay heat removal and reactor coolant pump seal injection subsequent to a HELB event to maintain the affected units sub-cooled with a pressurizer steam bubble in safe shutdown[1] conditions for up to 72 hours. This mission time is consistent with the SSF current licensing basis. Additional damage repair may be required to enable the Low Pressure Service Water and the decay heat removal function of the Low Pressure Injection systems to achieve cold shutdown. For those events that cause loss of power, loss of power will be considered. There are no time critical operator actions inside the Turbine Building associated with plant cooldown or the establishment of cold shutdown.	Common Understanding - Additional information to be provided in the LAR (Reference NRC Letter dated July 12, 2006, Enclosure 2, Item 2)
H20	**PSW/HPI Powering SSF** "HELB single active failure considerations rely to some extent upon the capability to align PSW/HPI power to the SSF. Therefore, contrary to the licensee's position as stated on Page 3 of Attachment 2, in Section 1.2, this capability should be included in the plant licensing basis." "HELB single active failure considerations rely upon the capability to align PSW/HPI power to the SSF. Therefore, contrary to the licensee's position (Section 1.2 on Page 3 of Attachment 2 of the submittal), it is necessary to credit this capability in the plant licensing basis."	The PSW/HPI power to the SSF is not necessary to mitigate a single failure within the initial 72 hours of the event. Therefore, it is Oconee's position that this function does need to be included in the licensing basis.	

ITEM #	NRC Issue	DUKE COMMENTS	RESOLUTION OF ITEMS
H21	**Main Steam Relief Valves (MSVRs) Cycling** "Page 3, first bullet: for how long and for how many cycles will the main steam relief valves (MSRVs) be credited; what assurance will be provided that they won't stick open, possibly compromising the mitigation strategy? What limitations are required relative to reactor coolant system (RCS) leakage when using the MSRVs and atmospheric dump valves (ADVs) for steam generator (SG) pressure control and crediting the SSF, and what changes are necessary to the TS in this regard?" "What are the maximum number of cycles the MSRVs will experience and why doesn't one or more MSRV sticking open pose a problem?" "The discussion indicates that steam pressure may be controlled using the ADVs to limit the number of MSRV cycles. What number of MSRV cycles are considered acceptable and why? What assurance is there that the MSRV cycles will be limited accordingly?"	Cycle test of a MSRV was completed 11/1/06. One thousand lift tests were conducted. At no time did the test relief valve stick open. Oconee views the results as a demonstration of the reliability of the valves to perform their design basis function during SSF operations. In addition, the number of lift tests conducted bounds the number of lift cycles expected during the 72 hour SSF mission time.	

Footnotes

{1} "Safe Shutdown" for the Oconee Nuclear Station is defined as Mode 3 with average Reactor Coolant System (RCS) temperature $\geq 525^{\circ}$ F. "Cold Shutdown" is defined as Mode 5 with RCS temperature $\leq 200^{\circ}$ F.