UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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November 19, 2001

EA-01-056
EA-01-125

Duke Energy Corporation
ATTN: Mr. W. R. McCollum
Site Vice President
Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION - NRC SUPPLEMENTAL INSPECTION REPORT 50-269/01-09, 50-270/01-09, AND 50-287/01-09

Dear Mr. McCollum:

On October 5, 2001, the NRC completed a supplemental inspection at your Oconee Nuclear Station. The enclosed report documents the inspection findings which were discussed on October 5, 2001, with Mr. Bruce Hamilton and other members of your staff and on October 16, 2001, with you and other members of your staff. In addition, a public regulatory performance meeting was conducted at your information center on October 19, 2001, to discuss the inspection findings.

This supplemental inspection was an examination of your problem identification, root cause evaluation, extent of condition determination, and corrective actions associated with two White findings identified in the mitigating systems cornerstone. The first White finding involved the reduced capability to provide reactor coolant makeup using the spent fuel pool as a suction source for a high pressure injection pump following certain tornadoes. The second White finding involved inadequate procedures for establishing station auxiliary service water flow to the steam generators within 40 minutes following certain tornado events. This supplemental inspection also included an NRC independent extent of condition review of issues related to the White findings.

Based on the results of this inspection, the NRC determined that your overall strategy for tornado mitigation involving F3, F4, and F5 tornadoes continued to have several technical issues requiring the need for additional corrective actions. Although your planned corrective actions appeared to contain elements addressing these issues, they were not sufficiently developed at the time of the inspection to allow closure of both White findings. Until these planned corrective actions are more developed and understood by the NRC, the first White finding involving the use of the spent fuel pool as a suction source for a high pressure injection pump will remain open. The second White finding will be closed because your corrective actions have addressed the specific issues associated with that finding.

During the inspection, the inspectors identified one issue of very low safety significance (Green), that also was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it has been entered into your corrective action program, the NRC is treating this issue as a non-cited violation, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny the non-cited violation in the enclosed report, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Oconee.

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Sincerely,

/RA/

Victor M. McCree, Acting Director
Division of Reactor Projects

Docket Nos: 50-269, 50-270, 50-287
License Nos: DPR-38, DPR-47, DPR-55

Enclosure: NRC Supplemental Inspection Report 50-269, 270,287/01-09

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	50-269, 50-270, 50-287
License Nos:	DPR-38, DPR-47, DPR-55
Report No:	50-269/01-09, 50-270/01-09, 50-287/01-09
Licensee:	Duke Energy Corporation
Facility:	Oconee Nuclear Station, Units 1, 2, and 3
Location:	7800 Rochester Highway Seneca, SC 29672
Dates:	October 1-5, 2001
Inspectors:	R. Gibbs, Senior Resident Inspector - Sequoyah (Team Leader) W. Rogers, Senior Reactor Analyst C. Payne, Senior Operations Engineer R. Carroll, Senior Project Engineer
Approved by:	V. McCree, Acting Director Division of Reactor Projects

SUMMARY OF FINDINGS
Oconee Nuclear Station, Units 1, 2, and 3

IR 05000269, 270,287/01-09, 10/1-5/2001, Duke Energy Corporation, Oconee Nuclear Station, Units 1, 2, & 3: Supplemental inspection for degraded mitigating systems cornerstone.

The inspection was conducted by a senior resident inspector, a senior reactor analyst, a senior operations engineer, and a senior project engineer. The inspection identified one green finding which was a non-cited violation. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

Cornerstone: Mitigating Systems

This supplemental inspection was performed by the NRC to assess the licensee's evaluation associated with two White findings related to tornado mitigation. These performance issues were previously characterized as having low to moderate risk significance ("White") in NRC Final Significance Determination letters dated November 9, 2000, and July 18, 2001. During this supplemental inspection, which was performed in accordance with Inspection Procedure 95002, the inspectors determined that the licensee performed an overall adequate evaluation of performance deficiencies related to the use of the spent fuel pool (SFP) as a suction source for a high pressure injection (HPI) pump and the alignment of the station auxiliary service water (ASW) pump within 40 minutes to support steam generator/reactor coolant system cooling for tornado mitigation.

The licensee’s problem identification efforts for both White findings were acceptable. Overall, the licensee’s root cause evaluations and extent of condition review for both findings were adequate. However, the licensee’s root cause determination did not specifically address the cause for the ASW procedure deficiency. This did not adversely impact the overall corrective action effort because the associated problems have been addressed. The inspectors agreed with the licensee’s determination that the failure to take timely corrective action for the ASW issue stemmed from a failure to implement an established process to address the procedure deficiency. However, the inspectors determined that an interim procedure change (in lieu of implementing the Operations Guide suggested by the license’s root cause team) would likely have resulted in more timely corrective actions. The White finding for alignment of ASW within 40 minutes, as well as related violation 50-269,270,287/01-03-03, are closed. The inspectors concluded that the licensee’s corrective actions to address the root causes and contributing causes for the HPI/SFP finding appeared to be reasonable. However, they were not sufficiently developed to allow the inspectors to determine their impact on the currently credited tornado mitigation strategy. Therefore, the White finding for the SFP not having sufficient inventory to support HPI reactor coolant makeup functions under certain conditions will remain open pending followup review of licensee corrective actions.

The NRC’s independent extent of condition review for both White findings determined that the licensee’s overall extent of condition was satisfactory. However, the inspectors concluded that the licensee did not fully review the area of design control. This conclusion was based on inspector-identified examples of where the licensee’s extent of condition: (1) did not confirm

emergency operating procedure/abnormal procedure functions were properly addressed in design control documentation; (2) failed to include design bases contained in design study calculations; and (3) did not evaluate for differences between calculation assumptions/results and the as-built facility. Although the NRC did not identify any safety significant impacts related to these examples, they did indicate a need for enhancement in the licensee's extent of condition review.

Findings

- Green. The inspectors identified a non-cited violation of 10CFR50, Appendix B, Criterion III, Design Control for the failure to ensure the Unit 1 and 2 control room doors were able to relieve pressure during a tornado event.

  The safety significance of the inability of the control room doors to provide pressure relief was evaluated by the licensee and determined to be very low. The licensee concluded that the walls were capable of withstanding the differential pressure caused by a tornado without the doors. The inspectors reviewed the licensee's evaluation and agreed there was not a loss of function. Since there was no loss of function the issue was of very low safety significance (Section 02.04).

Report Details

01 Inspection Scope

This supplemental inspection was performed by the NRC to assess the licensee's evaluation and corrective actions associated with two White findings related to tornado mitigation. These performance issues were previously described in NRC Inspection Reports 50-269, 270, 287/00-11 and 50-269,270,287/01-08, and are related to the mitigating systems cornerstone in the reactor safety strategic performance area. The inspection involved a review of the licensee's problem identification, root cause and extent of condition evaluation, corrective actions, and an NRC independent extent of condition review for both White findings.

The inspectors assessed the adequacy of the licensee's root cause evaluation by determining if the root causes and contributing causes were understood, and if the resulting corrective actions were sufficient to address those causes in order to prevent recurrence. This assessment included: a review of the licensee's Root Cause Failure Analysis Report and Problem Investigation Process report (PIP) O-01-02791, its associated corrective actions, and other related/referenced documents; interviews with key personnel on the licensee's root cause evaluation team, as well from the licensee's design basis and operations procedural groups; and a comparison of the NRC's independent extent of condition determination with that of the licensee's. The inspectors' independent extent of condition review included a review of technical issues associated with the tornado mitigation strategy, a procedure review and walkdown of the licensee's strategy for turbine building flooding, an evaluation of calculations supporting emergency operating procedure (EOP) and abnormal procedure (AP) functions, an evaluation for licensing bases issues similar to the tornado mitigation strategy, and a review of time critical operator actions.

02 Evaluation of Inspection Requirements

02.01 Problem Identification

a. Determination of who (i.e., licensee, self-revealing, or NRC) identified the issues and under what conditions

As a result of self initiated technical audits (SITAs) SA-96-17 and SA-97-10 conducted in 1996 and 1997, respectively, the licensee identified deficiencies with calculation OSC-3873, Hydraulic Model of High Pressure Injection System with Suction from Spent Fuel Pool. It was during a subsequent EOP/AP upgrade inspection that the NRC identified on May 4, 2000, that measures had not been adequately established to assure that a high pressure injection (HPI) pump could operate for the necessary time frame using the spent fuel pool (SFP) as the suction source following a tornado. The NRC Final Significance Determination letter dated November 9, 2000, identified this as a White finding with an associated violation of 10 CFR 50, Appendix B, Criterion III, Design Control. During a supplemental inspection of this HPI/SFP issue in March 2001 (Inspection Report 50-269,270,287/01-06), the NRC determined the licensee's replacement of the Unit 1 reactor coolant pump seals was adequate to reduce the risk of

a tornado induced loss of coolant accident and closed the associated violation. However, a violation of 10 CFR 50.59 was identified for the inappropriate deletion of the statement in Section 3.2.2 of the Updated Final Safety Analysis Report (UFSAR) concerning using the SFP as a suction source for the HPI system after a tornado event.

During procedure verification and validation (V&V) on January 27, 2000, the licensee identified that procedures for aligning the station auxiliary service water (ASW) pump to mitigate a tornado were not adequate to ensure that the pump could be started and aligned within sufficient time (40 minutes) to mitigate a design basis tornado event. As this condition adverse to quality had not been corrected as of March 22, 2001, the NRC Final Significance Determination letter dated July 18, 2001, identified this as a White finding with an associated violation of Technical Specification 5.4.1, Procedures, and 10 CFR 50, Appendix B, Criterion XVI, Corrective Action.

b. Determination of how long the issues existed, and prior opportunities for identification

The deficient calculation (OSC-3873) supporting the use of the SFP as a suction source for the HPI pump had been in place since 1990. This calculation was revised on September 1, 2000, to address deficiencies within the calculation; however, the uncertainty of the SFP being an adequate suction source for the HPI during a tornado event still remains. Specifically, the revised calculation identified that under certain conditions (i.e., high decay heat loads in the SFP) the HPI/SFP function was adversely impacted because of insufficient SFP inventory. This deficiency has existed for over ten years.

Regarding the ASW issue, the deficient procedure (AP/1,2,3/1700/006, Natural Disaster) used by operators for aligning ASW flow to the steam generators within 40 minutes had been in place since August 6, 1996. On May 16, 2001, the licensee revised AP/1,2,3/1700/006 and other associated procedures, such that alignment of the ASW pump within 40 minutes was assured. This deficiency existed for approximately five years.

Although not specifically addressed in the licensee's root cause evaluation, it was apparent from the event narrative and the associated event/causal diagrams that there were prior opportunities for the licensee to have identified both issues. Specifically, in response to SITA SA-96-17 concerns involving SFP level and HPI tornado event dynamics, the licensee had an opportunity to identify the HPI/SFP issue. As for the ASW issue, the licensee had an opportunity to identify the procedural deficiencies during the process of revising AP/1,2,3/1700/006 on August 6, 1996.

c. Determination of the plant-specific risk consequences (as applicable) and compliance concerns associated with the issues

The licensee's evaluation identified a change in core damage frequency (CDF) for each issue that was considered by the inspectors to be relatively consistent with the NRC's risk assessment. With respect to the HPI/SFP issue, the NRC initially determined the change in CDF to be 5.28E-6/year. However, since Unit 1 was the most susceptible to reactor coolant pump seal failure because of its older style seals, the licensee's evaluation identified the change in CDF to be a low E-6/year for Unit 1 (3E-6/year) and

below 1E-6/year for Units 2 and 3 (5E-7/year). Regarding the ASW issue, the NRC determined the change in CDF to be 1E-6/year for Unit 1 and 2.78E-6/year for Units 2 and 3. Similarly, the licensee's evaluation identified the change in CDF to be low to mid E-6/year for all three Units.

The combined risk for the HPI/SFP and ASW issues were not addressed in the licensee's evaluation. However, the inspectors determined that the combined change in CDF would be about 4E-6/year for Unit 1 (3E-6 + 1E-6) and 3.28E-6/year for Units 2 and 3 (5E-7 + 2.78E-6).

Additionally, the regulatory non-compliance(s) addressed in Section O2.01a. above for each of the two issues were adequately addressed by the licensee's corrective actions.

d. Assessment

The inspectors determined that the licensee's problem identification efforts for both White findings were acceptable.

O2.02 Root Cause and Extent of Condition Evaluation

a. Evaluation of methods used to identify root causes and contributing causes

The licensee used an events and causal factors analysis to conduct a root cause investigation of the individual issues, as well as a review of the extent of condition that led to the degraded cornerstone. Performed by a six person team (two from Catawba, one from McGuire, two from the General Office, and one from the Oconee Safety Review Group), the licensee's evaluation was considered by the inspectors to be appropriately independent and in procedural conformance with Nuclear System Directive (NSD)-212, Cause Analysis. The licensee's evaluation results were as follows:

- The root cause of the HPI/SFP issue was determined to be the calculation process that was used when the original calculation was developed in 1990. Specifically, assumptions made in the calculation did not provide sufficient detail so that the impact on results and conclusions could be easily understood or supported.

- The root cause of the licensee's failure to take timely corrective action for the ASW issue was determined to be that personnel did not follow the proper process to implement interim corrective actions to ensure operators would align the ASW pump within the required 40 minutes during a tornado event. The licensee's evaluation further indicated that if OMP 4-6, Use of Operations Guidelines, had been used as the method to inform operators of the need to immediately use AP/1,2,3/1700/006 in the event of a tornado (in lieu of an E-mail that had actual been used) this issue would not have occurred. The licensee's root cause evaluation did not specifically address the root cause for the deficiency associated with AP/1,2,3/1700/006. As the procedural deficiency was not identified during the process of revising AP/1,2,3/1700/006 on August 6, 1996, the inpectors inferred that V&V was not adequately performed. However, after establishing an improved V&V process, the licensee found the deficiency in

January 2000. The licensee plans to routinely V&V such time critical tasks in the future through the implementation of NSD-514, Control of Time Critical Tasks.

- The identified contributing/common cause for both White findings was the lack of a well understood licensing/design basis for tornado events. It was also indicated that this weakness had been recognized for a long period of time, but had remained uncorrected.

b. Level of detail of the root cause evaluation

The inspectors concluded that the licensee-identified root cause for the HPI/SFP issue, as well as the identified contributing/common cause for both issues, were appropriate. However, with respect to the ASW issue, the limited detail in the evaluation report made it difficult for the inspectors to discern if all relevant possibilities were considered in the root cause determination. Specifically, the inspectors had to confer with the licensee's team leader to confirm that other possibilities (e.g., inappropriate handling of the issue under the problem identification process, etc.) were considered and appropriately ruled out. The inspectors subsequently agreed that the root cause of the licensee's failure to take timely corrective action for the ASW issue stemmed from a failure to implement an established process to effect interim corrective actions for the associated procedural deficiency. However, the inspectors disagreed with the licensee's position that use of OMP 4-6 would have been an acceptable means of correcting this condition. The inspectors determined that an interim procedure change would likely have resulted in more timely corrective action. The inspectors also noted that the licensee's use of OMP 4-6 should be reevaluated for similar situations to prevent potential problems in the future. The licensee acknowledged the inspectors' observation.

c. Consideration of prior occurrences of the problem and knowledge of prior operating experience

The licensee performed an operating experience (OE) search to identify events with attributes similar to the White findings that could offer any lessons learned for further refinement of the root cause determination or identification of corrective actions to prevent recurrence. The search included: a review of NUS TRENDS database encompassing entries attributed to operators inability to mitigate a design basis tornado event and inadequate operator response times as a result of inadequate corrective actions; a NUS database text search of tornado related violations; and a review of potentially relevant issues from INPO's OE Web site. There were no contributions made from the above OE related searches.

The licensee's root cause evaluation identified that they had performed a review of other related corrective actions. This review appropriately involved the following initiatives: (1) prioritization and resolution of significant time critical actions; (2) resolution of procedure recommendations; and (3) engineering calculation problems since the calculation enhancement program was initiated. From the licensee's efforts, there were no additional resolution timeliness issues identified, no further examples revealed where additional shift communication or training should have been initiated as an interim measure, and in general, other than calculations related to the EOP effort, no clear or significant adverse calculation problem trends were observed.

d. Consideration of potential common causes and extent of condition of the problem

The licensee's assessment was performed by conducting a root cause failure analysis for each of the two White issues individually and then evaluating the results for common causes and issues related to the degraded cornerstone to determine the extent of condition. It was apparent from the licensee's evaluation that other potential common issues were reviewed in addition to the identified common cause involving lack of a well understood licensing/design basis for tornado events. Those potential common cause issues included: (1) time critical operator actions and procedure validation; (2) EOP change process, timeliness, backlog, and priority; (3) engineering calculation errors; and (4) operable but degraded condition management.

When assessing the identified common cause from an extent of condition perspective, the limited detail in the licensee's evaluation report made it necessary to confer with the licensee's team leader to confirm that the "lack of a well understood licensing/design basis" was explored in areas other than tornado mitigation. As discussed in Section 02.04, the inspectors determined that there were other areas where "lack of a well understood licensing/design basis" existed. However, as the licensee's team leader indicated, required actions in those other areas were well defined and underway. The inspectors' independent extent of condition review (addressed in Section 02.04) also found problems in three areas in which the licensee's extent of condition evaluation did not appear to consider.

e. Assessment

Overall, the inspectors determined that the licensee's root cause evaluations and extent of condition review were adequate. The inspectors did identify that the licensee's root cause determination did not specifically address the cause for the ASW procedure deficiency. This was not considered to be significant, however, due to the licensee's current V&V initiatives and the fact that the necessary procedural changes were ultimately made. The inspectors agreed with the licensee's determination that the failure to take timely corrective action for the ASW issue stemmed from a failure to implement an established process to effect interim corrective actions for the associated procedural deficiency. However, the inspectors determined that an interim procedure change (in lieu of implementing the Operations Guide suggested by the licensee's root cause team) would likely have resulted in more timely corrective action.

02.03 Corrective Actions

a. Appropriateness of corrective actions

The licensee's corrective actions were captured in PIP O-01-02791. The corrective actions identified to prevent recurrence of the HPI/SFP issue were: (1) implementation and revision of Engineering Directives Manual (EDM)-101, Engineering Calculations/Analysis; (2) completion of the remaining 19 out of 120 EOP setpoint calculation reviews; and (3) changes/clarification to the tornado mitigation licensing basis. Another related corrective action involved revising Section 3.2.2 of the UFSAR to reinsert the statement (which was inappropriately removed on November 13, 2000) related to use of the SFP as a suction source for the HPI pump following a tornado.

The specified remedial/immediate corrective actions for the ASW issue involved revising procedures EP/1,2,3/1800/01, Emergency Operation Procedure; AP/1,2,3/1700/011, Loss of Power; and AP/1,2,3/1700/006, Natural Disaster. Identified corrective actions to prevent recurrence were to reemphasize the use of OMP 4-6 to appropriate personnel and specify that changes/clarification be made to the tornado mitigation licensing basis. Another indicated corrective action was the development/implementation of NSD-514 to routinely V&V time critical tasks.

The inspectors reviewed EDM-101, Revision 10, and NSD-514, Revision 0, and found them to be appropriate. In addition, the inspectors also verified that the indicated EP, AP, and UFSAR changes were made, and V&V training was performed as indicated. As previously indicated in Section 02.02.b, the inspectors determined that an interim procedure change, in lieu of implementing the suggested Operations Guide under OMP 4-6, would have been the proper course of action with respect to immediate corrective action for the ASW issue. Therefore, the inspectors determined that reemphasizing when interim procedure changes are necessary should have been included in the licensee's prescribed corrective actions.

A key conclusion of the inspectors' independent extent of condition review was that the subject White findings, as well as the other tornado-related problems/issues identified in Section O2.04.1, were examples of a deficient tornado mitigation strategy. The bases for the inspectors conclusion that the tornado mitigation strategy is deficient are discussed in Section 02.04.1. Corrective action 6 of PIP O-01-02791 addressed improving the tornado licensing basis as a site design basis initiative under the Tornado Design Basis Project Plan. This plan addressed the licensee's intention to modify the standby shutdown system (SSS) to protect it from a design basis tornado and revise the licensing basis to reflect it as the primary assured tornado mitigation success path. In addition, the plan expressed the licensee's anticipation that neither the station ASW pump nor the HPI pump, taking suction from the SFP or the borated water storage tank, would be credited mitigation strategies in the licensing basis. The plan further indicated that risk insights would be used to define testing and maintenance requirements for other systems credited in the licensee's probabilistic risk assessment (PRA) for tornado mitigation. However, corrective actions associated with the root cause evaluation (PIP O-01-02791) and the Tornado Design Basis Project Plan were not sufficiently developed for the inspectors to be assured that all issues related to the deficient tornado mitigation strategy would be adequately resolved.

In addition, it was not clear to the inspectors that risk insights would support use of the SSS as the sole tornado mitigation strategy. Although the licensee intends to harden the west penetration room/cask decontamination room to make it more resistant to tornadoes, vulnerabilities inherent in the SSS design (e.g., inability to withstand a single failure, relatively high failure probability, etc.) make it apparent that other systems and/or strategies may be required for overall tornado mitigation. However, the licensee's project plan did not include specific information on the other systems and strategies, only that risk insights for PRA-credited systems would be used. Since the licensee's corrective actions were not fully developed at the time of the inspection, the inspectors could not sufficiently evaluate the licensee's overall corrective action effort. Additional review of corrective actions will be required to satisfy the inspection objectives of this supplemental inspection. The associated regulatory compliance implications for the

additional issues discussed in Section 02.04.1 will also be addressed during the follow up review of the corrective actions. As noted in Section 02.01.b, the underlying issue with the SFP not having sufficient inventory to support HPI reactor coolant makeup functions under certain conditions had not been corrected. The specific issues related to the ASW White finding were resolved. Consequently, the White finding dealing with use of the SFP as the suction source for an HPI pump will remain open pending followup inspection of the corrective actions. The White finding (and related violation 50-269, 270,287/01-03-03) for alignment of ASW within 40 minutes are closed.

b. Prioritization and establishment of schedule for implementing and completing the corrective actions

As indicated above, the inspectors reviewed a number of the licensee's planned corrective actions to confirm that the schedule for implementation was appropriate. However, this supplemental inspection occurred shortly after the licensee's root cause evaluation report was issued and corresponding recommended corrective actions had only recently been incorporated into PIP O-01-02791. Consequently, initiatives such as the scheduled completion of the remaining 19 EOP setpoint calculation reviews and the scheduled implementation of NSD-514 related performance tests were not yet reflected in the PIP. Regarding the contributing/common cause corrective actions, the revised tornado licensing basis was scheduled to be submitted to the NRC by April 1, 2002. The inspectors considered the scheduling of this submittal to be commensurate with the risks associated with the tornado mitigation strategy deficiencies addressed in Section O2.04.1.

c. Establishment of quantitative or qualitative measures of success for determining the effectiveness of the corrective actions to prevent recurrence

For neither of the identified root causes or contributing/common cause was it apparent to the inspectors that measures were taken to assure that the resultant corrective actions would be effective in preventing recurrence. The licensee acknowledged this observation and generated corrective action 16 in PIP O-01-02791 to perform a Level II assessment to validate the effectiveness of the overall corrective action plan. The inspectors considered this to be appropriate, but viewed the licensee's initial lack of establishing a means to determine the effectiveness of corrective actions to be a weakness in the licensee's response to the White findings.

d. Assessment

The inspectors concluded that the licensee's corrective actions to address the root causes and contributing causes appeared to be reasonable. However, they were not sufficiently developed at the completion of this supplemental inspection to allow the inspectors to determine if they address specific problems that exist with the currently credited tornado mitigation strategy. Therefore, the White finding for the SFP not having sufficient inventory to support HPI reactor coolant makeup functions under certain conditions will remain open pending followup review of corrective actions once they have been sufficiently developed. The White finding for alignment of ASW within 40 minutes, as well as related violation 50-269,270,287/01-03-03, are closed.

02.04 Independent Assessment of Extent of Condition and Generic Implications

To assess the validity of the licensee's conclusions regarding extent of condition for the issues surrounding the two White findings the inspectors independently sampled licensee performance within key attributes of the mitigating systems cornerstone that related to the White findings. The following areas were selected for the independent sampling.

.1 Independent Assessment of Tornado Mitigation Strategy

The inspectors performed an independent assessment of the tornado mitigation strategy dealing with depressurizing the secondary plant with atmospheric dump valves (ADVs), operating the ASW pump to inject circulating cooling water into the secondary side of the once through steam generators (OTSGs), and a HPI pump providing reactor coolant system makeup from the borated water storage tank (BWST) or the SFP. The evaluation included reviewing calculations supporting the strategy, reviewing previous NRC inspection reports containing potential deficiencies dealing with this strategy, reviewing procedures AP/0/A/1700/06, Natural Disaster, and AP/1/A/1700/011, Loss of Power, and walking down selected locations of the actions directed in AP/1/A/1700/011. The inspectors also reviewed open PIPs associated with the strategy to determine what potential deficiencies had been captured in the licensee's corrective action program.

The inspectors identified one deficiency associated with design control that had not been included in the licensee's corrective action program. Licensee design documents did not establish that pressurizer code safety relief valves were able to pass water in excess of 500°F and then reseat. For scenarios with no core cooling and the ASW pump taking up to 40 minutes to be placed in service, the reactor coolant system (RCS) would heatup and pressure would increase. In response, the safety relief valves would open, releasing steam from the pressurizer and eventually hot water from the RCS. Upon ASW pump injection to the secondary side of the OTSGs, the RCS would de-pressurize below the safety valve set point. However, if the safety valves failed to reseat, reactor coolant would continue passing out of the RCS. The ASW/HPI pump combination would be unable to maintain adequate core cooling with this continuous loss of coolant. This potential problem could also effect other mitigation strategies in which the safety valves release water. The inspectors concluded that the licensee's extent of condition review did not identify this deficiency because the scope of their review did not confirm that EOP/AP functions, such as pressurizer code safety relief valve reseat capability, were properly addressed in design control documentation.

In response to the issue, the licensee initiated PIP O-01-03651. Also, the licensee provided the inspectors with information indicating that valves of this nature had been tested under "hot" water conditions and successfully reseated. Pending further NRC review, this issue will be identified as unresolved item (URI) 50-269,270,287/01-09-01: Establishment of Pressurizer Code Safety Relief Valves to Pass Water in Excess of 500°F and Then Reseat.

The licensee's extent of condition actions were effective in identifying numerous problems/issues with the tornado mitigation strategy. Based on this and the issue discussed above, the inspectors concluded that the White findings were just two

examples of a deficient tornado mitigation strategy. The licensee's extent of condition actions identified the following:

- Failure of the Unit 1 safety related 4 KV buses, due to a tornado, would fail one of the two long-term power sources for the Keowee hydro-electric unit auxiliary loads. The PRA assumes a tornado that fails the 4 KV buses also fails the Keowee overhead line, which is the other power source for the Keowee auxiliary loads. Therefore, after approximately one hour when Keowee batteries are no longer able to supply auxiliary power, the onsite emergency power from Keowee would fail. Keowee is the credited power source for the tornado pump and the HPI pump. For tornados damaging Units 2 or 3, this problem would not disturb the emergency power supply provided Unit 1 was not affected. The licensee concluded that the ASW pump/HPI pump mitigation strategy for Unit 1 is not viable due to this vulnerability. PIP O-01-1225 was initiated with one of the corrective actions under review involving procedure changes to allow reestablishment of Keowee auxiliary power.

- Failure of the Unit 1 safety related 4KV buses, due to a tornado, de-energized all the low pressure service water and high pressure service water pumps that provide turbine driven emergency feedwater (TDEFW) pump bearing cooling. If the elevated water storage tank (EWST) inventory was not sufficient or the storage tank could not withstand the tornado affects, TDEFW pump gravity cooling would be lost and a previously unrecognized failure of the TDEFW function existed. Given the vulnerability described above, only the SSF would be available to prevent Unit 1 core damage. (Reference PIP O-01-1225)

- Due to the tornado effects (damage or debris) with intensities > F1, operator access to the ADVs for depressurization could be compromised. Licensee submittals to support the July 28, 1989, safety evaluation report indicated that the upper surge tanks were susceptible to tornado effects. Even though the valves were located approximately 20 yards from the upper surge tanks (USTs), no discussion was included that the valves were susceptible. Accounting for the tornado effects, the licensee determined a more accurate estimated failure probability for personnel operating the ADVs and aligning the ASW pump would be 0.55 versus the PRA estimated failure probability of 0.1. (Reference URI 269,270,287/01-08-03)

- Only upon damage of the BWST by tornado affects, would the SFP be used as the suction source for the HPI pump. However, manual valve LP-28, which is located within a few feet of the tank must be closed to avoid draining the pool's available water supply for RCS makeup. Access to the valve could be compromised with a conservatively estimated failure probability of 0.5 for operators to accomplish this task. This significantly increased the failure probability of the strategy over previous estimates when attempting to use the SFP as a suction source.

- There were potential run out and flow control difficulties with the ASW pump. The ASW pump flow control is via differential pressure since the discharge lines do not contain flow instrumentation. The operator would be challenged during

efforts to maintain the desired differential pressure band. Initial feeding of at least three OTSGs would place the pump in a run out flow condition. Also, if tornado related damage were to occur to discharge piping in the unprotected west penetration room, run out conditions would worsen. Such piping damage would increase the difficulty to establish and maintain proper flow when feeding multiple OTSGs. In addition, the failure probability of using the ASW pump strategy was heightened by the complex communications between remote locations for feeding multiple OTSGs. It would involve radio communication with operators in the penetration rooms to manually operate (position and re-position) the six inch manual gate valves (two per unit) and the operators in the turbine building to manually operate the ADVs on each unit. (Reference PIPs O-00-03641 & O-01-02598)

- Due to the time necessary to evaluate alternate core cooling strategies and to place the ASW pump into service, the compressive OTSG tube stresses could exceed manufacturer design limits on the tubes. The licensee had recognized this condition and is pursuing a new structural analysis with the manufacturer to determine if such stresses would cause tube failure. At the time of the inspection, the structural analysis was not complete. Previously, this issue had been identified as URI 269,270,287/01-08-02: Steam Generator Tube Stresses Resulting From Use of the Station ASW Pump. This URI will remain open pending completion of the licensee's structural analysis and NRC review of the results. (Reference PIP O-01-00940)

- The north wall of the Unit 3 main control room was not designed to withstand the effects of differing tornado intensities. This included differential pressure, wind velocity and missiles. At the time of the inspection, the licensee's engineering evaluation had not been completed. (Reference PIP O-01-02827)

- The inventory within the SFP was not sufficient to ensure a 24 hour mission time for an HPI pump in all conditions. Assuming operators could wait nine hours prior to placing the HPI pump into service, it was estimated that for ten percent of the time the SFP would be unable to supply a suction source for the HPI pump. The ability of the SFP to perform this function is contingent on high SFP temperatures due to core offloads. This is the same technical issue as the HPI/SFP White finding.

The inability of the ASW/HPI pump strategy to function for a tornado affecting Unit 1 safety related 4 KV buses (due to a loss of emergency power from Keowee) was one of the primary inputs to the inspectors' conclusion that the tornado mitigation strategy was deficient. The inspectors determined that the above listed vulnerabilities in the tornado mitigation strategy were directly attributed to the technical quality of licensee calculations and design controls to support EOP/AP functions and V&V efforts associated with EOP/AP development. As stated in Section 02.03, the corrective actions for these issues had either not been fully developed or not implemented at the time of this inspection. The inspectors also noted that current calculations either supported the strategy or identified strategy limitations such as insufficient inventory for the SFP to act as a HPI pump suction source in all conditions.

To understand the significance of all the issues identified above, the inspectors assessed their overall impact on the CDF from a tornado initiating event. The inspectors estimated the risk ramifications of not implementing or being unable to implement (as in the case of Unit 1) the tornado pump/HPI pump strategy for tornados of varying intensity and found that the change in CDF was in the mid-to-high E-6/year range. This estimate assumed a viable cooling source would be available to the TDEFW pump, OTSG tube integrity is maintained, and the control room remains intact. The assessed issues were viewed as additional examples of the performance deficiency associated with the two White findings, which collectively represented a deficient tornado mitigation strategy. In addition, since the overall risk significance of these assessed issues is in the same range as the original two White findings, these issues were not processed through the significance determination process (SDP).

Assessment

The inspectors determined that the licensee's extent of condition review for the tornado mitigation strategy was appropriately bounding, and in the areas reviewed, additional vulnerabilities related to the strategy were identified by the licensee. The additional vulnerabilities, like the two White findings, were attributed to the technical quality of licensee calculations and design controls to support EOP/AP functions and V&V efforts associated with EOP/AP development. The inspectors also noted that the licensee's extent of condition review had not considered the ability of pressurizer code safety relief valves to reseat after passing hot water. However, the significance of this issue did not change the overall risk characterization for the tornado mitigation strategy.

.2 Independent Assessment of Turbine Building Flood Mitigation Strategy

As part of the independent assessment to determine if other risk important strategies had problems similar to the tornado strategy, the inspectors performed an independent evaluation of the mitigation strategy for major internal turbine building flooding. The strategy included isolating the flooding source, operating the standby shutdown facility (SSF) or (if the SSF failed) providing once through RCS cooling via an HPI pump with the HPI motor cooled with high pressure service water (HPSW). The evaluation included reviewing the calculations supporting the strategy, walking down the locations of the actions directed in the mitigation procedure, AP/1,2,3/1700/010, Uncontrollable Flooding of the Turbine Building, and checking that the sequence of actions directed by the AP could be accomplished within the assumed time frames. The inspectors also reviewed open PIPs associated with the strategy to determine if the licensee had previously captured deficiencies identified by the inspectors.

The turbine building flood mitigation AP, revised under the new procedure development process, provided direction to accomplish all critical actions within the necessary time frames. Also, given recent licensee corrective actions to identified deficiencies, the strategy had been verified as viable.

The inspectors' observations for the turbine building flood strategy were:

- The licensee had identified deficiencies in the turbine building flood mitigation strategy from different aspects of their extent of condition reviews stemming from

the White findings. The deficiencies were documented in PIPs O-01-2667, O-01-1849, and O-01-3487.

- The calculations associated with turbine building flood mitigation supported the mitigation strategy.

- One non-critical deficiency for Unit 2, as it relates to the AP strategy, was identified by the inspectors. The deficiency was the installation of pipe caps on the condenser circulating water (CCW) discharge piping high point vents downstream of the valves. The caps negated the ability to vent the CCW discharge header when directed. The licensee had not identified this situation and immediately removed the caps. This deficiency was of minor safety significance.

- Design Study OSC-2319, Circulating Cooling Water System Hydraulic Transient Analysis and Turbine Building Flood Study, contained the basis for the design basis leak size and confirmed that the drain from the turbine building was adequately sized. Although technically satisfactory, it was not reviewed under the design basis calculation upgrade program. Class 4 historical calculations were excluded from the upgrade program. Design studies were classified as a sub-tier of Class 4 calculations. The licensee failed to recognize that portions of design study calculations can contain current design bases. Therefore, one aspect of the licensee's extent of condition actions to the White findings associated with calculation review/upgrade failed to include the design bases contained in design studies. In this instance, since the calculation was technically adequate, there was no safety impact.

Assessment

By performing an independent assessment of the turbine building flood mitigation strategy the inspectors determined that the licensee’s extent of condition review was sufficient to identify mitigation strategies with deficiencies similar to those associated with tornado mitigation. The inspectors concluded the turbine building flood mitigation strategy was viable and that deficiencies with the strategy had been identified and were being addressed.

The inspectors noted one aspect of the strategy that the licensee’s extent of condition review had not considered. Specifically, the scope of the licensee’s calculation review and upgrade programs had not included design study calculations.

.3 Independent Assessment of Current Calculations for Technical Errors

The inspectors performed an independent evaluation of calculations supporting EOP/AP functions or design bases functions. The review sample came from EOP set point calculations (3 of 120) and older calculations (7 of 332) supporting design bases. All of these calculations were included in ongoing calculation upgrade programs. Also, identification of other risk significant functions that could not be performed due to calculation errors was conducted by reviewing PIPs stemming from the calculation upgrade programs.

No problems were identified from the sampling of EOP set point calculations. These calculations had been upgraded to current design standards.

One of the older calculations supporting design bases indicated that the doors to the Unit 1/2 control room were to act as relief panels during a tornado. This was identified in calculation OSC-005, Tornado Design for Main Control Room and Spent Fuel Pool Room. These doors were modified previously for security reasons and would not function in that relief capacity. This situation was confirmed with the licensee's cognizant engineer and PIP O-01-03662 was initiated. The ramifications of the lack of pressure relief were evaluated and the licensee concluded that the walls were capable of withstanding the differential pressure caused by a tornado without the doors. The inspectors reviewed the licensee's evaluation and agreed there was not a loss of function. Since there was no loss of function, the issue was of very low safety significance. However, the inspectors determined that this performance issue, a lack of design control, had a credible impact on safety due the importance of ensuring the design bases is consistent with the as-built configuration of the plant and therefore, constituted a Green finding.

This licensee performance issue is a violation of 10CFR50, Appendix B, Criterion III, Design Control, which requires that structures, systems, and components are correctly translated into applicable specifications. Contrary to this requirement, the Unit 1/2 control room doors were modified, preventing them from providing a relief function during tornado events. Because the issue is of very low safety significance and because the licensee entered the item into their corrective action program (PIP O-01-03662), the violation is being treated as an non-cited violation (NCV), consistent with Section VI.A.1 of the NRC Enforcement Policy. The item is identified as NCV 50-269, 270/01-09-02: Failure to Ensure Control Room Doors Would Open to Relieve Pressure. No other problems, beyond administrative, were identified with the older calculation sampling.

Calculation OSC-005 had been reviewed by the calculation upgrade program and was identified as not meeting present design standards. However, this type design control deficiency was outside the scope of the upgrade program since the program did not confirm calculation assumptions or results were consistent with the as-built facility.

Assessment

Overall, the inspectors determined that the calculation upgrade programs were effective in identifying errors in older calculations and improving the accuracy of EOP setpoint calculations. Also, the inspectors determined that for the sampling selected, the calculations revised under current design standards did not contain errors. The licensee's extent of condition review in this area was sufficient, except in one aspect. This dealt with the scope of the calculation upgrade program not evaluating for differences between the calculation assumptions/results and the as-built facility.

.4 Independent Assessment for Licensing Bases Issues Similar to the Tornado Mitigation Strategy

The inspectors performed an independent assessment for licensing bases issues, similar to the tornado mitigation strategy, for which a clear licensing bases did not exist. The same licensee processes that identified or were used to review tornado mitigation licensing bases concerns were reviewed. This included open issues from the Oconee Safety Related Designation and Clarification Project (OSRDCP), SITA 96-17 that identified licensing bases questions about the HPI/SFP involvement in tornado mitigation, and PIPs stemming from that audit. A joint interview with the design bases group manager and the regulatory compliance manager was held to discuss outstanding licensing bases issues that were requiring extensive long-term debate to ascertain the licensing bases. Also, PIPs generated by the licensee's EOP/AP upgrade project were reviewed for other unclear outstanding licensing bases issues.

The interview with the design bases group manager and the regulatory compliance manager identified numerous areas where the licensing basis was unclear to the licensee. Areas included main control room habitability and the EFW system. As documented in engineering department project plans, the licensee was taking actions to resolve these areas. Also, a large number of UFSAR changes had been initiated in recent years, partially to clarify the licensee's understanding of the licensing bases.

The inspectors found that all of the OSRDCP outstanding issues were being resolved by the licensee. Further, the inspectors found that PIPs from the EOP/AP upgrade program did not contain similar licensing bases concerns that were not already known to the NRC through previous licensee event reports or inspection reports, and there were no other outstanding licensing bases issues from SITA 96-17. The inspectors did not identify any licensing bases issues, similar to the tornado mitigation strategy, which were unclear to the licensee and clarification actions were not underway.

Assessment

The inspectors determined that the licensee was appropriately addressing known licensing basis issues similar in nature to the tornado mitigation strategy.

.5 Independent Assessment of Time Critical Operator Actions

The inspectors performed an independent assessment of several time critical operator actions to determine if the performance deficiency that led to the ASW pump alignment issue involving the V&V process had impacted other risk important actions. Selected APs were reviewed and walked down to determine if the procedure steps could be performed as written and in the required time. Also, the inspectors determined if the actions and plant equipment were physically capable of being accomplished under the circumstances postulated for the related plant event. The following APs and listed areas/actions were selected for this review:

- AP/1/A/1700/011, Loss of Power, (tornado mitigation, failure to recover from 4 KV breaker failure (SSF failure), recover 600 V load centers X1, X2, & X3)

- AP/0/A/1700/025, Standby Shutdown Facility, (route SSF diesel generator service water discharge within a 15 minute window one hour and 50 minutes into a loss of power, after SSF diesel generator fails restore power to the SSF from Unit 2 during a flood or non-flood condition)

- AP/1/A/1700/019, Loss of Main Feedwater, (swap EFW recirculation from hotwell to USTs following a loadshed, align EFW pump suctions to the hotwell)

- AP/1/A/1700/024, Loss of LPSW/SSW, (cross-connecting low pressure service water before condenser circulating water overheats)

Assessment

The inspectors generally found that each of the time critical operator actions reviewed could be performed as written and in the time frame required. The inspectors also determined that the actions/equipment were physically capable of being accomplished and accessible under the circumstances postulated for the event.

3.0 Management Meetings

The inspectors discussed the preliminary results of the inspection on October 5, 2001, with Mr. B. Hamilton, Engineering Manager, and other members of licensee management and staff. Subsequent to the preliminary exit, an additional inspection exit was conducted on October 16, 2001, between Mr. V. McCree, Acting Director of the Division of Reactor Projects and Mr. W. McCollum, Site Vice-President and other members of licensee management and staff. In addition, a public regulatory performance meeting at the licensee's information center was conducted on October 19, 2001, which presented the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

E. Burchfield, Design Basis Group Manager
D. Coyle, Operations Procedures Manager
D. Garland, Operations Support
G. Gilbert, Catawba Regulatory Compliance Manager (Leader - Root Cause Evaluation Team)
W. Grayson, Mechanical Engineer
R. Hester, Civil/Mechanical Engineer
L. Kanipe, General Office Risk Analyst
G. McAninch, Design Basis Engineer
K. McMurray, Operations Support Supervisor
L. Nicholson, Regulatory Compliance Manager
J. Smith, Regulatory Compliance Technician
M. Standridge, Catawba Safety Review Group (Root Cause Evaluation Team)
G. Swindelhurst, Nuclear General Office Engineering
J. Weast, Regulatory Compliance Engineer

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-269,270,287/01-09-01	URI	Establishment of Pressurizer Code Safety Relief Valves to Pass Water in Excess of 500°F and Then Reseat (Section 02.04.1)

Closed

50-269,270,287/01-03-03	VIO	Failure to Promptly Correct Tornado Mitigation Procedures to Ensure the Station Auxiliary Service Water Pump Could be Aligned Within 40 Minutes of a Design Basis Tornado (Section 02.03)

Opened and Closed

50-269,270/01-09-02	NCV	Failure to Ensure Control Room Doors Would Open to Relieve Pressure (Section 02.04.3)

Discussed

50-269,270,287/01-08-02	URI	Steam Generator Tube Stresses Resulting From Use of the Station ASW Pump (Section 02.04.1)
50-269,270,287/01-08-03	URI	Operator Access to Steam Generator Atmospheric Dump Valves to Mitigate a Tornado (Section 02.04.1)

DOCUMENTS REVIEWED

Sections 02.01 through 02.03

UFSAR Section 3.2.2 (Change Package Number 01-12, dated 8/14/01)
EDM - 101, Engineering Calculations/Analysis, Rev. 10
NSD - 514, Control of Time Critical Tasks, Rev. 0
NSD 703, Administrative Instructions for Technical Procedures, Rev. 22
EP/1,2,3/1800/01, Emergency Operation Procedure, Rev. 29D (draft A)
AP/1/1700/011, Loss of Power, Rev. 23 and 27
AP/0/1700/006, Natural Disaster, Rev. 0
AP/1/1700/006, Natural Disaster, Rev. 5 (change 1) and 7
NSD - 212, Cause Analysis, Rev. 9
NSD - 208, Problem Investigation Process, Rev. 22
OMP 4-6, Use of Operations Guidelines, Rev. 1
Root Cause Failure Analysis Report, Rev. 2 (PIP O-01-02791)
Tornado Design Basis Project Plan, dated 9/24/01

PIP O-95-01192
PIP O-95-01341
PIP O-98-00148
PIP O-99-00115
PIP O-99-00902
PIP O-00-00363
PIP O-01-00455
PIP O-01-00940
PIP O-01-01225
PIP O-01-02827

Section 02.04.1

AP/0/A/1700/06, Natural Disaster, Rev. 0
AP/1/A/1700/011, Loss of Power, Rev. 27
OSC-2262, Tornado Protection Analysis, Rev. 2
OSC-3873, Hydraulic Model of HPI System with suction from the Spent Fuel Pool, Rev. 4
OSC-4989, ASW Hydraulic Model, Rev. 3
OSC-5125, ASW NPSH Analysis, Rev 2
Graph of Spent Fuel Pool Temperatures 1989 - 2001
PIP O-01-0940
PIP O-00-3641
PIP O-00-0363
PIP O-01-1225
PIP O-01-3651
PIP O-01-2598
PIP O-01-2827

Section 02.04.2

AP/1/A/1700/10, Uncontrollable Flooding of the Turbine Building, Rev. 4
OMP 4-02, Enclosure 9.8
Letter from Tucker (Duke) to Denton (NRC), dated 4/28/86
OSC-2319 Circulating Cooling Water System Hydraulic Transient Analysis and Turbine Building Flood Study
OSC-1732, Design of Modifications to Mitigate the Consequences of a Turbine Building Flood, Rev. 10
PIP O-01-0731
PIP O-01-2667
PIP O-01-3487
PIP O-01-1887

Section 02.04.3

OSC-5227, Verification of Assumption Used For Tornado Pressure Relief Vent Sizing
OSC-5125, ASW NPSH Analysis, Rev. 2
OSC-4989, Auxiliary Service Water System Hydraulic Model, Rev. 3
OSC-005, Tornado Design for Main Control Room and Spent Fuel Pool Room
OSC-0619, Analysis for use of Spent Fuel Pool Inventory for SSF, Rev. 0

OSC-3174, Auxiliary Service Water Minimum Flow Type III
OSC-2042, HPI Pump Motor Bearing Cooling Report, Rev. 3
OSC-2784, Oconee Fouled Coolers/High Lake Temperature Equipment Qualification Evaluation, Rev. 2
OSC-6895, Delay Analysis for the Essential Siphon Vacuum Pump Restart, Rev. 0
ONS Calculation Enhancement Project Calculation Review Matrix for OSC-005
PIP O-99-2881
PIP O-99-4246
PIP O-01-3662
PIP O-98-3493
PIP O-99-2793

Section 02.04.4

Root Cause Failure Analysis Report, Rev. 2 (PIP O-01-02791)
Graph of Final Safety Analysis Report Changes 1995 - 2000
2000 Updated Final Safety Analysis Report Revision Tracking System Listing
Status Report OSRDCP Outstanding Issues
Self Initiated Technical Audit 96-17
PIP O-96-0579
PIP O-96-0580
PIP O-96-0690
PIP O-96-0864
PIP O-96-1039
PIP O-96-1040
PIP O-96-1041
PIP O-96-1042
PIP O-96-1043
PIP O-96-1044
PIP O-96-1045
PIP O-96-1046
PIP O-96-1047
PIP O-96-1048

Section 02.04.5

SA-01-67, Investigation of Degraded Mitigation Systems Cornerstone
OP/0/A/1102/024, Operational Guidelines Following Fire in Auxiliary Building, Turbine Building or Vital Area, Rev. 023
AP/1/A/1700/011, Loss of Power (Enclosure 6.9), Rev. 023
AP/1/A/1700/011, Loss of Power (Enclosure 6.9), Rev. 023B
AP/1/A/1700/011, Loss of Power, Rev. 027
AP/0/A/1700/025, Standby Shutdown Facility, Rev. 018
AP/1/A/1700/019, Loss of Main Feedwater, Rev. 012
AP/1/A/1700/024, Loss of LPSW/SSW, Rev. 010
NSD 514, Control of Time Critical Tasks, Rev. 0
NSD 703, Administrative Instructions for Technical Procedures, Rev. 22
NSD 704, Technical Procedure Use and Adherence, Rev. 9
NSD 705, Instructions for the Verification and Validation of Technical Procedures, Rev. 1

Calculation OSC-7460, Time Critical Operator Actions, Rev. 0
Calculation OSC-2322, Standby Shutdown Facility, Rev. 6
Specification OSS-0254.00-00-4005, Design Basis Specification for the Design Basis Events, Rev. 5
PIP O-99-04999
PIP O-00-00124
PIP O-00-00623
PIP O-00-04080
PIP O-01-03622