APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-382/91-14 Operating License: NPF-38

Docket: 50-382

Licensee: Entergy Operations, Inc. (Entergy)

Facility Name: Waterford 3 Steam Electric Station

Inspection At: Waterford 3, Killona, Louisiana

Inspection Conducted: April 22-26, 1991

Inspectors: H. F. Bundy, Reactor Inspector, Test Programs Section
Division of Reactor Safety
D. A. Powers, Senior Reactor Inspector, Test Programs Section
Division of Reactor Safety

Approved: for T. F. Gwynn 5/9/91
R. D. Seidle, Chief, Test Programs Section Date
Division of Reactor Safety

Inspection Summary

Inspection Conducted April 22-26, 1991 (Report 50-382/91-14)

Area Inspected: Routine, announced inspection of the licensee's programmed enhancements in response to Generic Letter (GL) 88-17 [loss of decay heat removal (DHR)].

Results: The licensee's actions were generally responsive to the GL 88-17 programmed enhancement recommendations. The licensee's program exhibited the following strengths:

- Well designed and installed level instruments with large reactor coolant system level displays in the control room to enhance operator awareness
- Capability to trend in the control room numerous parameters related to shutdown cooling.
- Comprehensive administrative procedures and controls
- Comprehensive off-normal procedure for recovery from loss of shutdown cooling

- Assignment of a reactor operator dedicated to monitoring parameters and activities associated with shutdown cooling during the draining evolution and while on reduced inventory

- Establishment of an outage risk assessment task group

- Comprehensive, clearly descriptive, and pertinent engineering analyses

- Performance of an internal audit to determine responsiveness to GL 88-17

- Performance of Testing to determine the positions of the shutdown cooling loop flow control valves, which would preclude runout of the shutdown cooling pumps

- Performance of training on the plant simulator to identify the characteristics of shutdown cooling pump cavitation to licensed operators

The following were identified in the Generic Letter as items for potential improvement, but had not been incorporated by the licensee. The licensee committed to re-review these items.

- Installation of a high core exit temperature alarm (Open Item 382/9114-01, paragraph 2.2)

- Installation of alarms to detect approaching loss of shutdown cooling (Open Item 382/9114-02, paragraph 2.2)

Additionally, the inspectors found inconsistencies in the licensee's assumptions and their analysis of the time available to isolate the containment. As a result, the licensee committed to reconsider the potential hostile containment environmental conditions after loss of DHR in procedures and training (Open Item 382/9114-03, paragraph 2.2)

Two observations by the inspectors were discussed in paragraph 2.2 for the licensee's consideration and action, if deemed appropriate.

No violations or deviations were identified.

DETAILS

1. PERSONS CONTACTED

ENTERGY

*J. Houghtaling, Director, Modifications and Construction
*R. G. Azzarello, Director, Engineering
*R. F. Burski, Director, Nuclear Safety
*J. McGaha, Plant Manager
*D. F. Packer, Manager, Operations and Maintenance
*P. V. Prasankumar, Manager, Technical Services
*T. P. Brennan, Manager, Design Engineering
*G. M. Davis, Manager, Event Analysis
*G. Davie, Manager, Operations Assessment and Information Dissemination
*D. Schultz, Assistant Operations Superintendent
*C. Fugate, Shift Supervisor, Operations
J. O'Hern, Training Supervisor, Operations
K. T. Walsh, Event Analysis and Reporting Supervisor
F. A. Gropp, Supervisor Mechanical, System Engineering
*O. P. Bulich, Supervisor Mechanical/Civil, Design Engineering
*M. C. Murray, Engineer, Modification Management
*R. Prados, Senior Engineer, Licensing
*P. A. Sicord, Engineer III, Safety and Engineering Analysis
M. Devlin, Control Room Supervisor
*J. Gavigan, System Engineer, Safety Injection
T. Watkins, System Engineer, Reactor Coolant System
*D. W. Gamble, Instrumentation and Control Design Engineer

NRC
*S. D. Butler, Resident Inspector

The inspectors also interviewed other licensee employees during the inspection.

*Denotes those attending the exit meeting on April 26, 1991.

2. PROGRAMMED ENHANCEMENTS IN RESPONSE TO GENERIC LETTER 88-17 - LOSS OF DECAY HEAT REMOVAL (TI 2515/103)

2.1 Generic Letter 88-17 Recommendations and Inspection Scope

Generic Letter (GL) 88-17 provided recommended licensee actions to prevent and, if necessary, to respond to loss of decay heat removal (DHR) during operations with the reactor coolant system (RCS) partially drained.

Recommendations were made by GL 88-17 in two categories:

- Expeditious actions, which were to be implemented prior to operating in a reduced inventory conditions, and

- Programmed enhancements, which were to be developed in parallel with the expeditious actions and were to replace, supplement, or add to the expeditious actions.

The NRC's review of the licensee's expeditious actions was documented in NRC Inspection Report 50-382/89-13. The purpose of this inspection was to ascertain completion of programmed enhancements. For the purpose of future reference, the programmed enhancement recommendations are briefly paraphrased below (to avoid confusion, the numbers are identical to similar items contained in GL 88-17):

Programmed Enhancements

(1) Instrumentation

Provide reliable indications of parameters that describe the state of the RCS and the performance of systems normally used to cool the RCS for both normal and accident conditions. At a minimum, provide the following in the control room:

- Two independent RCS level indications;
- At least two independent temperature measurements representative of the core exit temperature whenever the reactor vessel (RV) head is located on top of the RV;
- The capability of continuously monitoring DHR system performance whenever a DHR system is being used for cooling the RCS; and
- Visible and audible indications of abnormal conditions in temperature, level, and DHR performance.

(2) Procedures

Develop and implement procedures that cover reduced inventory operation and that provide an adequate basis of entry into a reduced inventory condition. These include:

- Procedures that cover normal operation of the nuclear steam supply system (NSSS), the containment, and supporting systems under conditions for which cooling would normally be provided by DHR systems;
- Procedures that cover emergency, abnormal, off-normal, or the equivalent operations of the NSSS, the containment, and supporting systems if an off-normal condition occurs while operating under conditions for which cooling would normally be provided by DHR systems; and
- Administrative controls that support and supplement the procedures and all other actions identified in this communication, as appropriate.

(3) Equipment

- Provide equipment of high reliability for cooling the RCS and avoiding loss of RCS cooling;

- Maintain equipment available to mitigate loss of DHR or loss of RCS inventory should either occur, including at least one high-pressure injection pump and one other system, each sufficient to keep the core covered; and

- Provide adequate equipment for personnel communications involving activities related to the RCS or systems necessary to maintain the RCS in a stable and controlled condition.

(4) Analyses

Conduct analyses to supplement existing information and develop a basis for procedures, instrumentation installation and response, and equipment/NSSS interactions and response.

(5) Technical Specifications

Technical Specifications (TS) that restrict or limit the safety benefit of the actions identified in this letter should be identified, and appropriate changes should be submitted.

(6) RCS Perturbations

Reexamine item (5) of expeditious actions and refine operations as necessary to minimize reasonably the likelihood of loss of DHR.

2.2 Licensee's Actions in Response to GL 88-17 Programmed Enhancement Recommendations (TI 2515/103)

The inspectors' comments on the licensee's actions are provided below.

The Attachment is a tabulation or related documents reviewed by the inspectors. When a document is cited below, it will be the number assigned in the Attachment. In addition to reviewing the listed documents and interviewing appropriate personnel, the inspectors walked down installed instrumentation and equipment. The terms DHR and shutdown cooling (SDC) may be considered synonymous.

The inspectors reviewed the licensee's responses to GL 88-17 and followup questions, which were reflected in Documents 1, 2, and 6. The GL 88-17 recommendations and followup of NRC questions were sufficiently addressed with the specific exceptions discussed below. This inspection comprises the NRC review of the licensee's programmed enhancements, which were discussed in Document 7. However, the written notifications requested in Document 7 remain appropriate.

The inspectors' identified the following strengths in the licensee's program:

- Level instrumentation - There were "score board" displays in the control room for RCS level when at reduced inventory. Narrow range signals were provided by each of the two level instruments. This provided an enhanced awareness of RCS level by anyone in the control room. During the walkdown, the inspectors noted the level instruments reflected good design and craftsmanship.

- Trending Capability - Numerous parameters pertaining to SDC could be trended on cathode ray tubes (CRTs) and strip chart recorders in the control room.

- Administrative Procedures and Controls - They appeared comprehensive and well written. However, it was recognized that they must be updated to reflect the new instrumentation which was being installed.

- Off-Normal Procedure - With one exception, which is discussed below, the off-normal procedure for recovery from loss of SDC was comprehensive and well written.

- Drain Down Operator - A licensed reactor operator, with no other duties, was assigned to monitor parameters and activities associated with SDC during the draining evolution and while on reduced inventory. This precluded undesired events caused by operator distraction.

- Outage Risk Assessment Task Group - A task group with representatives from appropriate technical groups met periodically to discuss outage risks in general and loss of SDC risks in particular. Appropriate action items were assigned to ameliorate identified risks.

- Internal Audit - The licensee performed an internal audit to NRC temporary Instruction (TI) 2515/103, "Loss of DHR (GL 88-17) 10 CFR 50.54(f) Programmed Enhancements (Long Term) Review." It was apparent that actions resulting from this audit had improved the licensee's understanding of loss of DHR issues.

- SDC Pump Testing - Several of the SDC system flow control valves failed open on loss of control air. The licensee had performed testing to determine the limiting positions of the fail-as-is SDC loop flow control valves to prevent pump runout. A change had been made to the administrative procedure to require positioning of these valves prior to going to SDC.

- SDC Pump Cavitation Training - Conditions for cavitation of the SDC pumps had been modeled on the plant simulator. The training department had prepared scenarios, and licensed operators were being trained to recognize cavitation.

The inspectors identified the following potential improvement items:

- Installation of a High-Core Exit Temperature (CET) Alarm - The availability of a high CET alarm is a specific GL 88-17 recommendation.

There were no CET alarms at Waterford 3. The licensee agreed at the exit meeting to reevaluate installation of an alarm. Completion of this evaluation will be tracked as Open Item 382/9114-01.

- Installation of Alarms to Detect Approaching Loss of SDC - The procedures required monitoring SDC flow and SDC pump motor current in the control room to detect approaching loss of SDC. There where no useful alarms for detecting the anomalies which would be expected for an incipient loss of SDC. GL 88-17 recommends that alarms be installed for parameters important to SDC pump performance. The licensee agreed at the exit meeting to reevaluate installation of appropriate alarms. Completion of this evaluation will be tracked as Open Item 382/9114-02.

- Consideration of Potential Hostile Containment Environmental Conditions After Loss of DHR - The procedures emphasized closure of containment within 1.5 hours following loss of SDC. This figure was based on the minimum time to uncover the core. The licensee's analysis (Document 8) indicated that the containment could become uninhabitable in less than 30 minutes in the most adverse containment cooling conditions. The licensee agreed at the exit meeting to evaluate incorporating appropriate guidelines for dealing with hostile containment environmental conditions into the procedures and training. Completion of this evaluation will be tracked as Open Item 382/9114-03.

The following observations by the inspectors were discussed with the licensee for its consideration and action, if deemed appropriate:

- Incorrect Readings of RCS Level Displays in the Control Room - The inspectors observed high, but different readings on the RCS level "score board" displays. It turned out the instruments were over-ranged high. The inspectors made the observation that this information might be incorrectly interpreted. The licensee indicated that it was working on correcting this problem.

- Scaffolding Not Optimally Placed - The inspectors observed that the scaffolding was not optimally placed for venting the suction line of a SDC pump. The licensee was urged to verify that all necessary scaffolding or ladders for venting are properly placed prior to using SDC.

2.2.1 Instrumentation

2.2.1.1 Level Instrumentation

The variable leg sensing lines for both RCS level instruments came from a common hot leg tap. A Tygon hose sight gauge also was connected to this common tap. The licensee justified using this common tap in a meeting (Document 3) and a letter (Document 4). The NRC approved use of this common tap by a letter to the licensee (Document 5). The inspectors walked down the completed level instrument installation and had no further concerns. The design and craftsmanship of the installed instruments appeared to be good.

In accordance with Document 6, the licensee took credit for the refueling water level indication system (RWLIS) and reactor coolant shutdown level measurement system (RCSLMS) as the two independent, continuous level indications recommended by GL 88-17. The RWLIS utilized two differential pressure transmitters for providing signals to wide and narrow range gauges both locally and in the control room. Also, a narrow range signal was provided to a "score board" display in the control room. The center line of the hot leg was located at 13 feet 4½ inches MSL. The licensee considered 18 feet to be reduced inventory. The vessel flange was at 20 feet. The narrow range gauge indicated 12 feet to 16 feet and the wide range gauge indicated 12 feet to 48 feet.

The RCSLMS was recently installed and was not fully operational. It incorporated a sight gauge with a range of 12 feet to 30 feet and a thermal dispersion principal transmitter with a range of 12 feet to 18 feet. The transmitter provided signals to a local gauge and a control board gauge plus the "score board" display in the control room.

Also, a Tygon hose sight gauge from the same hot leg tap was available. It was called the refueling level indication system. The markings were clearly visible on the biological shield wall.

In addition, a heated junction thermocouple system provided control room RCS level indication at eight discrete points from the fuel alignment plate to near the top of the head. One point was located just above the hot leg centerline.

Control room low-level alarms were actuated by both RWLIS and RCSLMS. In addition, the RWLIS annunciator was also actuated by a high alarm.

During the walkdown, the inspectors observed high, but different level readings on the "score board" displays. It turned out that both instruments were over-ranged high. The inspectors made the observation that this information might be incorrectly interpreted. The licensee indicated that it was working on correcting this problem. The inspectors observed that these displays should contribute to and enhanced awareness of RCS level during reduced inventory operations.

Considering the diversity of RCS level instrumentation available and the checks and comparisons procedurally required, it was concluded that the level instrumentation was responsive to GL 88-17 recommendations.

2.2.1.2 Core Exit Temperature (CET) Monitoring

By using temporary patch cables, the licensee was monitoring at least two independent CETs anytime the head was on the reactor vessel (RV). These temperatures could be read or trended at several monitors in the control room. Because administrative procedures required the head to be on the RV at all times in reduced inventory, there would be no reduced inventory operations without CET monitoring. The licensee did not have the capability of monitoring CET with the head removed. This satisfies the GL-88-17 recommendation for monitoring CET. However, as discussed below, no CET high alarm was available.

2.2.1.3 SDC System Monitoring

There was considerable flexibility for monitoring critical SDC parameters. Most parameters could be monitored on two independent, qualified safety parameter display system (QSPDS) CRTs. In addition, signals could be sent from the plant computer to several CRTs and four 2-pen strip chart recorders. Parameters could be trended on the CRTs. The trending capabilities were considered a strength. The following monitored parameters related to SDC performance:

- SDC heat exchanger inlet and outlet temperatures
- SDC heat exchanger inlet pressure
- RCS pressure Guide (wide range)
- Temperature of SDC flow to the low-pressure safety injection (LPSI) header
- LPSI header pressure
- Total SDC flow rate
- LPSI (SDC) pump motor amperage

The monitoring of the above parameters was considered responsive to GL 88-17.

2.2.1.4 Visible and Audible Indications of Abnormal Conditions

As discussed above, the capability for trending a large number of SDC parameters is beneficial for detecting abnormal conditions. Also, as described in Document 2, there are many visual and audible alarms for failure of SDC equipment. However, as discussed in the guidance to GL 88-17, the intent is to have alarms which indicate an approach to a loss of DHR condition. In this regard, the inspectors identified the following potential improvement items:

- There were no high alarms for CET. This was also a specific GL 88-17 recommendation. The licensee agreed at the exit meeting to reevaluate installation of an alarm. Completion of this evaluation will be tracked as Open Item 382/9114-01.

- Licensee procedures required monitoring SDC flow and SDC pump motor current in the control room to detect approaching loss of SDC. There were no useful alarms for detecting the anomalies which would be expected. The licensee agreed at the exit meeting to reevaluate installation of appropriate alarms. Completion of this evaluation will be tracked as Open Item 382/9114-02.

With the above exceptions, the licensee's visible and audible indications of abnormal conditions appeared acceptable.

2.2.2 Procedures

The inspectors reviewed various letters, memoranda, and procedures (see Attachment) as well as interviewing plant personnel to ascertain the licensee's responsiveness to the GL 88-17 recommendation. The inspectors were favorable

impressed by the knowledge and sensitivity of the staff to loss of SDC concerns. In general, the licensee's procedures and administrative controls were considered a strength. Specific strengths noted were as follows:

- Administrative procedures and controls appeared comprehensive and well written. However, it was recognized that they must be updated to reflect new instrumentation which was being installed.

- With one exception, which is discussed below, the off-normal procedure for loss of SDC was comprehensive and well written.

- A reactor operator, with no other duties, was assigned to monitor parameters and activities associated with SDC during the draining operation and while in a reduced inventory condition. This precluded undesired events caused by operator distraction. The inspectors were informed that it was also the policy to have a plant management representative present during the draining evolution.

- An outage risk assessment task group with representatives from appropriate technical groups met periodically to discuss outage risks in general and the loss of SDC risks in particular. Appropriate action items were assigned to ameliorate identified risks.

The inspectors identified a potential improvement item associated with Document 10. It was noted that this procedure emphasized closure of containment within 1½ hours following loss of SDC. This figure was based on minimum time to uncover the core. The licensee's analysis (Document 8) indicated that the containment could become uninhabitable in less than 30 minutes in the most adverse containment cooling conditions. The licensee agreed at the exit meeting to evaluate incorporating appropriate guidelines for dealing with hostile containment environmental conditions into the procedures and training. Completion of this evaluation will be tracked as Open Item 382/9114-03.

2.2.3 Equipment

The equipment available for cooling the RCS and avoiding loss of RCS cooling satisfied the GL 88-17 recommendation. Procedures required availability of two high-pressure safety injection pumps and a LPSI pump for emergency makeup. Additional backup capability was provided by changing pumps.

For SDC communications, the licensee used the plant telephone system (PABX) and portable radios. The Waterford 3 nuclear operations support and assessment organization had verified the effectiveness of this equipment during an outage for reactor coolant pump seal maintenance. This satisfied GL 88-17 recommendations.

During a walkdown of equipment in a SDC pump room, the inspectors observed that the scaffolding was not optimally placed for venting the suction line of a SDC pump. The licensee was urged to verify that all necessary scaffolding or ladders for venting are properly placed prior to using SDC.

2.2.4 Analysis

The inspector reviewed select calculations that are referenced in the Attachment and that were considered to be design basis documents necessary to support non-power operation in accordance with the programmed enhancements of GL 88-17. The calculations included considerations such as reactor coolant system (RCS) heatup rate, pressurization, time until the onset of coolant boiling, and time to uncover the core upon loss of SDC.

By reviewing these calculations, the inspector verified that various administrative control requirements were adequately supported by calculational bases. The licensee's data input assumptions, references, and calculational methods were found to be comprehensive, clearly descriptive, and pertinent. The licensee's analyses, in general, revealed a good engineering and operational understanding of the risks associated with the loss of SDC. Some of the analyses were designed to yield conservative results; whereas, other analyses employed expected system availabilities and hence resulted in "best-estimate" results. All of the licensee's analyses utilized 1979 American Nuclear Society (ANS) standard curves for decay heat. From a review of a sampling of the analyses, the inspector determined there had been independent reviews and approvals of the analyses by other individuals in the engineering department.

One of the licensee's noteworthy activities was the Waterford 3 shutdown cooling task force (currently referred to as the outage risk assessment task group) request to have an internal audit performed of the SDC program as it related to the inspection attributes given in TI 2515/103. The resulting audit was performed by Nuclear Operation Support and Assessment (NOSA). The audit findings, which were issued on May 21, 1990, found 10 potential deficiencies. In general, the audit's potential deficiencies were not atypical of the findings resulting from NRC inspections at other utilities. The licensee's outage risk assessment task group closed out the open items of the audit on April 12, 1991.

2.2.5 TS Changes

The inspector reviewed Entergy letters that proposed an amendment to the TS. The single amendment request was the only TS change request that was proposed in response to GL 88-17. The proposal described the deletion of the automatic closure interlock (ACI) on the isolation suction valves of the SDC system and the corresponding requirement for ACI surveillance testing. The proposal also requested that the TS explicitly identify the testing of the SDC system isolation valve position alarms and the open permissive interlock. The amendment request appeared reasonable, and no additional necessary TS changes were identified by the inspector.

As discussed in the proposal, the licensee concluded that during SDC system operation, the ACI provided a potential for inadvertent closure of the system isolation valve. The licensee found that if ACI actuation occurred, (a) the SDC pressure relief valves would not be available to assist in relieving reactor coolant system (RCS) over-pressure transients, (b) loss of decay heat removal would occur, and (c) possible SDC pump damage would ensue. The

licensee proposed the amendment following consultation with the Combustion Engineering Owners' Group. From an SDC system unavailability analysis for an interfacing systems loss-of-coolant accident, it was found that the SDC unavailability was improved with the removal of the ACI. Specifically for Waterford 3 the risk analysis showed that removing the ACI decreased both SDC system and low-temperature over-pressure protection unavailability by 39 percent.

The inspector noted that the proposal had been approved by the Office of Nuclear Reactor Regulation on January 9, 1991.

2.2.6 RCS Perturbations

The inspector determined that the licensee has implemented administrative controls on activities that could effect RCS perturbations when the SDC system was in service. These controls have been implemented by procedure and include specific measures to ensure that SDC operation will not be interrupted. Operational aspects that the licensee has provided for included the requirement for a dedicated operator during RCS drain down operations, restrictions on RCS level and drain down rate, and establishing system flow controls. In regard to the latter aspect, the licensee conducted an operational test to determine what SDC system flow rate would cause pump cavitation in the event of a maximum transient flow situation. Such a situation corresponded to an inadvertent failure to the fully open position of the SDC pump discharge header control valves and the shutdown heat exchanger outlet header flow control valves. The licensee's special test established the throttling positions of each train of the SDC header to RCS loop flow control valves that will limit flow to acceptable levels, which are less than 4100 gpm. The licensee's procedures required setting these flow control valves to the corresponding positions when mid-loop operations are to be undertaken.

The inspector reviewed records related to the most recent SDC training. The scope of the training covered Waterford 3 specific hardware and procedures and also included industry-related events. The inspector was informed that operator training on the simulator has been enhanced by the addition of software that allows the simulation of SDC pump cavitation. Records showed that SDC training was recently given to licensed and non-licensed operators and other selected individuals from operations and maintenance staffs. The inspector was told that the training staff recommended that operators who fail to attend such SDC training within the past six months be removed from control room watch duties. The licensee representative stated that all licensed operators who had not received the most recent SDC training were those who had intentionally decided to let their licenses expire. The inspector reviewed attendance records for all operators scheduled on shift on May 24, 1991, and found that all had attended the most recent SDC training that was given within the past six months.

2.2.7 Summary of Inspector Findings

No violations, unresolved items, or deviations were identified. Two open items are discussed in paragraph 2.2.1.4. One open item is discussed in paragraph 2.2.2. Licensee response to GL 88-17 was comprehensive except for the three specifics covered by the three open items.

3. EXIT MEETING

The inspectors met with licensee representatives denoted in paragraph 1 on April 26, 1991, and summarized the scope and findings of this inspection. Mr. Bundy also had a telephone conversation with a licensing representative of Entergy on May 1, 1991, to learn the dates by which the evaluations discussed in the section 2.2 for the open items discussed would be completed. The licensee did not identify, as proprietary, any of the material provided to, or reviewed by, the inspectors during the inspection.

ATTACHMENT

DOCUMENTS REVIEWED

1. Letter W3P88-3091, LP&L (Now Entergy) to NRC, "GL 88-17, Loss of DHR Response to Expeditious Actions," dated December 23, 1988

2. Letter W3P89-0101, LP&L to NRC, "GL 88-17, Loss of DHR Response to Programmed Enhancements," dated February 1, 1989

3. Letter, NRC to LP&L, "Summary of Meeting Held on May 10, 1990, with LP&L to Discuss the Use of Common Tap for RV Level Indication," dated May 18, 1990

4. Letter W3P90-1314, LP&L to NRC, "WAT3 SDC level Indication System Taps," dated May 21, 1990

5. Letter, NRC to Entergy (Formerly LP&L), "SDC Level Indication system Taps, dated June 15, 1990

6. Letter W3P90-1526, Entergy to NRC, "WAT3 Status Update of GL 88-17, Programmed Enhancements," dated November 1, 1990

7. Letter, NRC to Engergy, "Programmed Enhancements for GL 88-17, Loss of DHR," dated December 11, 1990

8. Memorandum W3B90-1045, J. B. Holman to R. S. Starkey, "Consideration of Potential Hostile Containment Conditions After Loss of SDC," dated September 18, 1990

9. Procedure OP-001-003, "System Operating Procedure Reactor Coolant system Drain Down," Revision 12, Change 2, dated April 15, 1991

10. Procedure OP-901-046, "Off-Normal Operating Procedure Shutdown Cooling Malfuction," Revision 7, approved March 12, 1991

11. Engineering Calculation (EC) 582-001, "Recovery from Loss of SDC," Revision 0, approved Septemoer 15, 1989

12. Memorandum W3C1-91-0002, J. B. Holman to D. F. Packer, "Steam Generator Nozzle Dam Use; Loss of SDC Concerns," dated January 4, 1991

13. Procedure OP-009-005, "Shutdown Cooling System," Revision 11

14. Entergy Operations Letter W3P90-0234, "Technical Specification Change Request NPF-38-108," dated July 25, 1990, R. Barkhurst to Document Control Desk (DCD)

15. Entergy Operations Letter W3P90-1509, "Technical Specification Change Request (TSCR) NPF-38-108," dated October 12, 1990, R. Burski to DCD

16. Entergy Operations Letter W3P90-1528, "Technical Specification Change Request (TSCR) NPF-38-108," dated November 7, 1990, R. Burski to DCD

17. NRC Letter, "Issuance of Amendment No. 65 to Facility Operating License NPF-38 Waterford Steam Electric Station, Unit 3 (TAC No. 77259)," dated January 9, 1991, D. Wigginton to R. Barkhurst

18. Inter-Office Correspondence (IOC), "Audit of Loss of DHR Prevention Program," dated May 21, 1990, D. Baker to J. McGaha

19. IOC, "Shutdown Cooling Audit by NRC," dated April 12, 1991, G. Davie and D. Thorpe to Distribution

20. Lesson Plan (LP), "RCS Drain Down Procedure," No. ZREQ-813-00, approved March 23, 1989

21. LP, "Loss of Shutdown Cooling (Refueling-Related Off-Normal Operating Procedures)," No. ZREQ-821-00, approved March 23, 1989

22. LP, "Industry Operating Experience in Reduced RCS Inventory Condition," No. ZREQ-822-00, approved March 23, 1989

23. Special Test Procedure 01074040, Rev. 0, "Test to Establish SDC Flow Limitation"

24. EC S89-006, Rev. 0, "Loss of Shutdown Cooling: Time to Uncover Core if Vessel Head Removed," approved August 28, 1989

25. EC M89-010, Rev. 0, "Loss of SDC: HPSI Decay Heat Removal and RCS Heatup," approved September 14, 1989

26. EC M88-012, Rev. 2, "Loss of Shutdown Cooling Scenario: Pressurizer Manway Venting," approved September 12, 1989