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QA

February 28, 1992

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Response to NRC Safety Evaluation Report (SER) on
Station Blackout (SBO)

Dear Gentlemen:

Entergy Operations Inc., Waterford 3, has reviewed the NRC SER on SBO. The Waterford 3 response is herein provided.

Waterford 3 concurs with the SER and the NRC recommendations with the clarifications herein provided. A response is provided for each NRC recommendation as well as for any text of the SER which we believe requires clarification. Additional information which has been identified as required for the resolution of SER items will be provided to the NRC by June 1, 1992. Specific dates have been identified for the completion of Waterford 3 follow-up actions such as procedural changes or the performance of confirmatory analyses.

Waterford 3 is planning to replace the 1E batteries (3A-S, 3B-S, and 3AB-S) by the end of refuel 5, currently scheduled for September 19, 1992 with new batteries of a similar type and capacity. A reduced life will be established by the end of refuel 5 for the new batteries 3A-S and 3B-S to satisfy a design margin of 1.10 and an electrolyte temperature of 70°F. The 3AB DC system will be modified by the end of refuel 6 to satisfy a design margin of 1.10.

Waterford 3 would also like to apprise the NRC the SBO evaluation of record may be revised in order to address Waterford 3's continuing reviews aimed at enhancing the documentation. The NRC will be apprised in the event that any documentation change would materially affect the results or conclusions of the SER.

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Please contact me or Robert J. Murillo should the NRC have any questions regarding this submittal.

Very truly yours,

R.F. Burski

RFB/RJM/dc
Attachment
cc: R.D. Martin, NRC Region IV
D.L. Wigginton, NRC-NRR
R.B. McGehee
N.S. Reynolds
NRC Resident Inspectors Office

Waterford 3 Response
To
NRC Safety Evaluation Report
on Station Blackout

1.0 Section 2.1; EDG Reliability Calculations

Section 2.1 states that the licensee should include the EDG reliability calculations for the last 20 and 100 demands.

The diesel generator reliabilities were determined pursuant to the methodology in NSAC 108 in accordance with Regulatory Guide 1.155, regulatory position 1.1.1. The EDG reliability for each diesel was computed based on the following relationships in NSAC 108:

EDG Reliability=(start reliability) x (load-run reliability)

$$\text{Start Reliability} = \frac{\text{Number of Successful Starts}}{\text{Total Number of Valid Demands to Start}}$$

$$\text{Load Run Reliability} = \frac{\text{Number of Successful Load Runs}}{\text{Total Number of Valid Demands to Load}}$$

The number of successful starts, valid demands to start, successful load-runs, and valid demands to load were determined based on an assessment of EDG testing records. The start reliability, load-run reliability, and then EDG reliability was computed for each diesel. The EDG reliabilities were computed for the last 20 and 50 demands to start and demands to load. At the approximate time of the date for responding to 10CFR50.63, April 17, 1989, the EDGs did not have 100 valid load run demands. Therefore, the computation for EDG reliability could not be determined for the last 100 demands since the EDGs did not have 100 valid demands to load. The computations and data used to determine the EDG reliabilities are retained by Waterford 3 as part of the SBO documentation.

The EDG target reliability for Waterford 3 is 0.975. Subsequent to the Waterford 3 initial response to the SBO rule, Waterford 3 has monitored EDG reliability in accordance with Regulatory Guide 1.155, regulatory position C.1.2.4; NUMARC 87-00, Appendix D, section D.2; and NUMARC Initiative 5A. The trigger values of 3, 4, and 5 failures for a selected EDG reliability of 0.975 for the last 20, 50, and 100 demands are used in monitoring EDG performance. Quarterly reports are submitted to senior management to keep them informed about the reliability performance of the EDGs.

As of December 1991, the EDG reliability performance on a unit basis was 0, 2, and 2 failures in 20, 50, and 100 demands which is less failures than the trigger failure values of 3, 4, and 5 for an EDG reliability of 0.975. The appropriate procedure will be prepared or revised by the end of refuel 5 to document the EDG reliability monitoring program at Waterford 3.

2.0 Section 2.1; ESW Classification

Section 2.1 states that the ESW classification is not consistent with the information provided in NUMARC 87-00.

As documented in letter W3F1-91-0387, Waterford 3 relied on plant specific data to determine the ESW and SW categories in accordance with sections 3.2.1 Part 1.B (A and B) and 3.2.1 Part 1C (B) of NUMARC 87-00. The SER did not provide an assessment regarding the acceptability of the site specific approach used by Waterford 3 as described in letter W3F1-91-0387. Nonetheless, we concur that according to Table 3-2 of NUMARC 87-00, the ESW classification is Group "4" instead of Group "3". As stated in the SER, the offsite AC power design characteristic group (P2) of the plant is not affected by this difference. Therefore, the SBO documentation will be revised by the end of refuel 5 to identify Waterford 3 as an ESW classification Group 4 based on Table 3-2 of NUMARC 87-00. However, we reserve the option to re-submit the site specific approach for NRC review and approval at a later date should we determine such action is necessary.

3.0 Section 2.2.2.a, Section 2.2.2.b, Recommendation (1), Recommendation (2); Shedding of Loads

Section 2.2.2.a states that the shedding of instrumentation from the batteries is not in accordance with the guidance provided in "NUMARC Supplemental Questions and Answers," Item Number 7.2. Section 2.2.2.b states that the licensee did not specifically identify the loads being shed during an SBO event. Recommendation (1) states that the licensee should justify the shedding of the control room monitoring systems. Recommendation (2) states that the licensee should identify the specific loads shed by the plant and that justification should be provided.

Waterford 3 concurs with recommendations (1) and (2). The specific loads which are shed during an SPO will be identified, including control room monitoring systems. Justification will be provided for each load which is shed, taking into account the guidelines of NUMARC 87-00. The submittal will be provided to the NRC by June 1, 1992.

4.0 Section 2.2.2.c, Recommendation (3); Battery Electrolyte Temperature

Section 2.2.2.c states that the licensee assumed an initial electrolyte temperature of 77°F and that the licensee should ensure that the temperature of the batteries will not drop below this temperature under all circumstances. Recommendation (3) states that the licensee should ensure that the temperature does not drop below 77°F under all circumstances.

Waterford 3 concurs with recommendation (3). The station blackout battery capacity calculations of record are EC-E89-010, Revision 2, EC-E89-011, Revision 2, and EC-E91-060, Revision 0, for batteries 3A-S, 3B-S, and 3AB-S respectively. These calculations are based on the assumption that the battery electrolyte temperature is a minimum of 77°F. Procedure ME-003-200 requires that the battery room ambient temperature be maintained between 78 and 82°F. In the event that the ambient temperature is not maintained within 78 to 82°F, then the shift supervisor or the control room supervisor is required to be notified so that corrective action can be initiated.

Waterford 3 will replace by the end of refuel 5 the existing batteries with new batteries of a similar type and capacity, see item 5.0. A procedural change will be made by the end of refuel 5 to control the battery electrolyte temperature at 70°F or above, consistent with technical specification license amendment request NPF-38-121, submitted to the NRC via letter W3F191-0819. The calculations of record will be revised by the end of refuel 5 to reflect an electrolyte temperature of 70°F.

5.0 Section 2.2.2.d, Recommendation (4); Battery Design Margin

Section 2.2.2.d states that the licensee used a design margin of 1.00 which is not consistent with the guidance provided in IEEE-Std 485 which recommends a design margin of 1.10-1.15. Section 2.2.2.d further states that battery 3AB-S has a design margin of 1.04 and that therefore the battery calculations are not conservative. Recommendation (4) states the batteries should have a design margin of at least 10% as recommended by IEEE-Std 485.

Waterford 3 will implement recommendation (4). The existing batteries will be replaced by the end of refuel 5 with new batteries of a similar type and capacity. A reduced life (i.e., an aging factor less than 1.25) will be established by the end of refuel 5 for the new batteries 3A-S and 3B-S to satisfy a design margin of 1.10. The 3AB DC system will be modified by the end of refuel 6 to satisfy a design margin of 1.10. The calculations of record will be revised by the end of refuel 5 to reflect a design margin of 1.10 for batteries 3A-S and 3B-S and the available design margin for battery 3AB-S. These changes will essentially mean the new batteries will need to be replaced prior to their end of life, i.e. 80% capacity as defined in IEEE-Std 485.

The SBO calculation of record for battery 3AB-S at the time of the August 30, 1991 Waterford 3 SBO submittal (W3F1-91-0387) was EC-E90-002R1. This calculation established that battery 3AB-S has a design margin of 1.04. Calculation EC-E90-002R1 was superseded by calculation EC-E91-060 November 29, 1991. Calculation EC-E91-060 established battery 3AB-S has a design margin of about 1.07. Calculation EC-E91-060 used an improved version of BATTPRO software to provide an enhanced modeling of the time sequences of loads. Calculation EC-E91-060 used an aging factor of 1.15 and established that battery 3AB-S had a lifetime of 18.3 years, or was adequate until January 1996.

6.0 Section 2.2.4, Recommendation (1); DACs Initial Temperatures

Recommendation (1) states that the licensee should establish an administrative procedure to ensure that the room temperatures in the DACs during normal power operation will not exceed the assumed initial temperatures during an SBO event.

Waterford 3 will implement recommendation (1). Heat-up calculations were prepared for the Control Room, EFW Pump Room, and Switchgear Rooms A, B, and A/B. Waterford 3 will put into effect by the end of refuel 5 a procedure(s) to ensure that the temperatures in the foregoing areas are maintained at or below the initial temperatures assumed in the station blackout calculations of record and to ensure that corrective action is taken within a specified time period should a temperature excursion occur.

7.0 Section 2.2.4, Recommendation (2); Control Room Cabinets and Doors

Recommendation (2) states that the licensee should establish a procedure to open control room cabinets and doors within 30 minutes of the onset of a station blackout event.

Recommendation (2) has already been implemented in part. Procedure OP-902-005 identifies the control room cabinets and doors which need to be opened at the onset of a station blackout event. Procedure OP-902-005 will be revised by the end of refuel 5 to state that the cabinets and doors need to be opened within 30 minutes.

8.0 Section 2.2.6; Reactor Coolant Inventory

Section 2.2.6 states that the expected maximum losses from the RCS are 25 gpm from each of the RCS pumps, and 12 gpm allowed by TS for a total of 112 gpm.

The RCS inventory analysis and the containment temperature and pressure analysis that were performed by Waterford 3 were based on 100 gpm and did not include the 12 gpm allowed by the technical specification. The 100 gpm assumption is acknowledged in the Technical Evaluation Report prepared by Science Applications International Corporation, SAIC-91/1254. The inventory and containment temperature and pressure analyses demonstrated significant RCS inventory reserves and significant temperature and pressure margins in comparison to LOCA temperature and pressure values. The inclusion of an additional 12 gpm is not expected to change the results of the inventory and containment temperature and pressure analyses in any appreciable way. Waterford 3 will update by December 18, 1992, the RCS inventory and containment temperature and pressure analyses with the additional 12 gpm RCS losses.

9.0 Section 2.2.6; Generic Issue (GI) 23

Section 2.2.6 states that the reactor coolant inventory evaluation was based on the guidance provided in NUMARC 87-00 of 25 gpm per reactor coolant pump (RCP) seal leakage for pressurized water reactors. The 25 gpm value was agreed to between NUMARC and the staff pending resolution of GI 23. Section 2.2.6 further states that if the final resolution of GI 23 defines higher RCP leakage rates than assumed for this evaluation, the licensee should be aware of the potential impact of this resolution on their analyses and actions addressing conformance to the SBO rule.

Entergy Operations, Inc. on September 27, 1991 via letter JGC09161.J19/JCLFLR-1 provided extensive comments to the NRC on the proposed resolution of GI 23. The Entergy Operations, Inc. position can be summarized as follows:

- Improved RCP seal performance during normal operation conditions has occurred as a result of utility efforts to this end. This improved performance has accomplished a reduction in the probability of seal failure at Entergy Operations' PWRs that is comparable to the reduction attributed to the proposed GI-23 resolution requirements.

- Significant industry information exists which can be used to reduce the uncertainty in the assessment of off-normal RCP seal performance. Information available to Entergy Operations indicates that the potential for significant RCP seal leakage (and the corresponding potential for core melt) due to a loss of seal cooling, is much smaller than that assumed in the generic cost benefit assessments of the proposed GI-23 resolution.

- Fundamental design differences and improvements provide considerably improved performance (normal and off-normal conditions) for Waterford 3 compared to the performance used in the NRC's cost benefit assessment.

Entergy Operations, Inc. plants have already reduced RCP seal failure probabilities to an acceptable level due to the foregoing improvements and design differences. Accordingly, while we are aware the NRC resolution of GI 23 may impact, in a generic manner, SBO, we believe there is a technical and regulatory basis to justify the 25 gpm RCP seal leakage assumption for SBO. Nonetheless, we will address this issue on a plant specific basis, if necessary, when GI 23 is resolved by the NRC.

10.0 Section 2.3; Training

Section 2.3 states that the staff expects the licensee to implement the appropriate training to ensure an effective response to an SBO.

Waterford 3 concurs with the NRC expectation. The only physical related modifications were the placement in the plant of a portable air compressor that can be connected to the EDG air receivers and the termination of the EDG field flashing command should the EDG fail to start. Waterford 3 conveyed information about the portable air compressor in letters W3F1-91-0295 and W3F1-91-0227 dated May 14, 1991 and March 21, 1991 respectively. Procedure OP-009-002 was revised to incorporate information about the installation and operation of the portable air compressor. The training for these changes was covered as part of the required reading for Design Change Package (DCP) 3147. Other procedures pertaining to station blackout are OP-902-005 and OP-902-008, and the training for these procedures was performed prior to the effective date for the changes which were made for station blackout. The training department will perform by the end of refuel 5 a review of other procedures related to station blackout to determine if there is a need for additional training. The review will document the schedule for the completion of the training should a need for additional training be identified.

11.0 Section 2.4, Recommendation; Proposed Modifications

The recommendation states that the licensee should include a full description including the nature and objectives of any required modifications in the documentation that is to be maintained by the licensee in support of the SBO submittals.

Waterford 3 concurs with the recommendation; however, there were no modifications that were required to be implemented in order for Waterford 3 to cope with an SBO for 4 hours, except as noted in item 10.0. The documentation for the portable air compressor and the termination of the EDG field flashing command is retained in Design Change Package (DCP) 3147. As stated in item 5.0, Waterford 3 will replace by the end of refuel 5 the existing batteries with new batteries of a similar type and capacity. The 3AB DC system will be modified by the end of refuel 6 to satisfy a design margin of 1.10. The calculations which demonstrate the new batteries have sufficient capacity to cope with an SBO will be retained as part of the SBO evaluation of record.

12.0 Section 2.5, Recommendation; Quality Assurance

The recommendation states that the licensee should verify and confirm that the SBO equipment is or will be covered by an appropriate QA program consistent with the guidance of Appendix A, RG 1.155.

Waterford 3 will implement the NRC recommendation. The majority of equipment required for coping with a station blackout is classified as 1E and thus covered by the QA program for 1E equipment. Portable lights, 8 hour battery backed emergency lights, and control room lights will be covered by and maintained in accordance with 10CFR50 Appendix R. A QA program will be developed by the end of refuel 5 for the EDG portable air compressor. As a form of verification, a list of SBO equipment will be prepared, and a documentation reference will be provided which establishes the equipment is covered by a QA program. The list of SBO equipment and the corresponding listing of references will be completed by the end of refuel 5 and retained as part of the SBO evaluation of record.

13.0 Section 2.6, Recommendation; EDG Reliability Program

Section 2.6 states that the licensee did not specifically state that a reliability program in accordance with R.G. 1.155, Section 1.2, will be implemented. The recommendation states that the licensee should implement an EDG reliability program which as a minimum meets the guidance of RG 1.155, section 1.2.

Waterford 3 concurs in principle with the NRC recommendation. Waterford 3 currently retains as part of the SBO evaluation of record a description of the Waterford 3 EDG reliability program. The EDG reliability program is comprised of six critical elements which include; (1) surveillance needs, (2) performance monitoring, (3) maintenance program, (4) failure analysis and root cause investigation, (5) EDG problem closeout, and (6) EDG reliability data systems. We believe the Waterford 3 EDG reliability program meets the intent of regulatory position 1.2 of Regulatory Guide 1.155. However, items 1 through 5 of regulatory position 1.2 are generally stated and are subject to interpretation. Therefore, Waterford 3 cannot conclude deterministically that the EDG reliability program meets NRC expectations. Accordingly, Waterford 3 will submit to the NRC by June 1, 1992 for review and concurrence a description of the Waterford 3 EDG reliability program relative to items 1 through 5 of regulatory position 1.2.