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10 CFR 50.90

W3F1-2014-0072

January 13, 2015

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Subject: Waterford Steam Electric Station, Unit 3 Response to Request for Additional Information Regarding a Change to the Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation (TAC No. MF3058)
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

- REFERENCES:
1. Entergy Letter W3F1-2013-0043, Request for Review of Change to Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation at the Onset of a Loss of Offsite Power, dated November 11, 2013. (ADAMS Accession No. ML13316C052)
 2. Letter from NRC, Request for Additional Information Regarding a Change to the Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation (TAC No. MF3058), dated August 22, 2014. (ADAMS Accession No. ML14171A263)
 3. Entergy Letter W3F1-2014-0064, Response to Waterford Steam Electric Station, Unit 3 – Request for Additional Information Regarding a Change to the Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation (TAC No. MF3058), dated October 23, 2014. (ADAMS Accession No. ML14300A020)
 4. Letter from NRC, Waterford Steam Electric Station, Unit 3 – Request for Additional Information Regarding a Change to the Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation (TAC NO. MF3058), dated October 21, 2014, received October 23, 2014. (ADAMS Accession No. ML14246A015)

Dear Sir or Madam:

In letter dated November 11, 2013 (Reference 1), Entergy Operations, Inc. (Entergy) submitted a request to amend the facility operating license. The proposed amendment will clarify how the Pressurizer Heater function is met for natural circulation at the onset of a loss of offsite power concurrent with the specific single point vulnerability.

In letter dated August 22, 2014 (Reference 2), NRC requested Entergy to provide additional information to support review of the requested License Amendment Request. Entergy provided a response to that request in Reference 3.

In letter dated October 21, 2014 (Reference 4), NRC requested Entergy to provide additional information to support review of the requested License Amendment Request. This letter provides that response in Attachment 1.

This correspondence contains no new commitments. If you have any questions or require additional information, please contact the Regulatory Assurance Manager, John Jarrell, at 504-739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 13, 2015.

Sincerely,

A handwritten signature in black ink, appearing to read "MRC/LEM". The signature is fluid and cursive, with a prominent initial "M" and a trailing flourish.

MRC/LEM

- Attachments:
1. Waterford 3 Response to Request for Additional Information (TAC No.MF3058)
 2. Excerpt from Waterford 3 Response to Request for Additional Information in Support of Extended Power Uprate (W3F1-2004-0061)

cc: Mr. Marc L. Dapas, Regional Administrator
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Attachment 1 to

W3F1-2014-0072

Waterford 3 Response to Request for Additional Information

(TAC No.MF3058)

Waterford 3 Response to Request for Additional Information

In letter dated November 11, 2013 (Reference 1), Entergy Operations, Inc. (Entergy) submitted a request to amend the facility operating license. The proposed amendment will clarify how the Pressurizer Heater function is met for natural circulation at the onset of a loss of offsite power concurrent with the specific single point vulnerability.

In letter dated October 21, 2014 (Reference 2), NRC requested Entergy to provide additional information to support review of the requested License Amendment Request. The specific information requested is listed below:

In Attachment 2 on page 4 of 6 and page 6 of 6, the licensee proposed to add, in part, the following clarification to UFSAR Section 5.4.10.2, "System Description" (Insert 2A and Insert 3):

The natural circulation cooldown analysis, performed to comply with Branch Technical Position 5-4, Design Requirements of the Residual Heat Removal System, does not credit the operation of any pressurizer heaters.

However, this analysis is not cited to a prior document submitted under a previous LAR and, therefore, it is not available to the NRC staff for consideration as part of the licensee's current request. Since the WF3 UFSAR reflects the plant's specific design basis, please provide documentation that demonstrates NRC approval of the natural circulation cooldown analysis performed to comply with Branch Technical Position 5-4. Please update the submittal to include this documentation as a reference citation.

Response to Question

NUREG-0800, Standard Review Plan (SRP), Section 5.4.7, Residual Heat Removal (RHR) System, provides standard guidance for the NRC staff to use when reviewing a Licensee's request during original or subsequent licensing activities. Revision 2 of SRP Section 5.4.7 was effective in July, 1981, and referenced Branch Technical Position (BTP) Reactor Services Branch (RSB) 5-1. Revision 3 of SRP Section 5.4.7 was effective in April, 1984, and a draft revision 4 was issued in April, 1996. Both of these revisions referenced BTP 5-1.

In Entergy letter W3F1-2003-0074 (Reference 3), License Amendment Request NPF-38-249 Extended Power Uprate, dated November 13, 2003, Entergy requested a revision to the Facility Operating License and Technical Specifications to increase the unit's rated thermal power level from 3441 megawatts thermal (MWt) to 3716 MWt. In this amendment request, Entergy provided information that the ability

of the Shutdown Cooling System (SDCS) to achieve cold shutdown was verified. The system performance was evaluated to support the performance as described in the FSAR, and the system's capability to achieve cold shutdown conditions for Reactor Systems Branch Technical Position RSB BTP 5-1, Natural Circulation Cooldown (Revision 3 was effective at that time). The NRC requested additional information in letter dated June 21, 2004 (Reference 4), to provide a quantified evaluation of the time needed for plant cooldown to achieve cold shutdown conditions per RSB BTP 5-1. Entergy provided the response to that request in letter W3F1-2004-0061 (Reference 5). A copy of the response to that specific RAI is included as Attachment 2 to this letter.

The NRC approved the requested Extended Power Uprate in Amendment 199 to Facility Operating License No. NPF-38 for Waterford 3 in NRC letter dated April 15, 2005 (Reference 6). In the Safety Evaluation (SE) included with this letter, the NRC states the following:

The NRC staff has reviewed the licensee's analyses related to the effects of the proposed EPU on the SDCS. The NRC staff concludes that the licensee has adequately accounted for the effects of the proposed EPU on the system, and demonstrated that the SDCS will maintain its ability to cool the RCS following shutdown and provide decay heat removal. Based on this, the NRC staff concludes that the SDCS will continue to meet the requirements of GDCs 4, 5, and 34, and RSB BTP 5-1, natural circulation cooling, following implementation of the proposed EPU. Therefore, the NRC staff finds the proposed EPU acceptable with respect to the SDCS.

In March, 2007, Revision 4 of SRP 5.4.7 was issued. This revision editorially changed the reference from BTP 5-1 to 5-4. As a result of this change, BTP 5-4 contains the same technical requirements that BTP 5-1 did prior to Revision 4 of SRP Section 5.4.7. BTP 5-1 is currently titled "Monitoring of Secondary Side Water Chemistry in PWR Steam Generators."

The current Waterford 3 natural circulation cooldown analysis was performed as part of the Replacement Steam Generator project. It has not been cited or submitted in a previous License Amendment Request, and therefore, was not available to the NRC staff for consideration.

The Design Analysis Report (DAR) (Reference 7) was performed by the Analysis of Record (AOR) holder, Westinghouse, to provide a summary of the analyses performed to demonstrate compliance with BTP 5-4. Two separate analyses are performed as part of the BTP 5-4 evaluation. The first analysis performs a full scope computer simulation of the plant cooldown from hot standby conditions to shutdown cooling (SDC) system entry conditions using the functional requirements specified in BTP 5-4. The second analysis models the shutdown cooling system performance and evaluates the plant

cooldown from SDC entry conditions to 200°F following a natural circulation cooldown. The second analysis does not involve the Pressurizer Heater function and thus is excluded from further discussion as part of this RAI.

The simulations performed as part of the natural circulation cooldown from hot standby conditions to SDC entry conditions was performed assuming the functional requirements stated in paragraph B of BTP 5-4. In accordance with these requirements, the systems which can be used to take the reactor from normal operating conditions to shutdown cooling conditions must satisfy the following:

1. The design shall be such that the reactor can be taken from normal operating conditions to cold shutdown using only safety-grade systems satisfying General Design Criteria 1 through 5.
2. The systems shall have suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities to assure that for onsite electrical power system operation (assuming offsite power is not available) and for offsite electrical power system operation (assuming onsite power is not available) the system function can be accomplished assuming a single failure.
3. The systems shall be capable of being operated from the control room with either only onsite or only offsite power available. In demonstrating that the systems can perform their function assuming a single failure, limited operator action outside the control room is considered acceptable if suitably justified.
4. The systems shall be capable of bringing the reactor to a cold shutdown condition, with only onsite or offsite power available, within a reasonable period of time following shutdown, assuming the most limiting single failure.

Two scenarios are considered in this analysis: failure of one of the steam generator Atmospheric Dump Valves (ADVs) to open and failure of one of the Emergency Diesel Generators (EDGs). The two scenarios correspond to two different single failures and are simulated in this analysis in order to assure that the most limiting single failure is identified in accordance with Item 4 above. The results are given in terms of time (in hours) following the reactor trip to reach shutdown cooling entry conditions.

This analysis assumes the plant is operating normally at 100.5% when the initiating event, a loss of offsite power, occurs. Following the initial loss of offsite power, the plant is maintained at hot standby conditions for four hours before cooldown begins and, except where specifically permitted by BTP 5-4, only safety grade systems and equipment are credited. Other significant assumptions, including systems and equipment that are or are not available are detailed in the DAR.

The DAR notes that the analysis assumes the Pressurizer Heaters, which are non-safety grade, are not available following a loss of offsite power. The analyses results documented in the DAR demonstrate that Waterford-3 will maintain its ability to cool the Reactor Coolant System (RCS) and maintain shutdown margin following shutdown and provide decay heat removal consistent with BTP 5-4 following Replacement Steam Generator implementation.

The DAR is considered proprietary information to Westinghouse. Should the NRC staff desire to perform an audit of the DAR, arrangements can be made to facilitate this review at the Westinghouse offices in Rockville, Maryland.

Waterford 3 proposes adding the following verbiage to page 7 of 11 of Reference 1, section titled "Factors Allowing This Change":

"...Third, the natural circulation cooldown analysis performed to comply with Branch Technical Position 5-4, Design Requirements of the Residual Heat Removal System, does not credit the operation of any pressurizer heaters (Reference 1). Therefore, the operator action to energize the Pressurizer Heaters is not a time critical operator action."

In addition, Waterford 3 proposes to add Section 7.0 References to the License Amendment Request to include the following reference to the Westinghouse calculation.

1. *Westinghouse Design Analysis Report DAR-PS-03-8, Waterford 3 Branch Technical Position 5-4 Cooldown Report for Replacement Steam Generators.*

Finally, in the License Amendment Request (Reference 1) Attachment 1 on page 1 of 11, Entergy states in, "...this proposed amendment will provide clarification that manual operator action outside of the Control Room is needed to energize the Pressurizer Heaters associated with natural circulation at the onset of a loss of offsite power in the event a specific common circuit breaker being open concurrently." For clarification, as discussed above, the Pressurizer Heaters are not required to perform a natural circulation cooldown to SDC entry conditions following a loss of offsite power. If it is desired to restore the Pressurizer Heater function at the onset of a Loss of Offsite Power concurrent with the specific common circuit breaker, CVCEBKRO14AB-13, being open, operator action outside the control room would be necessary to restore the Pressurizer Heater function.

REFERENCES

1. Entergy letter W3F1-2013-0043, Request for Review and Approval of Change to Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation at the Onset of a Loss of Offsite Power, dated November 11, 2013. (ADAMS Accession No. ML13316C052)
2. NRC letter, Request for Additional Information Regarding A Change to the Updated Final Safety Analysis Report Clarifying Pressurizer Heaters Function for Natural Circulation, dated October 21, 2014. (ADAMS Accession No. ML14246A015)
3. Entergy letter W3F1-2003-0074, License Amendment Request NPF-38-249 Extended Power Uprate Waterford Steam Electric Station, Unit 3, dated November 13, 2003. (ADAMS Accession No. ML040260317)
4. NRC letter, Waterford Steam Electric Station, Unit 3 (Waterford 3) – Request for Additional Information Related to Revision to Facility Operating License and Technical Specifications – Extended Power Uprate Request (TAC NO. MC1355), dated June 21, 2004. (ADAMS Accession No. ML041740577)
5. Entergy letter W3F1-2004-0061, Supplement to Amendment Request NPF-38-249, Extended Power Uprate Waterford Steam Electric Station, Unit 3, dated July 28, 2004. ADAMS Accession No. ML042120475.
6. NRC letter, Waterford Steam Electric Station, Unit 3 – Issuance of Amendment RE: Extended Power Uprate (TAC NO. MC1355), dated April 15, 2005. (ADAMS Accession No. ML051030082)
7. Westinghouse Design Analysis Report DAR-PS-03-8, Waterford 3 Branch Technical Position 5-4 Cooldown Report for Replacement Steam Generators.

Attachment 2 to

W3F1-2014-0072

**Excerpt from Waterford 3 Response to Request for Additional Information in Support of
Extend Power Uprate (W3F1-2004-0061)**



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W3F1-2004-0061

July 28, 2004

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

SUBJECT: Supplement to Amendment Request NPF-38-249,
Extended Power Uprate
Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

REFERENCES:

1. Entergy Letter dated November 13, 2003, "License Amendment Request NPF-38-249 Extended Power Uprate"
2. NRC Letter dated June 21, 2004, "Waterford Steam Electric Station, Unit 3 (Waterford 3) – Request for Additional Information Related to Revision to Facility Operating License and Technical Specifications - Extended Power Uprate Request (TAC No. MC1355)"
3. Entergy Letter dated May 26, 2004, "Supplement to Amendment Request NPF-38-249, Extended Power Uprate"
4. Entergy Letter dated July 14, 2004, "Supplement to Amendment Request NPF-38-249, Extended Power Uprate"

Dear Sir or Madam:

By letter (Reference 1), Entergy Operations, Inc. (Entergy) proposed a change to the Waterford Steam Electric Station, Unit 3 (Waterford 3) Operating License and Technical Specifications to increase the unit's rated thermal power level from 3441 megawatts thermal (MWt) to 3716 MWt.

By letter (Reference 2), the Nuclear Regulatory Commission (NRC) staff requested additional information (RAI) related to reactor systems. Entergy's responses to 40 of the 61 questions are contained in Attachment 1 to this letter. Responses to the remainder of the questions will be provided by August 10, 2004. The need to answer the RAI in two parts was discussed with the Waterford 3 Nuclear Reactor Regulation (NRR) Project Manager.

Three additional items are addressed in this supplement.

- Entergy and members of your staff held discussions regarding the approach to be taken for a reactor vessel internals management program. A revised commitment,

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Response to Request for Additional Information

Question 1:

Please provide a quantified evaluation of the time needed for plant cooldown to achieve cold shutdown conditions per RSB BTP 5-1 (natural circulation cooldown using only safety grade equipment), and for plant cooldown per the requirements of Appendix R to Title 10 of the Code of Federal Regulations (10 CFR), Part 50 (regarding fire protection) for Waterford 3 at extended power uprate (EPU) power level and the current power level.

Response 1:

RSB 5-1 Cooldown:

A revised evaluation was prepared for the Waterford 3 plant for Extended Power Uprate (EPU) conditions that demonstrates the time required to achieve cold shutdown conditions of 200°F per the requirements of RSB BTP 5-1 for a natural circulation cooldown, with a loss of off-site power using only safety grade equipment and assuming the worst single failure. The analysis is done in two phases; the first is an analysis of cooldown from normal operating pressures and temperatures to conditions suitable for the initiation of shutdown cooling operation, followed by analysis that models using the shutdown cooling system (SDCS) to cool to RCS temperature of 200°F.

The cumulative results table provides current analysis of record results as well as the revised results for the EPU condition. The results demonstrate that the Waterford 3 plant will maintain its ability to cool the RCS following shutdown and provide decay heat removal consistent with Branch Technical Position 5-1 following power uprate to 3716MWt.

Cumulative Results Table for RSB 5-1 Analyses

	Current Duration	EPU Duration
Limiting Failure:	ADV Failure	DC Bus Failure
Cooldown Method:		
Nat. Circ. Cooldown to reach 350°F	Start: 0.0 hrs. End: 25.1 hrs. Duration: 25.1 hrs.	Start: 0.0 hrs. End: 8.9 hrs. Duration: 8.9 hrs.
Shutdown Cooling 350°F to 200°F	Start: 25.1 hrs. after shutdown End: 28.1 hrs. Duration: 3.0 hrs.	Start: 9.0 hrs. after shutdown End: 34.7 hrs. Duration: 25.7 hrs.
Total Time	28.1 hrs.	*34.7 hrs.

* Total duration conservatively ignores small disconnect between end of steam generator cooldown and start of SDCS cooldown.

The limiting failure case for EPU is the loss of the DC bus failure resulting in the longest cooldown time. This scenario fails one emergency diesel generator and control logic of

one atmospheric dump valve (ADV). In this scenario only one train of safety related equipment is available, and in particular only one SDCS train is available for cooldown from 350°F to 200°F. Loss of control of the ADV means that temporarily only one steam generator (SG) is available for cooldown to 350°F. The transient assumes local manual control of the ADV by the time cooldown of the RCS commences after the required four hour hold period at HZP conditions resulting in both ADV/SG being available. Note that the assumption of manual action at four hours is a change from the current RSB BTP 5-1 analysis, which does not credit operator manual action until after ten hours, the minimum point in time when ADV nitrogen supply is exhausted. Based upon the results of the EPU analysis, the Waterford 3 plant is capable of being cooled to a cold shutdown condition with only offsite or onsite power available within a reasonable period of time following shutdown, assuming the most limiting single failure. Consistent with current Waterford 3 license basis, 36 hours is considered a reasonable time period.

For current power conditions, the limiting single failure is considered an ADV failure. In this scenario the failed ADV is permanently unavailable, forcing a cooldown on a single steam generator. Once on SDC the cooldown proceeds rapidly, as two trains are available. It should be noted that the current analysis is conservatively based upon an assumed 108% of current core power (3661 MWt). Also note that the change in worst single failure is not a direct result of the EPU conditions but is the consequence of more accurate natural circulation mixing factors used in the first phase of the cooldown during the natural circulation cooldown.

Appendix R Cooldown

10CFR 50 Appendix R requires the safety function for hot shutdown structures, systems and components to be such that "one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations(s) must be maintained free of fire damage by a single fire including an exposure fire." In addition it allows the safety function for cold shutdown structures, systems or components to suffer fire damage by the statement "Both trains of equipment necessary to achieve cold shutdown may be damaged by a single fire, but fire damage must be limited so that at least one train can be repaired or made operable within 72 hours using onsite capability." Thus the Appendix R requirements are prescriptive in that at least one train required for hot shutdown must be available and at least one train required for cold shutdown must be available within 72 hours. The Waterford 3 post fire safe shutdown compliance strategy does not rely on any repairs to achieve hot standby and the only repairs credited for cold shutdown are the replacement of fuses that may have blown prior to the transfer of control from the Control Room to the Remote Shutdown Room.

The Appendix R fire analysis is based on maintaining one train of the redundant systems normally credited for safe shutdown.

In regards to the Appendix R analysis hot shutdown related actions are provided specific completion times and cold shutdown related actions are not time critical. The analysis provided for other plant transients bound the impacts of the Appendix R fire event. Thus there is essentially no difference between the Extended Power Uprate (EPU) power level and the current power level with respect to the Appendix R analysis and associated time required for plant cooldown.