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W3F1-2014-0014

February 28, 2014

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

SUBJECT: Second Six Month Status Report for Implementation of Order EA-12-049, Commission Order Modifying License With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

- References:**
1. NRC Order Number EA-12-049, "Order to Modify Licenses With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (ADAMS Accession No. ML12054A736)
 2. NRC Interim Staff Guidance JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," Revision 0, dated August 29, 2012 (ADAMS Accession No. ML12229A174)
 3. Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012 (ADAMS Accession No. ML12221A205)
 4. Entergy letter to NRC, "Initial Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated October 26, 2012 (W3F1-2012-0093) (ADAMS Accession No. ML12300A447)
 5. Waterford Steam Electric Station, Unit 3 letter to NRC, "Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated February 28, 2013 (ADAMS Accession No. ML13063A266)

6. Waterford Steam Electric Station, Unit 3 letter to NRC, "First Six Month Status Report for Implementation of Order EA-12-049, Commission Order Modifying License With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" dated August 28, 2013 (ADAMS Accession No. ML13241A281)

Dear Sir or Madam:

On March 12, 2012, the NRC issued Order Number EA-12-049 (Reference 1) to Entergy Operations, Inc. (Entergy). The order was immediately effective and required Waterford Steam Electric Station, Unit 3 (Waterford 3) to develop mitigating strategy provisions for beyond-design-basis external events.

Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an Overall Integrated Plan (OIP). Reference 2 endorses industry guidance document NEI 12-02, Revision 1 (Reference 3). Reference 4 provided the initial status report regarding mitigating strategies and Reference 5 provided the OIP.

NRC Order EA-12-049 requires submission of a status report at six-month intervals following submittal of the Overall Integrated Plan with regard to the requirements for mitigation strategies for beyond-design-basis external events for Waterford 3. Reference 6 provided the first six-month status report for Waterford 3. The purpose of this letter is to provide, as an attachment, the second six month status report for the implementation of Order EA-12-049.

There are no new commitments identified in this submittal. Should you have any questions concerning the content of this letter, please contact John Jarrell, Regulatory Assurance Manager, at (504) 739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 28, 2014.

Sincerely,



MRC/LEM

Attachment: Waterford Steam Electric Station, Unit 3, Second Six Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to the Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

cc: Attn: Director, Office of Nuclear Reactor Regulation
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Attachment

W3F1-2014-0014

**Waterford Steam Electric Station, Unit 3,
Second Six Month Status Report for the Implementation of Order EA-12-049,
Order Modifying Licenses with Regard to the Requirements for
Mitigation Strategies for Beyond-Design-Basis External Events**

**Waterford Steam Electric Station, Unit 3,
Second Six Month Status Report for the Implementation of Order EA-12-049,
Order Modifying Licenses with Regard to the Requirements for
Mitigation Strategies for Beyond-Design-Basis External Events**

1 Introduction

Waterford Steam Electric Station, Unit 3 (Waterford 3), developed an Overall Integrated Plan (Reference 1 in Section 8) documenting the diverse and flexible strategies (FLEX) in response to NRC Order EA-12-049 (Reference 2). This attachment provides a planned update of milestone accomplishments since submittal of the last status report (Reference 3), including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

The following milestone(s) have been completed since the development of the Overall Integrated Plan (OIP), and are current as of January 31, 2014.

- First Six-Month Status Report — August 2013
- Second Six-Month Status Report — Complete with submission of this document in February 2014

3 Milestone Schedule Status

The following provides an update to the milestone schedule to support the OIP. This section provides the activity status of each item, and whether the expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed.

Milestone	Target Completion Date **	Activity Status	Revised Target Completion Date
Submit Overall Integrated Plan	Feb 2013	Complete	
Submit Six Month Updates:			
Update 1	Aug 2013	Complete	
Update 2	Feb 2014	Complete	
Update 3	Aug 2014	Not Started	
Update 4	Feb 2015	Not Started	
Update 5	Aug 2015	Not Started	
Perform Staffing Analysis	Nov 2015	Not Started	
Modifications:			
Engineering and Implementation			
N-1 Walkdowns	May 2014	Not Started	

Milestone	Target Completion Date **	Activity Status	Revised Target Completion Date
Design Engineering	Oct 2014	Started	
Implementation Outage	Nov 2015	Not Started	
On-site FLEX Equipment			
Purchase	Dec 2014	Started	
Procure	Sept 2015	Started	
Off-site FLEX Equipment			
Develop Strategies with RRC	Dec 2013	Started	April 2015
Install Off-Site Delivery Station (if Necessary)	Nov 2015	Not Started	
Procedures			
Create Waterford FSGs	Nov 2015	Not Started	
Create Maintenance Procedures	Nov 2015	Not Started	
Training			
Develop Training Plan	May 2015	Not Started	
Implement Training	Nov 2015	Not Started	
Submit Completion Report	Feb 2016*	Not Started	

* This date corresponds to the last six month status report and provides time to compile the report following the completion of the fall 2015 Implementation Outage.

** Target Completion Date is the last submitted date from either the overall integrated plan or previous six-month status reports

4 Changes to Compliance Method

There are no changes to the compliance method as documented in the Overall Integrated Plan (Reference 1).

5 Need for Relief/Relaxation and Basis for the Relief/Relaxation

Waterford 3 expects to comply with the order implementation date and no relief/relaxation is required at this time.

6 Open Items from Overall Integrated Plan and Interim Staff Evaluation

The following table provide a summary and status of any open items documented in the overall integrated plan and any open items or confirmatory items documented in the Interim Staff Evaluation (ISE). A fourth table includes a listing of Audit Questions and the status of each item.

Overall Integrated Plan Open Item	Status
<p>O11. The suction path from the TDEFWP to the WCTs would be through a non-running ACCWS pump post-ELAP. It is expected that both the TDEFWP and the currently sized EFW FLEX pump (primary strategy) will have sufficient capability and/or NPSH to do so. However, this will need to be confirmed more fully as the detailed design of the primary strategy for maintaining core cooling and heat removal evolves (with SGs available).</p>	<p>In Progress (see related information in Section 7)</p>
<p>O12. An analysis will be needed to demonstrate that containment pressure and temperature will stay at acceptable levels throughout the ELAP event and that no containment spray system will be required as part of FLEX.</p>	<p>In Progress</p>
<p>O13. At this stage of the conceptual design, the chemistry effects of alternate cooling source (ACS) use on secondary wetted components are unknown.</p>	<p>In Progress</p>
<p>O14. It is currently unclear how long gravity feed from the SITs can be maintained during Modes 5 and 6 in Phase 1. The ability to gravity feed depends upon SIT fluid height/backpressure, line losses through the gravity flow path, and developed pressure within the RCS. If this time is sufficiently short, Waterford 3 may choose to pre-stage requisite FLEX equipment in Modes 5 and 6.</p>	<p>Closed - The SITs availability in Modes 5 and 6 will be addressed by the outage shutdown safety risk planning (EN-OU-108 as revised for FLEX) process.</p>
<p>O15. It is expected that only the component cooling water system and dry cooling towers will need to be made operational to reject the heat load generated post-ELAP in Phase 3. However, this must be investigated more fully to confirm such. Notably, only 60% of the dry cooling tower fan motors are currently missile protected and none of the wet cooling tower (WCT) fan motors are missile protected. If more than 60% of dry cooling tower (DCT) capacity is needed to support Phase 3, DCT and/or WCT fan motors may need to be missile protected. Currently available information follows:</p> <p>The DCT one train heat removal in an accident would be 113.38 Mbtu/hr. Given that 60% of the DCT is missile protected, it's assumed that that 40% of the heat removal capability is lost. 38 hours after shutdown, decay heat is less than 68 Mbtu/hr (ANS 79 decay heat curve) and less than the heat removal capacity of the DCTs. As the event proceeds, the required heat removal will decrease. Until this point in the event, Phase 1 and 2 FLEX strategies will be capable of removing decay heat. Final system operating details for the CCW and DCT (i.e., number of pumps and fans to operate) still need to be determined.</p>	<p>In Progress (see related information in Section 7)</p>

Interim Staff Evaluation Open Items		Status
3.1.3.A	Wind Hazard Screening - The licensee's response fails to consider the warning time offered by a hurricane storm for pre-staging FLEX equipment. In addition, as described in NEI 12-06, Section 7.2.2, hurricanes can have a significant impact on local infrastructure, e.g., downed trees and flooding that should be considered in the interface with off-site resources.	In Progress
3.2.1.1.B	CENTS - Justify conformance with the limitations of the use of CENTS by providing the CENTS-calculated value of the centered one-hour moving average of the flow quality at the top of the SG tubes, which corresponds to the maximum void fraction of 0.2 in SG tubes as conditions used to define termination of single phase natural circulation, and confirming that the value is less than the limit specified in the white paper dated September 24, 2013 for use in defining the onset of reflux being.	In Progress
3.2.1.2.A	RCP Seal Leakage - Justification of less than 15 gpm per RCP seal leakage in analysis.	On page 28 of the OIP, it is stated: "Consistent with Reference 8 methodology, the total leakage from the Waterford RCP seals is assumed to be no greater than approximately 58 gpm during Phase 1." The total seal leakage assumed in the current analysis is no greater than 60 gpm. This will be reflected in a future update to the OIP. (See related information in Section 7)
3.2.1.2.B	RCP generic seal question regarding: (1) the analysis used to determine the leakage rate, (2) cold leg subcooling, (3) leakage flow path characteristics after seal failure, (4) seal performance at high temperatures, (5) isolation of controlled bleed off lines, and (6) pressure dependent seal leakage rates.	In Progress
3.2.1.3.A	Decay Heat -Assumption 4 on page 4-13 of WCAP-17601 states that decay heat is per ANS [American Nuclear Society] 5.1-1979 + 2 sigma, or equivalent. Address the	In Progress

Interim Staff Evaluation Open Items		Status
	applicability of assumption 4 to Waterford. If the ANS 5.1-1979 + 2 sigma model is used in the Waterford ELAP analysis, address the adequacy of the use of the decay heat model in terms of the plant-specific values of the following key parameters: (1) initial power level, (2) fuel enrichment, (3) fuel burnup, (4) effective full power operating days per fuel cycle, (5) number of fuel cycles, if hybrid fuels are used in the core, and (6) fuel characteristics (addressing whether they are based on the beginning of the cycle, middle of the cycle, or end of the cycle). If a different decay heat model is used, describe the specific model and address the adequacy of the model and the analytical results.	
3.2.1.8.A	Core Sub-Criticality- Regarding boron mixing, the NRC staff has not yet accepted the PWROG [Pressurized Water Reactor Owners Group] position paper on boron mixing. Therefore, additional technical justification will be needed to resolve this issue, both generically and on a plant-specific basis.	In Progress (see related information in Section 7)
3.2.4.2.A	Ventilation - Adequacy of ventilation in the control room to protect energized equipment throughout the entire ELAP event, especially if the ELAP is due to high temperature hazard.	In Progress
3.2.4.2.B	Ventilation- Effects of elevated temperatures in the battery room, especially if the ELAP is due to a high temperature hazard.	In Progress
3.2.4.2.C	Ventilation - Hydrogen concentration in the battery rooms during recharging	In Progress
3.2.4.2.D	Ventilation - Loss of ventilation and any potential impacts on the necessary equipment in the TDEFW pump room.	In Progress
3.2.4.4.A	Lighting - Review the licensee's assessment of the habitability/accessibility requirements to ensure lighting is appropriately addressed.	In Progress
3.2.4.8.A	Electrical Power Sources/Isolation and Interactions- Provide a summary of the sizing calculations used to determine the adequacy of the FLEX generators used to power plant electrical equipment.	Revised response to associated Audit Question 41 provided on the Entergy ePortal on 10/30/13.
3.2.4.10.A	Load Reduction to Conserve DC Power - The licensee's Integrated Plan on Page 7 identifies dc load shed at hour 1 and 4. With regard to the load shedding of the dc bus in order to conserve battery capacity: a. Provide the dc load profile for the mitigation strategies to maintain core cooling, containment, and SFP cooling during	In Progress

Interim Staff Evaluation Open Items		Status
	<p>all modes of operation. In your response, describe any load shedding that is assumed to occur and the actions necessary to complete each load shed. Also provide a detailed discussion on the loads that will be shed from the dc bus, the equipment location (or location where the required action needs to be taken), and the required operator actions necessary and the time to complete each action. In your response, explain which functions are lost as a result of shedding each load and discuss any impact on defense-in-depth strategies and redundancy.</p> <p>b. Identify any plant components that will change state if vital ac or dc power is lost or de-energized during the load shed.</p> <p>c. Provide the minimum voltage that must be maintained and the basis for the minimum voltage on each battery/dc bus during each Phase under all MODES of operation (consider the impact of reduced loading as a result of load shedding).</p>	

Interim Staff Evaluation Confirmatory Items		Status
3.1.1.1.A	Seismic Protection - Licensee to ensure that: 1) seismic interactions to ensure equipment is not damaged by non-seismically robust equipment or structures for portable equipment that will be stored outside; 2) how large FLEX equipment such as pumps and power supplies stored inside seismic structures is appropriately secured to protect them during a seismic event; and, 3) where other portable equipment such as hoses and power cables would be stored to assure proper protection from a seismic event.	In Progress
3.1.1.2.A	Seismic Deployment - Protection of the connection points for Reactor Coolant System (RCS) inventory control during the final phase is yet to be determined (TBD).	In Progress
3.1.1.2.B	Seismic Protection - Protection of the tow vehicle used to move the spare or "N+1" FLEX generator. (Also tied into to the ability to move equipment in the flooding context discussed in Section 3.1.2.2 and wind protection for the vehicle discussed in Section 3.1.3.2)	In Progress
3.1.1.3.A	Seismic Procedural Interface - Seismic hazards associated with large internal flooding sources that are not seismically robust and do not require ac power, and the use of ac power to mitigate ground water in critical locations.	In Progress
3.1.1.4.A	Seismic Off site resources - The licensee has not yet identified the local staging area and method of transportation to the site.	In Progress
3.1.2.2.A	Flooding Deployment- Implementation of flooding persistence into their FLEX strategies for pre-event staging	In Progress

Interim Staff Evaluation Confirmatory Items		Status
	of FLEX equipment.	
3.1.2.3.A	Flooding Procedural Interface- Deployment of portable equipment in flooded conditions not incorporated into flood procedures or the need to deploy temporary flood barriers and extraction pumps necessary to support deployment.	In Progress
3.1.3.2.A	Wind Deployment - Whether procedures and programs will include taking proactive actions such as testing, connecting, and readying exposed portable equipment to reduce the potential for wind impacts.	In Progress
3.2.1.1.A	CENTS - Verify the use of CENTS in the ELAP analysis for Waterford is limited to the flow conditions before reflux boiling initiates. This includes providing a justification for how the initiation of reflux boiling is defined.	In Progress
3.2.1.4.A	Initial Values for Key Plant Parameters and Assumptions- Review analysis of UHS [Ultimate Heat Sink] (licensee open item OI5)	In Progress (see related information in Section 7)
3.2.3.A	Containment Functions Strategies - Review the results of the finalized containment analysis associated with open item OI2 of the Integrated Plan, which shows that containment functions will be (potentially) restored and maintained in response to an ELAP event.	In Progress
3.2.4.4.B	Communications - Confirm that upgrades to the site's communications systems have been completed.	In Progress
3.2.4.5.A	Protected and Internal Locked Area Access- Verify access plans are incorporated into FLEX strategies.	In Progress
3.2.4.6.A	Personnel Habitability - Review the licensee's assessment of the habitability/accessibility requirements in all critical areas.	In Progress
3.2.4.7.A	Water Sources -Verify the evaluation of the suction path from the TDEFWP to the WCTs [Wet Cooling Towers] through a non-running ACCWS [Auxiliary Component Cooling Water System] pump post-ELAP confirms it is viable.	In Progress
3.2.4.7.B	Water Sources - Description of how the licensee would get water from the Mississippi River to the FLEX pumps.	In Progress
3.2.4.8.B	Electrical Power Sources/Isolation and Interactions - Licensee to provide the level of detail of the FLEX instrumentation to ensure that electrical equipment remains protected (from an electrical standpoint- e.g., power fluctuations). Also, confirm electrical isolation to ensure that the portable/FLEX diesel generators are isolated from Class 1 E diesel generators to prevent simultaneously supplying power to same Class 1 E bus.	In Progress
3.2.4.9.A	Portable Equipment Fuel - Diesel fuel oil supply for the diesel	In Progress

Interim Staff Evaluation Confirmatory Items		Status
	driven pump and how continued operation to ensure core cooling is maintained. Diesel fuel oil supply (e.g., fuel oil storage tank volume, supply pathway, etc.) for the FLEX generators and how continued operation to ensure core and SFP cooling is maintained indefinitely (i.e., Phase 2 and 3).	
3.2.4.9.B	Portable Equipment Fuel - Discuss how fuel quality will be maintained.	In Progress

Audit Question Open Items	Status	Completion or Target Date
WF3-001	In progress	August 2014
WF3-002	In progress	August 2014
WF3-003	In progress	August 2014
WF3-004	Closed*	
WF3-005	In progress	August 2014
WF3-006	In progress	August 2014
WF3-007	In progress	February 2015
WF3-008	Closed*	
WF3-009	In progress	August 2014
WF3-010	Closed*	
WF3-011	Closed*	
WF3-012	In progress	August 2014
WF3-013	Closed*	
WF3-014	Closed*	
WF3-015	Closed*	
WF3-017	In progress	February 2015
WF3-018	In progress	February 2015
WF3-019	In progress	February 2015
WF3-020	In progress	February 2015
WF3-021	In progress	August 2014
WF3-022	In progress	August 2014
WF3-023	In progress	August 2014
WF3-024	In progress	August 2014
WF3-025	In progress	August 2014
WF3-026	Closed*	

Audit Question Open Items	Status	Completion or Target Date
WF3-027	In progress	February 2015
WF3-028	Closed*	
WF3-029	Closed*	
WF3-030	In progress	February 2015
WF3-031	Closed*	
WF3-032	In progress	August 2014
WF3-033	In progress	August 2014
WF3-034	In progress	August 2014
WF3-035	In progress	August 2014
WF3-036	In progress	August 2014
WF3-038	In progress	August 2014
WF3-039	In progress	August 2014
WF3-040	In progress	February 2015
WF3-041	In progress	August 2014

*Closed indicates that Entergy's response is complete.

7 Potential Interim Staff Evaluation Impacts

In addition to the items identified in Section 6, the items discussed below have potential impact on the Interim Staff Evaluation.

- Waterford has identified a non-conservatism in a supporting calculation (CN-SEE-II-12-38) to the Spent Fuel Pool (SFP) cooling strategy for the normal fuel offload scenario as described in the Waterford Overall Integrated Plan (Reference 1); this has been documented in the Waterford corrective action program as CR WF3 2014 0296. The Waterford Overall Integrated Plan (Reference 1) discusses the scenario on pages 45 and 47 of 108. The Interim Staff Evaluation and Audit Report for Waterford (Reference 3) references the affected strategy in Section 3.2.2 on pages 44 and 45 of 65. The timing associated with the time to boil of the SFP and the time by which makeup must be established to the SFP for normal fuel offload will be reduced once the non-conservatism is addressed. The updated sequence of events timing will be reported in Third Six-Month Status Report. The supporting calculation for fuel in transfer or full core off-load was unaffected by this condition and remains conservative and bounding for the sizing of the FLEX SFP makeup pump.
- The following additional items were identified that could impact the Interim Staff Evaluation (ISE):

- All references to "approximately 58 gpm" will be changed to "60 gpm". The OIP stated "...no greater than approximately 58 gpm in phase 1." (See also ISE Open Item 3.2.1.2.A in Section 6)
- The ISE states that PWROG position paper on boron mixing has not been accepted. Subsequent to the issuance of the WF3 ISE the NRC endorsed the PWROG position paper on boron mixing (ADAMS Accession No.: ML13276A183). (See also ISE Open Item 3.2.1.8.A in Section 6)
- The EFW secondary strategy involving a secondary diesel pump and a diesel booster pump is being reconsidered. Instead, a diverse suction and discharge path are planned to be provided for the primary EFW FLEX pump and the +1.
- The amount of equipment to be stored in the N+1 building has yet to be finalized.
- The strategy to repower the dry cooling tower train and a component cooling water pump is being reconsidered; the proposed plan is to extend phase 2 strategy indefinitely. The plant would transition to other water sources whenever such resources are available such that a long term strategy is not required once plant is stable. (See also OIP open item OI5 in Section 6)
- The strategy of switching over to WCT basin through non-running ACCWS pump is being reconsidered to instead using the water transfer pump to fill the CSP from the WCT. The TDEFWP would continue to draw directly from the CSP for the duration of the event. (See also OIP open item OI1 in Section 6)
- The decay heat and makeup requirements for core cooling via the steam generators are being reevaluated.

8 References

The following references support the updates to the Overall Integrated Plan described in this Attachment.

1. Waterford Steam Electric Station, Unit 3 letter to NRC, "Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated February 28, 2013 (ADAMS Accession No. ML13063A266)
2. NRC Order Number EA-12-049, "Order to Modify Licenses With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (ADAMS Accession No. ML12054A736).
3. Waterford Steam Electric Station, Unit 3 letter to NRC, "First Six Month Status Report for Implementation of Order EA-12-049, Commission Order Modifying License With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" dated February 28, 2013. (ADAMS Accession No. ML13241A281)
4. NRC letter to Entergy Operations, Inc. - Waterford Steam Electric Station, Unit 3 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC No. MF0977), dated November 22, 2013 (ADAMS Accession No. ML13220A402)