UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

July 20, 2018

EA-18-020

Mr. John Dinelli, Site Vice President
Entergy Operations, Inc.
17265 River Road
Killona, LA 70057-0751

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – INSPECTION OF THE IMPLEMENTATION OF MITIGATION STRATEGIES AND SPENT FUEL POOL INSTRUMENTATION ORDERS AND EMERGENCY PREPAREDNESS COMMUNICATION/STAFFING/MULTI-UNIT DOSE ASSESSMENT PLANS – INSPECTION REPORT 05000382/2017009 AND NOTICE OF VIOLATION

Dear Mr. Dinelli:

On September 21, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed the on-site portion of the subject inspection at your Waterford Steam Electric Station, Unit 3, and continued in-office review and inspection through June 2018. On June 7, 2018, the NRC inspectors discussed the final results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

The inspection examined activities conducted under your license as they relate to the implementation of mitigation strategies and spent fuel pool instrumentation orders (EA-12-049 and EA-12-051) and emergency preparedness communication, staffing, and multi-unit dose assessment plans, your compliance with the Commission's rules and regulations, and with the conditions of your operating license. Within these areas, the inspection involved examination of selected procedures and records, observation of activities, and interviews with station personnel.

The enclosed report discusses a violation associated with a finding of very low safety significance (Green). The NRC evaluated this violation in accordance Section 2.3.2 of the NRC Enforcement Policy, which can be found at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html. The violation met the requirements for treatment as a non-cited violation; however, because the violation is associated with a failure to meet the requirements of an Order issued by the Commission which will require subsequent, specific follow-up inspection to ensure compliance has been established, the NRC determined the issuance of Notice of Violation (Notice) is appropriate in this case.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC's review of your response will also determine whether further enforcement action or inspection is necessary to ensure your compliance with regulatory requirements.

Additionally, the NRC inspectors documented one finding of very low safety significance (Green) in this report. The finding did not involve a violation of NRC requirements.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region IV; and the NRC resident inspector at the Waterford Steam Electric Station, Unit 3.

This letter, its enclosures, and your response will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Geoffrey Miller, Branch Chief
Project Branch D
Division of Reactor Projects

Docket No. 50-382
License No. NPF-38

Enclosures:
1. Notice of Violation
2. Inspection Report 05000382/2017009 w/Attachment

cc: Electronic copy for Waterford 3

NOTICE OF VIOLATION

Entergy Operations, Inc.
Waterford Steam Electric Station, Unit 3

Docket No. 50-382
License No. NPF-38
EA-18-020

During an NRC inspection conducted from September 18, 2017, through June 7, 2018, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events," dated March 12, 2012, Section IV.A.2, requires, in part, that all licensees identified in Attachment 1 to this Order comply with the requirements described in Attachment 2 of this Order except to the extent that a more stringent requirement is set forth in the license.

Order EA-12-049, Attachment 1, identified Entergy Operations, Inc., Waterford Steam Electric Station, Unit 3, (Waterford 3) as a power reactor licensee subject to Section IV of the Order.

Order EA-12-049, Attachment 2, requires, in part, that licensees develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event. The transition phase requires providing sufficient, portable, on-site equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. Licensees must also provide reasonable protection for the associated equipment from external events, and full compliance includes, in part, the staging or installation of equipment needed for the strategies.

ENTGWF081-REPT-001, "Waterford Steam Electric Station Unit 3 Final Integrated Plan," Revision 1, dated July 20, 2016, provides the necessary guidance on strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities following a beyond-design-basis external event.

- Section 2.2, "Strategies," states, in part, that Phase 2 strategies support the transition from installed plant equipment to FLEX equipment which is deployed by the on-shift personnel to maintain essential functions.

- Section 2.3.2, "Phase 2 Strategy," states, in part, that the capability for reactor core cooling is accomplished from a pre-staged FLEX core cooling pump to provide feedwater to the steam generators in the event the turbine-driven emergency feedwater pump fails or sufficient steam pressure is no longer available to drive the turbine-driven emergency feedwater pump turbine, and that the FLEX core cooling pump is powered by the FLEX diesel generator. Section 2.3.2 also states, in part, that reactor coolant system inventory control involves the use of refueling water storage pool or boric acid makeup tank inventory through a repowered charging pump which receives its power from the FLEX diesel generator. Section 2.3.2 further states, in part, that the FLEX diesel generator is capable of supplying power to a battery charger such that DC power for controls and instrumentation continues to be available to support the reactor coolant system core cooling function.

- Section 2.4.2, “Phase 2 Strategy Modes 1-4,” states in part, that the capability to provide spent fuel pool make-up and/or spray during Phase 2 is accomplished using the component cooling water make-up pumps which are powered by the FLEX diesel generator.

- Section 2.7, “Planned Protection of FLEX Equipment,” states, in part, that in order to assure reliability and availability of the FLEX equipment required by the FLEX strategy, Waterford 3 has sufficient equipment to address all functions on-site, plus one additional spare (i.e., an “N+1” capability). Section 2.7 further states, in part, that the “N+1” diesel generator provides the capability to restore the “N” function by relocating the “N+1” diesel generator to the reactor auxiliary building from the “N+1” storage building.

- Section 2.15.1, “Method of Storage and Protection of FLEX Equipment,” states, in part, that to assist with unanticipated unavailability of the “N” set, evaluations have been performed and pre-planned strategies have been developed to provide reasonable protection of specific “N+1” equipment for predictable external events with pre-warning (i.e., Mississippi River flood and hurricanes) and instances where the “N” set is unavailable for conditions other than conduct of routine maintenance and testing during normal operations.

Contrary to the above, from June 1, 2016, to June 7, 2018, the licensee failed to adequately develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event. Specifically, the licensee failed to establish appropriate design and procedures associated with providing electrical power using the “N+1” FLEX diesel generator to support transition phase (Phase 2) strategies necessary to maintain or restore the core cooling and spent fuel pool cooling capabilities in mitigating a beyond-design-basis external event.

This violation is associated with a Green Significance Determination Process finding.

Pursuant to the provisions of 10 CFR 2.201, Entergy Operations, Inc., is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region IV, 1600 E. Lamar Blvd., Arlington, TX 76011-4511, and a copy to the NRC resident inspector at the facility that is the subject of this Notice of Violation (Notice), within 30 days of the date of the letter transmitting this Notice. This reply should be clearly marked as a “Reply to a Notice of Violation; EA-18-020” and should include for the violation: (1) the reason for the violation or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken, and (4) the date when full compliance will be achieved.

Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy or proprietary information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information).

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days of receipt.

Dated this 20th day of July 2018

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number(s):	05000382
License Number(s):	NPF-38
Report Number(s):	05000382/2017009
Enterprise Identifier:	I-2017-009-0006
Licensee:	Entergy Operations, Inc.
Facility:	Waterford Steam Electric Station, Unit 3
Location:	Killona, Louisiana
Inspection Dates:	September 18, 2017 to June 7, 2018
Inspectors:	R. Alexander, Senior Project Engineer (Team Leader) J. Mateychick, Senior Reactor Inspector C. Speer, Resident Inspector E. Uribe, Project Engineer D. Loveless, Senior Reactor Analyst
Approved By:	G. Miller Chief, Project Branch D Division of Reactor Projects

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring licensee's performance by conducting a Temporary Instruction 2515/191, "Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/ Staffing/Multi-Unit Dose Assessment Plans" at Waterford 3 Steam Electric Station in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information. NRC and self-revealed findings, violations, and additional items are summarized in the table below.

List of Findings and Violations

Failure to Establish Appropriate Electrical-Related FLEX Strategies for Mitigating a Beyond-Design-Basis External Event			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Strategies	Green Notice of Violation VIO 05000382/2017009-01 Open EA-18-020	H.14 – Conservative Bias	TI 2515/191
The NRC inspection team identified a Green finding and associated violation in that the licensee failed to adequately develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event. Specifically, the licensee failed to establish appropriate design and procedures associated with providing electrical power using the "N+1" FLEX diesel generator to support transition phase (Phase 2) strategies necessary to maintain or restore the core cooling and spent fuel pool cooling capabilities in mitigating a beyond-design-basis external event.			

Failure to Adequately Consider the Impacts on FLEX Phase 2 Equipment from Large Internal Flooding Sources Which Were Not Seismically Robust			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green Finding FIN 05000382/2017009-02 Closed	P.2 - Evaluation	TI 2515/191
The NRC inspection team identified a Green finding related to the licensee's failure to adequately consider the impacts from large internal flooding sources that are not seismically robust on the design, protection, and staging of the FLEX core cooling pump on the -35 ft. elevation of the reactor auxiliary building.			

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The team reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards."

OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS

TI 2515/191 - Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans

The inspection verified plans for complying with NRC Orders EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12056A045) and EA-12-051, Order Modifying Licenses With Regard to Reliable Spent Fuel Pool Instrumentation (ADAMS No. ML12054A679) are in place and are being implemented by the licensee. Additionally, the inspection verified implementation of staffing and communications information provided in response to the March 12, 2012, request for information letter (ADAMS No. ML12053A340) and multiunit dose assessment information provided per COMSECY-13-0010, "Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned", dated March 27, 2013, (ADAMS No. ML12339A262).

(1) Based on samples selected for review, the team inspected to determine whether the licensee satisfactorily implemented appropriate elements of the Diverse and Flexible Coping Strategies (FLEX) as described in the plant specific submittals [including the Final Integrated Plan (ADAMS No. ML16203A321)] and the associated safety evaluation (ADAMS No. ML17045A148), and to determine whether the licensee is in compliance with NRC Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events. Specifically, the team inspected to determine whether the licensee satisfactorily:

a) developed and issued FLEX Support Guidelines (FSGs) to implement the FLEX strategies for postulated external events;

b) integrated their FSGs into their existing plant procedures such that entry into and departure from the FSGs were clear when using existing plant procedures;

c) protected FLEX equipment from site-specific hazards;

d) developed and implemented adequate testing and maintenance of FLEX equipment to ensure their availability and capability;

e) trained their staff to assure personnel proficiency in the mitigation of beyond-design basis events; and

f) developed the means to ensure the necessary off-site FLEX equipment would be available from off-site locations.

(2) Based on samples selected for review, the team inspected to determine whether the licensee satisfactorily implemented appropriate elements of the FLEX strategy as described in the plant specific submittals [including the Final Integrated Plan (ADAMS No. ML16203A321)] and the associated safety evaluation (ADAMS No. ML17045A148), and to determine whether the licensee is in compliance with NRC Order EA-12-051, Order Modifying Licenses With Regard to Reliable Spent Fuel Pool Instrumentation. Specifically, the team inspected to determine whether the licensee satisfactorily:

a) installed the spent fuel pool instrumentation sensors, cabling and power supplies to provide physical and electrical separation as described in the plant specific submittals and safety evaluation;

b) installed the spent fuel pool instrumentation display in the location, environmental conditions, and accessibility as described in the plant specific submittals;

c) trained their staff to assure personnel proficiency with the maintenance, testing, and use of the spent fuel pool instrumentation; and

d) developed and issued procedures for maintenance, testing, and use of the reliable spent fuel pool instrumentation.

(3) The team reviewed information provided in the licensee's multi-unit dose submittal and in response to the NRC's March 12, 2012, request for information letter (ADAMS No. ML12053A340), and inspected to determine whether the licensee satisfactorily implemented enhancements pertaining to Near-Term Task Force Recommendation 9.3. Specifically, the team inspected to determine whether:

a) the licensee satisfactorily implemented required staffing changes to support an extended loss of all ac power (ELAP)/loss of ultimate heat sink (LUHS) scenario;

b) emergency preparedness communications equipment and facilities were sufficient for dealing with an ELAP/LUHS scenario; and

c) the licensee implemented multi-unit/-source dose assessment capabilities (including releases from the spent fuel pool) using the licensee's site-specific dose assessment software and approach.

The team verified that non-compliances with requirements and standards identified during the inspection were entered into the licensee's corrective action program as appropriate.

INSPECTION RESULTS

<table>
<tr><td colspan="4">Failure to Establish Appropriate Electrical-Related FLEX Strategies for Mitigating a Beyond-Design-Basis External Event</td></tr>
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VIO 05000382/2017009-01
Open
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<tr><td colspan="4">Description: To meet the requirements of NRC Order EA-12-049, the licensee committed in its Final Integrated Plan (FIP) to meet the requirements contained in NEI 12-06, “Diverse and Flexible Coping Strategies (FLEX) Implementation Guide,” Revision 0, as endorsed by the NRC. As described in the NEI 12-06 guidance, Section 3.2.2, “in order to assure reliability and availability of the FLEX equipment required to meet these capabilities [in responding to an ELAP/LUHS event], the site should have sufficient equipment to address all functions at all units on-site, plus one additional spare, i.e., an N+1 capability, where “N” is the number of units on-site.” As such, for the single unit Waterford 3 site, the N (or N-set) equipment was generally designated as the “primary” or minimum FLEX equipment for a given function or set of functions, and the N+1 equipment is the one additional “backup” piece of equipment for the same functions/set of functions.

However, the licensee requested alternatives to the NEI 12-06, Revision 0, guidance, in part, because the Waterford 3 site location along the banks of the Mississippi River raised potential challenges to moving FLEX equipment from the N+1 storage building during postulated flooding or hurricane events. The alternatives, in part, included:

(1) the pre-staging of one 480 VAC FLEX diesel generator (the N FLEX DG) within a robust structure inside the Nuclear Plant Island Structure (NPIS) on the reactor auxiliary building roof at the +41 foot MSL elevation; and

(2) storage of some N+1 FLEX equipment (including the N+1 FLEX DG) in the N+1 storage building located outside of the NPIS, though the N+1 storage building is not protected against flooding or wind driven missile hazards.

Additionally, given that the N+1 storage building was not designed to protect the backup equipment stored within it from all hazards applicable to the station, the licensee proposed that should any of the pre-staged “N-set” equipment inside the NPIS (including the N FLEX DG) be out-of-service or non-functional, the licensee would initiate actions within 24 hours and implement compensatory actions within 72 hours to restore the “N” capability of that equipment. These actions included providing protection for the N+1 equipment (e.g., N+1</td></tr>
</table>

FLEX DG) by moving them to within the NPIS within the 72 hours allowed to implement compensatory measures. The NRC staff documented in its Safety Evaluation (Sections 3.14.4 and 3.14.5) that "…although the guidance of NEI 12-06 has not been met, if these alternatives are implemented as described by the licensee, they will meet the requirements of the order."

The licensee's FLEX electrical strategy (as described in the FIP Section 2.3.2 and 2.3.11) includes shedding of non-critical DC electrical loads early in the event to allow the station's DC battery coping time to be extended from 4 hours to approximately 12.5 hours. Upon connection and starting of a FLEX DG, the station batteries could then be recharged providing continuous DC power to critical instruments and valves throughout Phase 2 of the event. Further, in addition to repowering the DC battery chargers, the FLEX DG was designed to provide or restore electrical power to the following Phase 2 equipment: (1) permanently installed charging pumps (to provide reactor coolant system makeup capability), (2) FLEX core cooling pumps (which are backups to the turbine-driven emergency feedwater pump to supply steam generator makeup capability), (3) permanently installed component cooling water makeup pumps (to provide spent fuel pool makeup capability), (4) fuel oil transfer pump, (5) battery room exhaust fan, and (6) various lighting.

During the course of the on-site inspection, the team identified that the licensee had developed procedures during final implementation which were inconsistent with the FIP and the NRC Safety Evaluation and failed to ensure that the key FLEX safety functions continued to be met. Specifically:

(1) The team determined that the licensee procedures and guidelines were implemented such that the N+1 FLEX DG would only be moved inside the NPIS (and protected) for the concurrent conditions of both the N FLEX DG out-of-service and when the station was forecast to experience "predictable external events with pre-warning" (e.g., hurricane, Mississippi River flooding). The team determined that this was contrary to the approved alternative described in the NRC Safety Evaluation in which the NRC staff understood that the licensee would move the N+1 FLEX DG inside the NPIS when the N FLEX DG was out of service or when the station was forecast to experience predictable external events to ensure that the N FLEX DG capability was continuously met under all hazards.

(2) Additionally, the team determined that if the licensee were to move the N+1 FLEX DG inside the NPIS for the conditions described above, the licensee had not established procedures or provisions to be able to run the N+1 FLEX DG inside the NPIS as described by NEI 12-06, Revision 0, Sections 6.2.3 and 7.3.2. Specifically, the licensee had not established a means to appropriately fuel or ventilate the N+1 FLEX DG had it become necessary to operate the engine inside of the enclosed reactor auxiliary building during a persistent flood or hurricane. Therefore the capability of the FLEX DGs could not be met under all hazards by the N+1 FLEX DG if the N FLEX DG was non-functional.

(3) Finally, the team determined that the licensee implemented part of the provisions of NEI 12-06, Revision 2, Section 11.5, which allows an outage time of 45 days for the N FLEX DG when the N+1 FLEX DG was in a location that was not fully protected under all hazards. The team determined that the licensee implemented this revised allowed outage time for a 25-day period beginning in February 2017 when the N FLEX DG was out of service due to a failed component when there was not a concurrent predicable external event, and therefore

the licensee staged the N+1 FLEX DG outside the NPIS at the ground elevation of the station unprotected from potential high winds, hurricanes, seismic, and/or flooding hazards.

The inspection team further determined that in implementing the approved alternatives described in the NRC Safety Evaluation for the protection of the N+1 FLEX DG when the N FLEX DG was out of service for other than planned maintenance, the licensee had created a Technical Requirements Manual (TRM) Limiting Condition for Operation Action Statement that was inconsistent with the approved alternatives. Specifically, TRM Limiting Condition for Operation 3.13.2, Action b.1, correctly implemented the approved alternatives in the Safety Evaluation and NEI 12-06, Revision 0, stating:

> "With one or more 'N' RAB [Reactor Auxiliary Building] FLEX Components specified in Table 3.13-1 [which includes the FLEX DG]… relocate the N+1 Building FLEX component to meet 'N' RAB FLEX capability within 72 hours and restore the 'N' RAB FLEX component within 90 days if the 'N+1' Building FLEX component relocation can satisfy the FLEX functions for all events."

However, TRM Limiting Condition for Operation 3.13.2, Action b.2, went further by implementing elements of NEI 12-06, Revision 2, in stating:

> "With one or more 'N' RAB FLEX Components specified in Table 3.13-1… relocate the N+1 Building FLEX component to meet 'N' RAB FLEX capability within 72 hours and restore the 'N' RAB FLEX component within 45 days if the 'N+1' Building FLEX component relocation cannot completely satisfy the FLEX functions for all events."

The 45-day allowed outage time as described in NEI 12-06, Revision 2, was intended for situations where FLEX equipment could be pre-staged as risk reduction measures in locations not fully protected from all hazards to facilitate shorter FLEX implementation timelines when the unit was in Modes 5 or 6 (i.e., during refueling outages). In implementing the reduced allowed outage time described in Revision 2, the N-set FLEX capability was still required to be met, which was not the situation for the 25-day period for the N+1 FLEX DG as identified by the inspection team. However, the licensee's FIP clearly stated that the licensee's strategies were developed based on the guidance in NEI 12-06, Revision 0, and the NRC Safety Evaluation stated that the staff evaluated the strategies against that standard (Section 3.1, page 8).

Because the licensee committed to NEI 12-06, Revision 0, which does not have the revised allowed outage time for the unprotected equipment, the inspection team determined that the allowed outage time for the N FLEX DG should have been 72 hours with the N+1 FLEX DG staged in the location outside of the NPIS. As such, the licensee failed to ensure the N capability was met for the FLEX DGs for a period of at least 25 days in early 2017, until the failed component was replaced and the N FLEX DG returned to a functional and available status.

The inspection team determined that the issues described above were examples associated with the licensee's overall failure to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event as required by NRC Order EA-12-049.

Corrective Actions: Following teleconferences with the Region IV-based inspection team and the NRC Headquarters Beyond-Design-Basis events subject matter experts in October through November 2017, the licensee acknowledged the concerns raised by the inspection team and documented in the corrective action program that the strategies to utilize N+1 FLEX DG were not consistent with the guidance in NEI 12-06, Revision 0, nor the approved alternatives. Additionally on November 16, 2017, the licensee used the correct 90-day action statement in TRM Limiting Condition for Operation 3.13.2 for the N+1 FLEX DG not being available under all conditions with the procedures currently in place for the station, while the licensee continued to take actions to correct the issues identified by the inspection team. Subsequently, on January 10, 2018, the licensee declared the N+1 FLEX DG functional (and exited the Technical Requirements Manual Action Statement), with additional administrative controls in place should the N FLEX DG become non-functional, while the licensee pursues long term corrective actions to revise the strategy for the protection and utilization of the N+1 FLEX DG under all hazards.

Corrective Action Reference(s): CR-WF3-2017-09150; CR-WF3-2017-09152

Performance Assessment:

Performance Deficiency: The inspection team identified that the licensee established their FLEX strategies for the protection and utilization of the N+1 FLEX Diesel Generator (DG) which were inconsistent with the requirements of NEI 12-06, Revision 0, and the approved alternatives to the guidance described in Section 12.5 of the licensee's Final Integrated Plan, and Section 3.14 of the NRC Safety Evaluation, which was a performance deficiency. Specifically, the licensee established the FLEX strategies such that the N+1 FLEX DG could not be used under all hazards, and implemented a revised allowed out-of-service time inconsistent with the NEI 12-06, Revision 0, and approved alternative guidance.

Screening: The performance deficiency is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affects its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, in establishing the FLEX electrical strategy the licensee failed to ensure the N capability of the FLEX DGs remained available under all hazards.

Significance: The team assessed the significance of the finding using IMC 0609, Appendix O, "Significance Determination Process for Mitigating Strategies and Spent Fuel Pool Instrumentation (Orders EA-12-049 and EA-12-051)," dated October 7, 2016. The team determined that the performance deficiency did not impact the spent fuel pool instrumentation order (EA-12-051) (question 1). However, the team determined that the performance deficiency included an exposure period of greater than 72 hours and involved both unavailable equipment and deficient procedures associated with the N+1 FLEX DG that would result in the complete loss of one or more FLEX functions (questions 2 and 3). Additionally, using available information, the product of the finding's exposure time and the applicable external event initiating event frequencies was greater than the 1E-6 threshold [in this case the hurricane event was the most dominant contributor] (question 4). Further, the team determined that the performance deficiency could involve significant programmatic issues in the areas of equipment/strategy design, procedural guidance, and training such that the effectiveness of the Mitigating Strategy program is reduced (question 5). Therefore,

further evaluation of the finding was directed in accordance with IMC 0609, Appendix M, "Significance Determination Process Using Qualitative Criteria."

In accordance with IMC 0609, Appendix M, the senior reactor analyst completed a bounding quantitative evaluation which provided an upper bound incremental conditional core damage probability (ICCDP) of 1.32E-5, where the ICCDP contribution is dominated by a hurricane-induced external event, with an exposure period capped at one year (from date of Order compliance [May 31, 2016] through the date in which the inspectors identified the issue [September 21, 2017]). The evaluation used a frequency of 4.6E-2/year for a hurricane-initiated loss of offsite power (LOOP). This was the best estimate based on actual data given that Waterford has experienced one hurricane-induced LOOP during the plant life (i.e., during Hurricane Katrina, 2005).

Additionally, FLEX equipment and strategies required by Order EA-12-049 provide a level of defense-in-depth for beyond-design-basis events resulting in an ELAP/LUHS in a similar manner to the equipment and strategies required by 10 CFR 50.54(hh)(2) which are intended to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire. As such, the inspectors reviewed the guidance in IMC 0609, Appendix L, "B.5.b Significance Determination Process," for an additional qualitative bounding assessment for this performance deficiency. In that the licensee failed to ensure the N-set capability of the FLEX DG was maintained under all hazards, multiple FLEX strategies (i.e., core cooling and spent fuel pool cooling) could not be assured under all hazards. Therefore, analogous to the unavailable, unrecoverable loss of multiple functions intended to mitigate beyond-design-basis events described in the IMC 0609, Appendix L, this FLEX-related performance deficiency involved the loss of multiple functions intended to mitigate beyond-design-basis events. As such, this deterministically developed methodology provided a qualitative bounding assessment of low-to-moderate safety significance.

Finally, the NRC considered additional qualitative factors associated with (1) effects on defense-in-depth; (2) extent the performance deficiency affected other equipment; (3) degree of degradation of the equipment failure; (4) effects of exposure time on the performance deficiency; (5) likelihood of the licensee's recovery actions to mitigate the performance deficiency; and (6) other qualitative circumstances. As further described in the attachment to this report, the qualitative factors considered together with the bounding evaluations described above support the final determination that the finding is of very low safety significance (Green).

Cross-cutting Aspect: The finding had a human performance cross-cutting aspect associated with conservative bias, in that the licensee failed to use a decision-making process that emphasized prudent choices over those that were simply allowable. Specifically, the licensee established the FLEX electrical strategy based in part on a review of the changes in NEI 12-06, Revision 2, which appeared to allow the licensee to establish alternative controls and procedures for the N+1 FLEX DG. However, in establishing this element of the strategy, the licensee failed to consider the core requirement to ensure the N+1 FLEX DG would be capable of providing the N-set capability under all hazards [H.14].

Enforcement:

Violation: Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events," dated March 12, 2012, Section IV.A.2, requires, in part, that all licensees identified in Attachment 1 to this Order comply with the requirements described in Attachment 2 of this Order except to the extent that a more stringent requirement is set forth in the license.

Order EA-12-049, Attachment 1, identified Entergy Operations, Inc., Waterford Steam Electric Station, Unit 3, (Waterford 3) as a power reactor licensee subject to Section IV of the Order.

Order EA-12-049, Attachment 2, requires, in part, that licensees develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event. The transition phase requires providing sufficient, portable, on-site equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. Licensees must also provide reasonable protection for the associated equipment from external events and full compliance includes, in part, the staging or installation of equipment needed for the strategies.

ENTGWF081-REPT-001, "Waterford Steam Electric Station Unit 3 Final Integrated Plan," Revision 1, dated July 20, 2016, provides the necessary guidance on strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities following a beyond-design-basis external event.

- Section 2.2, "Strategies," states, in part, that Phase 2 strategies support the transition from installed plant equipment to FLEX equipment which is deployed by the on-shift personnel to maintain essential functions.

- Section 2.3.2, "Phase 2 Strategy," states, in part, that the capability for reactor core cooling is accomplished from a pre-staged FLEX core cooling pump to provide feedwater to the steam generators in the event the turbine-driven emergency feedwater pump fails or sufficient steam pressure is no longer available to drive the turbine-driven emergency feedwater pump turbine, and that the FLEX core cooling pump is powered by the FLEX diesel generator. Section 2.3.2 also states, in part, that reactor coolant system inventory control involves the use of refueling water storage pool or boric acid makeup tank inventory through a repowered charging pump which receives its power from the FLEX diesel generator. Section 2.3.2 further states, in part, that the FLEX diesel generator is capable of supplying power to a battery charger such that DC power for controls and instrumentation continues to be available to support the reactor coolant system core cooling function.

- Section 2.4.2, "Phase 2 Strategy Modes 1-4," states in part, that the capability to provide spent fuel pool make-up and/or spray during Phase 2 is accomplished using the component cooling water make-up pumps which are powered by the FLEX diesel generator.

- Section 2.7, "Planned Protection of FLEX Equipment," states, in part, that in order to assure reliability and availability of the FLEX equipment required by the FLEX strategy, Waterford 3 has sufficient equipment to address all functions on-site, plus

one additional spare (i.e., an "N+1" capability). Section 2.7 further states, in part, that the "N+1" diesel generator provides the capability to restore the "N" function by relocating the "N+1" diesel generator to the reactor auxiliary building from the "N+1" storage building.

- Section 2.15.1, "Method of Storage and Protection of FLEX Equipment," states, in part, that to assist with unanticipated unavailability of the "N" set, evaluations have been performed and pre-planned strategies have been developed to provide reasonable protection of specific "N+1" equipment for predictable external events with pre-warning (i.e., Mississippi River flood and hurricanes) and instances where the "N" set is unavailable for conditions other than conduct of routine maintenance and testing during normal operations.

Contrary to the above, from June 1, 2016, to June 7, 2018, the licensee failed to adequately develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event. Specifically, the licensee failed to establish appropriate design and procedures associated with providing electrical power using the "N+1" FLEX diesel generator to support transition phase (Phase 2) strategies necessary to maintain or restore the core cooling and spent fuel pool cooling capabilities in mitigating a beyond-design-basis external event.

Disposition: This violation met the requirements for treatment as a non-cited violation; however, since the violation is associated with a failure to meet the requirements of orders issued by the Commission which will require subsequent specific follow up inspection to ensure compliance has been established, the NRC determined the issuance of Notice of Violation is appropriate.

Failure to Adequately Consider the Impacts on FLEX Phase 2 Equipment from Large Internal Flooding Sources Which Were Not Seismically Robust			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green Finding FIN 05000382/2017009-02 Closed	P.2 - Evaluation	TI 2515/191
The NRC inspection team identified a Green finding related to the licensee's failure to adequately consider the impacts from large internal flooding sources that are not seismically robust on the design, protection, and staging of the FLEX core cooling pump on the -35 ft. elevation of the reactor auxiliary building.			
Description: As described in the licensee's FIP Section 2.3, the station's FLEX strategy for core cooling utilizes the turbine driven emergency feedwater pump during Phase 1 of an extended loss of ac power/loss of ultimate heat sink (ELAP/LUHS) event response (starting in Modes 1-4) to feed the steam generators with feedwater from the condensate storage pool and exhausting the steam via the atmospheric dump valves. In Phase 2 of the response, the station's strategy continues to employ the turbine driven emergency feedwater pump since sufficient steam pressure is expected to be available to drive the pump turbine, drawing feedwater from the condensate storage pool and subsequently from the wet cooling tower basins. However, as backup should the pump fail or steam pressure drop below that which is necessary to drive the pump turbine, the licensee pre-staged an electric driven FLEX core			

cooling pump (FCCP) at the reactor auxiliary building -35 ft. elevation. This pre-staged backup pump is the N-set FCCP, while the N+1 FCCP is stored in the N+1 storage building. Either FCCP can be powered the FLEX power panel connected to either the N or N+1 480 VAC FLEX DG (once placed into service), and can feed the steam generators once the plant is cooled down to below 400 ºF, drawing feedwater suction from the condensate storage pool, wet cooling tower basins, or refueling water storage pool, and discharging into one of two new FLEX connections in the emergency feedwater lines. Additionally, the FCCP provides an additional backup to the charging pumps (one of three which are repowered from the FLEX DG) for reactor coolant system makeup and cooling.

Further, as described in the licensee's FIP Sections 2.3.5.4 and 2.3.10, for an ELAP/LUHS event that occurs when the plant is in Modes 5 or 6 (with the steam generators not available for heat removal/core cooling), the FCCP serves as the primary method for making up water to the reactor coolant system that would start to boil off from the residual decay heat in the core. In this condition, the FCCP would take suction from the refueling water storage pool and discharge into the reactor coolant system via one of two new FLEX connections in the high pressure safety injection lines.

During walkdowns of the reactor auxiliary building -35 ft. elevation, the inspection team noted that the N FCCP was installed on a pedestal which elevated the base of the pump approximately 18 inches above the floor grade. The licensee stated that the FCCP was elevated to account for the potential for internal flooding caused by a seismic event rupturing a large water source that was not seismically robust. This consideration in the FLEX strategy was required by NEI 12-06, Revision 0, Section 5.3.3, item 2, which states "…Consideration should be given to the impacts from large internal flooding sources that are not seismically robust and do not require ac power (e.g., gravity drainage from lake or cooling basins for nonsafety-related cooling water systems)." However, the inspection team noted that the electrical cable connection for the FCCP did not have a waterproof cap, nor was the cable secured such that the cable end would not drop below the base of the pump, potentially exposing the electrical connection to damaging internal flood waters.

The inspection team reviewed engineering calculation ECM 15-004, "Waterford 3 FLEX Internal Flooding Calculation," Revision 0, and determined that the licensee had considered several internal water sources, in particular piping and a tank associated with the fire protection system, that were determined to not be seismically robust and could contribute to flooding of the reactor auxiliary building -35 ft. elevation. The licensee considered the critical maximum flood level on the elevation to be 15 inches, and validated that the non-robust internal flooding sources would not exceed that elevation. However, the team noted that the licensee's calculation did not consider the FCCP electrical cable connection's length and capability to fall into the potential internal flood waters. The team further reviewed the sections in FSG-005, "Initial Assessment and FLEX Equipment Staging," Revision 6, associated with the staging and deployment of the FCCP under various conditions, and determined there was no procedural guidance provided to ensure the assumptions made in ECM 15-004 calculation were maintained by way of administrative controls.

The team determined that the lack of physical or procedural controls to ensure the FCCP electrical cable connection met the assumptions of the internal flooding calculations could affect both the pre-staged N FCCP and the backup N+1 FCCP. However, the team determined that the N+1 FCCP would only be affected in the situation where the pump was moved from the storage building and staged at the reactor auxiliary building -35 ft. elevation

to restore the N-capability of the FCCP prior to the seismic event causing the internal flooding. While the N+1 FCCP is skid mounted, it had similar critical dimensions and an electrical cable connection similar to the pre-staged N FCCP.

Corrective Action(s): In response to the inspection team's questions, the licensee documented the concerns in the corrective action program and initiated actions to secure the FCCP electrical cable connection to the top of the pump casing to preclude the connection from falling into the potential internal flood waters following a seismic event. The licensee also made changes to procedure FSG-005 to include the use of cable stands (procured and staged for use in a FLEX equipment box in the reactor auxiliary building) to ensure the cable from the FLEX distribution panel connecting to the FCCP is maintained above potential internal flood waters.

Corrective Action Reference(s): CR-WF3-2017-07709; CR-WF3-2017-07712

Performance Assessment:

Performance Deficiency: That the station did not give adequate consideration to the impacts from large internal flooding sources that were not seismically robust was a performance deficiency. Specifically, the electrical connection to provide power from the FLEX DG to the FLEX core cooling pump (FCCP) on reactor auxiliary building -35' elevation was not protected from potential impacts of seismically-induced internal flooding from non-seismic fire protection piping in the area either by design or by procedure, contrary to NEI 12-06, Revision 0, Section 5.3.3, item 2. The electrical connection for the FCCP was not water resistant or otherwise protected from flooding. Following a seismically-induced internal flooding event, the connection could potentially either be damaged or otherwise fail from water exposure, potentially rendering the pump unable to function.

Screening: The performance deficiency is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affects its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, without design or procedural protections in place to address the performance deficiency, a seismically-induced internal flood could render either the N-set or N+1 FCCP unable to fulfill its functions during an ELAP event.

Significance: The team assessed the significance of the finding using IMC 0609, Appendix O, "Significance Determination Process for Mitigating Strategies and Spent Fuel Pool Instrumentation (Orders EA-12-049 and EA-12-051)," dated October 7, 2016. The team determined that the performance deficiency did not (1) impact the spent fuel pool instrumentation order (EA-12-051); (2) did not involve unavailable equipment, deficient procedures, or deficient training that would result in the complete loss of one or more FLEX functions (where both the N and N+1 equipment were completely lost) with an exposure period of greater than 72 hours; and (3) did not involve programmatic deficiencies that reduced the effectiveness of the Mitigating Strategies. Further the product of the finding's exposure time and the applicable external event initiating event frequency (i.e., in this case a seismic event) was not greater than 1E-6. Therefore, the finding was of very low safety significance (Green).

Cross-cutting Aspect: The finding had a problem identification and resolution cross-cutting aspect associated with evaluation, in that the licensee failed to completely consider the impacts of the potential internal flood height on all electrical components for the FCCP [P.2].
Enforcement: Inspectors did not identify a violation of regulatory requirements associated with this finding.

Observation	TI 2515/191
The Waterford 3 site is unique in that there are approximately 15 permanent, large chemical industry facilities within 5 miles of the station along the Mississippi River. As such, the licensee has design basis analyses documenting the potential hazards from the wide variety of flammable and toxic materials produced and/or stored at these industrial facilities described in Updated Final Safety Analysis Report (UFSAR), Section 2.2.3. Additionally, because of these hazards, the licensee (1) utilizes Technical Specification-required, broad range gas detection equipment to detect and initiate automatic isolation of the control room ventilation system (described in UFSAR, Section 6.4), and (2) established comprehensive toxic chemical contingency (i.e., emergency) procedures to address actions to ensure the safety of station personnel during such releases from nearby facilities. The equipment and procedures have been described in the UFSAR and established since early in the operations of Waterford 3, well before the development of the FLEX strategies in accordance with Order EA-12-049. The inspection team reviewed the licensee's FLEX strategies and planning to determine if the licensee had considered whether one of the beyond-design-basis external events that could affect Waterford 3 would also adversely affect the nearby industrial facilities. The team considered that the external event may consequently cause those facilities to experience failures in electrical power and safety systems resulting in a release of toxic gas which could affect Waterford 3 and the station's ability to implement the FLEX strategies. In particular, the licensee's FLEX strategy includes actions to ventilate the control room envelope by opening up several doors to the outside environment. Normally this area is operated at a positive pressure to limit in-leakage and with monitoring using broad range gas detection equipment that can automatically initiate control room envelope isolation. Additionally, the licensee's FLEX deployment strategy requires operations and other staff to work in the outside environment to stage, operate, and monitor the FLEX equipment during Phases 1 and 2 of an ELAP/LUHS event. The Waterford 3 staff indicated that they had not considered those "offsite effects" because NEI 12-06 (Section 2, Boundary Conditions, page 8) did not require licensees to consider "independent, concurrent events" in establishing FLEX strategies. However, the inspection team noted that NEI 12-06 also states in Section 3.2.2, Item 11, that "Plant procedures/ guidance should consider accessibility requirements at locations where operators will be required to perform local manual operations.… procedures/guidance should identify the protective clothing or other equipment or actions necessary to protect the operator, as appropriate." While the station maintains personal protective equipment (i.e., self-contained breathing apparatus (SCBA)) which could be employed to protect staff should an offsite toxic gas release encroach the site, the inspection team determined that the licensee had not evaluated whether the supply of breathing air on-site (and other necessary personal protective consumables) would be sufficient for the duration of a beyond-design-basis event until	

additional offsite resources arrived (24 hours or later). Similarly, the licensee had not evaluated the potential impacts on the FLEX strategy in opening the control room envelope, nor variations in the FSG-directed actions to account for the potential concurrent toxic gas impacts on the site.

Licensee Actions: Considering the conflicting requirements in NEI 12-06, the licensee's design bases SSCs, and the specifics of the industrial environment surrounding the station, the licensee documented the inspection team's questions in the corrective action program with an action to "convene a cross-discipline team of Operations, Engineering, and EP [emergency preparedness] to develop and assess potential enhancements to implementation of the FLEX mitigating strategy to address coincident toxic chemical release during a Beyond Design Basis Event."

Subsequently, the licensee initiated actions to address the observations and questions, including:

- Established/enhanced processes with the local large chemical industrial facilities and St. Charles Parish Emergency Operations Center (EOC), whereby the licensee will be able to obtain the status of the industrial facilities, and any information on potential toxic gas releases, directly from the St. Charles EOC during beyond-design-basis events

- Procurement of additional handheld toxic gas detection equipment

- Procurement of additional breathing air resources to support field and control room FLEX activities during potential on-site impacts from a nearby, concurrent toxic gas release

- Conducting additional GOTHIC thermodynamic analyses to support development of contingency FLEX strategies for situations where the control room and switchgear rooms may need to be maintained closed or re-closed (rather than ventilated) due to on-site impacts from a nearby, concurrent toxic gas release

- Staging of additional FLEX personal protective equipment (SCBAs, handheld gas monitoring equipment, etc.) at locations in the plant near FLEX equipment staging areas

- Enhancements to the overall FLEX strategies/FSGs and severe weather preparation procedures, including triggers to implement toxic gas response contingencies during a beyond-design-basis event

- Evaluation and documentation of the enhancements to the FLEX strategies in accordance with the guidance in NEI 12-06, Section 11.8, "Configuration Control"

- Additional staff training on the revised FLEX contingency strategies and equipment

Corrective Action References: CR-WF3-2017-07689; CR-WF3-2018-00998

Planned Actions: As of the end of the inspection, the licensee had not completed all of the actions to address the observations/questions, though they were tracked within the corrective action program, with anticipated completion in 2018. These actions may be subject to further NRC inspection.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On September 22, 2017, the inspectors presented the on-site inspection results in a management debrief to Mr. R. Gilmore, Director, Regulatory and Performance Improvement, and other members of the site staff.

- On June 7, 2018, the inspectors presented the complete inspection results in a telephonic exit meeting to Mr. J. Dinelli, Vice President, and other members of the site staff.

DOCUMENTS REVIEWED

TI 2515/191 - Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans

Condition Reports (CR-xx-xxxx)

CR-WF3-2016-0795	CR-WF3-2016-2493	CR-WF3-2016-3467	CR-WF3-2016-5404
CR-WF3-2016-5991	CR-WF3-2016-6267	CR-WF3-2017-0854	CR-WF3-2017-1884
CR-WF3-2017-2019	CR-WF3-2017-2305	CR-WF3-2017-5336	CR-WF3-2017-6474
CR-WF3-2017-7491	CR-WF3-2017-7572*	CR-WF3-2017-7610*	CR-WF3-2017-7640*
CR-WF3-2017-7653*	CR-WF3-2017-7662*	CR-WF3-2017-7689*	CR-WF3-2017-7694*
CR-WF3-2017-7709*	CR-WF3-2017-7711*	CR-WF3-2017-7712*	CR-WF3-2017-7722*
CR-WF3-2018-0998*	LO-WLO-2017-0058		

* - Notes CRs written as a result of the inspection

Procedures (Number)	Title	Revision or Date
EN-FAP-EP-010	Severe Weather Response	06
FIG-001	FLEX Implementing Guideline - Extended Loss of AC Power	004
FSG-001	Long Term Inventory Control	003
FSG-002	Alternate EFW Suction Source	002
FSG-003	Alternate Low Pressure Feedwater	002
FSG-004	ELAP DC Bus Load Shed and Management	002
FSG-005	Initial Assessment and FLEX Equipment Staging	006
FSG-005	Initial Assessment and FLEX Equipment Staging	008
FSG-006	Alternate CSP Makeup	001
FSG-007	Loss of Vital Instrumentation or Control Power	001
FSG-008	Alternate RCS Boration	000
FSG-009	Low Decay Heat Temperature Control	000
FSG-010	Safety Injection Tank Isolation	000
FSG-011	Alternate Spent Fuel Pool Makeup and Cooling	001
FSG-012	Alternate Containment Cooling	000
FSG-013	Transition from FLEX Equipment	001
FSG-100	BDBEE/ELAP Emergency Response Organization FSG	000
FSG-101	BDBEE/ELAP Communications FSG	003
OI-004-000	Move FHB Rounds to RCA Watch	029
OI-004-000	Update order of log points	029
OP-901-513	Spent Fuel Pool Cooling Malfunction	021
OP-901-521	Severe Weather and Flooding	324
OP-902-005	Station Blackout Recovery	021
SAMG-Intro	Introduction	002
S-SAMG-01	Loss of Large Areas of the Plant Due to Fire/Explosion	019

Work Orders (Number)	Title	Revision or Date
00462201-01	FS ILI3000, Perform Functional Test (FLEX Standby PM)	
52697490-01	FLEX Standby PM-1 Year Operational Test-FLEXMDSG0001	
52698032-01	FLEX Standby PM- 6 Month Functional Test-FLEXMDSG0001	
52703445-01	FLEX Standby PM-1 Year Fluid Analysis-FLEXMDSG0001	
52706314-01	FLEX Standby PM- 1 Year Filter Replace/Lube - FLEXDRE001	6/6/2017
52706797-01	FLEX Standby PM – 1 Year Inventory – Aux Bldg	6/21/2017
52730989-01	FLEX Standby PM- 6 Mo Functional – FLEXMPMP0006 Pump	
52730990-01	FLEX Standby PM- 6 Month Functional – FLEXMPMP0003 Pump	
52730991-01	FLEX Standby PM-6 Month Inspection Debris Removal - FLEXDRE001	6/6/2017
52754363-01	FLEX - Sullivan Air Compressor Elec PM, Check Battery	7/31/2017
52754364-01	FLEX Sullivan Air Compressor Mech PM, Check Fluids and Run	7/22/2017
52758030-01	FLEX Standby PM- 3 Mth Walkdown/PMP Rotation – FLEXMPMP0001	
52758033-01	FLEX Standby PM- 3 Mth Walkdown/PMP Rotation – FLEXMPMP0005	
52758034-01	FLEX Standby PM- 3 Month Walkdown – FLEXMPMP0003 Pump	
52758035-01	FLEX Standby PM- 3 Month Walkdown – FLEXMPMP0006 Pump	
52767007-01	FLEX Standby PM-1 Month Walkdown Inspection FLEXDRE001	8/2/2017
52772909-01	FLEX Standby PM-1 Month Walkdown Inspection FLEXMDSG0001	8/29/2017

Miscellaneous Documents (Number)	Title	Revision or Date
95-0019-000	Godwin Installation, Operation and Maintenance Manual	12
D-G971.0015	FLEX Diesel Generator Vendor Manual	0
EC 77588	N+1 FLEX Diesel Generator Overturning and Sliding Due to Wind	5/3/2018
Form Number 02-DSY-PM-00111	Blancett B2800 Flow Monitor Programming and Installation Manual	
SD400	Industrial Diesel Generator Set	
TD-G200.0085	Goulds Pump Model 3316 Installation, Operation, & Maintenance Instructions	1
TD-M924.0015	EFP-IL Signal Processor Operator’s Manual	0
TD-M924.0025	EFP-IL Signal Processor Technical Manual	0
TD-M924.0035	SFP-1 Level Probe Assembly Technical Manual	0

Miscellaneous Documents (Number)	Title	Revision or Date
TD-W120.3085	Westinghouse Molded Case Circuit Breakers Series C, F-Frame, For Type EHD, FDB, FD, HFD, FDC, DW, HFW, FWC	2
TRM Section 3/4.13.2	Diverse and Flexible Coping Strategies (FLEX) Equipment	136
TRM Section 3/4.13.3	FLEX Fluid and Electrical Connections	136
WF3-CS-16-00003	Design Requirments and Vendor Documentation for FLEX N+1 Storage Building	0
WF3-SA-14-00002	Waterford 3 FLEX Strategy Development	02
Work Standard-FLEX	FLEX Equipment # FLEXMPMP0003 Diesel Driven Water Transfer Pump Operations	0

IMC 0609, Appendix M – Quantitative Evaluation
Waterford 3 N+1 FLEX Diesel Generator Issue

Summary:

The analyst performed a bounding analysis of the subject finding in accordance with Inspection Manual Chapter (IMC) 0609, Appendix M, "Significance Determination Process using Qualitative Criteria." The analyst quantified the following items that were common to all initiators:

1. The conditional core damage probability for an unrecoverable loss of offsite power given that the N FLEX diesel generator was out of service and the N+1 FLEX diesel generator failed from an external event;
2. The estimated baseline conditional core damage frequency given the N+1 FLEX diesel generator was successful; and
3. The estimated probability that the N FLEX diesel generator would be out of service at the time of an external event occurring.

For each external event, the analyst then preformed the following:

1. Estimated the initiating event frequency that would result in an unrecoverable loss of offsite power;
2. Calculated the baseline incremental conditional core damage probability (ICCDP);
3. Calculated the failure case ICCDP; and
4. Subtracted the baseline from the failure case to determine the combined ICCDP over the 1-year exposure period.

The analyst combined the ICCDPs for each external event initiator to get the total ICCDP for the performance deficiency. The result was 1.32×10^{-5}. This bounds the significance of the finding to less than Red.

Performance Deficiency:

The inspection team identified that the licensee established their FLEX strategies for the protection and utilization of the N+1 FLEX Diesel Generator (DG) which were inconsistent with the requirements of NEI 12-06, Revision 0, and the approved alternatives to the guidance described in Section 12.5 of the licensee's Final Integrated Plan, and Section 3.14 of the NRC Safety Evaluation, which was a performance deficiency. Specifically, the licensee established the FLEX strategies such that the N+1 FLEX DG could not be used under all hazards, and implemented a revised allowed out of service time inconsistent with the NEI 12-06, Revision 0, and approved alternative guidance.

More Than Minor Determination:

The performance deficiency is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and it adversely affected the associated cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, in establishing the FLEX electrical strategy the licensee failed to ensure the N capability of the FLEX DGs remained available under all hazards.

Evaluation using IMC 0609, Appendix O:

Using IMC 0609, Appendix O, "Significance Determination Process for Mitigating Strategies and Spent Fuel Instrumentation," dated 10/07/16, the inspectors performed a screening of the finding in accordance with Section 0609O-04, "Guidance." Based on this screening, Appendix O directed that the inspection finding be assessed using Inspection Manual Chapter 0609, Appendix M, "Significance Determination Process using Qualitative Criteria."

Evaluation using IMC 0609, Appendix M:

In accordance with Section 4.1, "Initial Bounding Evaluation," the senior reactor analyst used the best available quantitative methods and information to bound the risk significance of the finding. The external initiating events evaluated were those beyond the design basis of the facility as prescribed by Order EA-12-049 as follows:

- Seismic events
- External flooding
- Storms such as hurricanes, high winds and tornadoes
- Extreme snow, ice and cold, and
- Extreme heat

The following documents the assumptions used and the bounding evaluation for each of the external initiators:

Assumptions:

1. The Waterford 3 SPAR Model, Version 8.54 is the best tool for quantifying the conditional core damage probability related to this degraded condition, including the unavailability of the N+1 FLEX diesel generator whenever the N FLEX diesel is out of service.

2. The seismic evaluation procedures delineated in the Risk Assessment of Operational Events Handbook, Volume 2, "External Events," Revision 1.01 are the best available method of determining the frequency of a seismically-induced loss of offsite power at the Waterford 3 site.

3. The seismic hazard vector provided in Table 4A-1, "Seismic Hazard Vectors for the 72 SPAR Plants," of the Risk Assessment of Operational Events Handbook, Volume 2, "External Events," Revision 1.01, is the best available information related to the seismic hazard at the Waterford 3 site.

4. A seismic event at the Waterford 3 site that is large enough to cause a loss of offsite power by exceeding the fragility of switchyard insulator stacks would result in a loss of offsite power that is unrecoverable within a 24-hour period.

5. The risk from the failure to have a strategy that protects the N+1 FLEX diesel generator from all hazards when staged outside the Nuclear Island "east" watertight doors impacted the plant from May 31, 2016 to September 21, 2017. Therefore, an exposure period of 1-year was used as described in the significance determination process.

6. The probability of the N FLEX diesel generator being out of service for testing or maintenance can be approximated by taking the total outage time and dividing it by the total time that the FLEX strategies were in service since the date of full implementation on May 31, 2016.

7. The maximum precipitation event postulated at the Waterford 3 site would not cause flooding that would impact the staging of the N+1 FLEX diesel generator unless it was accompanied by additional precipitation from a major hurricane.

8. The frequency of a postulated failure of the Mississippi river levee at the Waterford 3 site can be approximated by the failure frequency of an earthen dam less than 50 feet high that is more than 5 years since closure.

9. A failure of the Mississippi river levee at the Waterford 3 site would result in a loss of offsite power that is unrecoverable within a 24-hour period.

10. The mean failure frequency of all earthen dams provided in Table 5A-1, “Dam Failure Rates,” of the Risk Assessment of Operational Events Handbook, Volume 2, “External Events,” Revision 1.01, is the best available information related to a Mississippi river levee failure at the Waterford 3 site.

11. The estimated frequency of an F2 or larger tornado strike at the Waterford 3 site, provided by the Office of Nuclear Reactor Research is the best available information related to strong winds greater than 125 mph at the Waterford 3 site.

12. Any F2 or larger tornado striking the Waterford 3 site would result in a loss of offsite power that is unrecoverable within a 24-hour period and the failure of the N+1 FLEX diesel generator when staged outside the nuclear island.

13. The Waterford 3 reactor plant has been operating for approximately 32.8 calendar years.

14. Given that one hurricane-induced loss of offsite power occurred at the Waterford 3 site during the operating life of the plant, the mean frequency of a hurricane-induced loss of offsite power can be quantified as 4.6×10^{-2}/year.

15. A hurricane-induced loss of offsite power at Waterford 3 would be unrecoverable within a 24-hour period.

16. If the Generac SD400 vendor manual provides a low operating temperature limit for a subsystem of the generator skid, then the entire diesel generator is capable of operating at ambient temperatures above this limit.

17. If the Generac SD400 vendor manual provides a maximum operating temperature limit for a subsystem of the generator skid, then the entire diesel generator is capable of operating at ambient temperatures below this limit.

18. The optional manufacturer’s enclosure for the Generac SD400 is installed over the N+1 FLEX diesel generator skid and is sufficient to prevent the diesel generator from being disabled by accumulated snow and ice at the Waterford 3 site.

External Events Conditional Core Damage Probability:

The analyst determined that the only external initiators of concern are those that would result in an unrecoverable loss of offsite power. Therefore, using the plant-specific Standardized Plant Analysis Risk Model, Version 8.54, the analyst quantified the conditional core damage probability (CCDP) for a non-recoverable, weather-related loss of offsite power. The CCDP was 3.60×10^{-3}. Because the SPAR does not model the FLEX equipment, this CCDP ($CCDP_{case}$) was used as the case value for failure of the FLEX functions. The dominant core damage sequences included a loss of offsite power with failure of:

1. The Emergency Power Supply System
   Operators to Isolate Controlled Bleedoff
   Operators to Maintain Reactor Coolant System Subcooling
   Operators to Restore Offsite Power in 2 Hours
   Operators to Recover Emergency Diesel Generators in 2 Hours
   Operators to Manually Control Emergency Feedwater Flow
   Operators to Depressurize the Steam Generators

2. The Emergency Power Supply System
   The Turbine-Driven Emergency Feedwater Pump
   Operators to Restore Offsite Power in 1 Hours
   Operators to Recover Emergency Diesel Generators in 1 Hours

3. The Emergency Feedwater System

Baseline Conditional Core Damage Probability:

Given the case CCDP of 3.60×10^{-3}, the analyst calculated a baseline CCDP. To establish a baseline CCDP, the analyst used a screening value of 0.1 consistent with PRA analyst practices, for the failure of the FLEX equipment, and applied this to the dominant sequences. The resulting estimated baseline CCDP ($CCDP_{base}$) was 3.60×10^{-4}.

Probability of N FLEX Diesel Generator Being Out of Service for Testing or Maintenance:

In accordance with Assumption 6, the analyst calculated the probability that the N FLEX diesel generator would be out of service. The analyst used the following data:

1. The N FLEX diesel generator was unavailable for a 17-day period from January 23, 2017 through February 9, 2017, when an alarm annunciated and the licensee incorrectly interpreted the alarm as an indication problem.
2. The N FLEX diesel generator was unavailable for a 25-day period from February 9, 2017, through March 6, 2017, because of a failed component.
3. The analyst estimated that quarterly testing of the N FLEX diesel generator would remove the diesel from service for 1 hour during each test.
4. The analyst estimated that annual testing of the N FLEX diesel generator would remove the diesel from service for 5 hours.
5. The total time that the FLEX strategy required the N FLEX diesel generator was from May 31, 2016 when the licensee declared full FLEX implementation, until the date the inspectors identified the issue on September 21, 2017.

Based on Item 5, the N FLEX diesel generator was installed for 478 days. The sum of the outage times for the N FLEX diesel generator was 42.4 days. Therefore, the probability of the N FLEX diesel generator being out of service ($P(N_{oos})$) was calculated to be 8.87×10^{-2}.

The analyst noted that the unavailability of the N FLEX diesel generator was based on limited information. Therefore, a sensitivity was performed to assess the range of potential results. The analyst quantified the following 2 cases:

1. Assuming that the 17-day period from January 23, 2017, through February 9, 2017, was an anomaly, the analyst quantified the risk upon removing this period from the total outage time of the N FLEX diesel generator. The resulting unavailability was 5.31×10^{-2} which led to an ICCDP of 7.90×10^{-6}.

2. Assuming that the performance deficiency could have reasonably increased the calculated unavailability of the N FLEX diesel generator, the analyst added a 17-day period to the total outage time and quantified the change in risk. The resulting unavailability was 1.24×10^{-1} which led to an ICCDP of 1.85×10^{-5}.

The change in this value results in approximately 40% change in either direction. Therefore, the sensitivity of the total ICCDP to this assumption is negligible.

Exposure Period:

In accordance with Assumption 5, the exposure period (EXP) during which the plant was potentially impacted by the performance deficiency was 1 year.

Seismic Events:

The analyst followed the seismic procedures delineated in the Risk Assessment of Operational Events Handbook, Volume 2, "External Events," Revision 1.01. Section 4.0, "Seismic Event Modeling and Seismic Risk Quantification," provides a method of calculating the frequency of a seismically-induced loss of offsite power ($\lambda_{seismic\text{-}LOOP}$) given the seismic hazard vector for the site. The analyst calculated a frequency of 2.27×10^{-5}/year over the entire seismic hazard spectrum.

Using the values quantified above, the analyst calculated a bounding ICCDP for seismic initiators as follows:

$ICCDP = ICCDP_{case} - ICCDP_{base}$

Where:

$ICCDP_{case} = \lambda_{seismic\text{-}LOOP} * CCDP_{case} * P(N_{oos}) * EXP$

$= 2.27 \times 10^{-5}/year * 3.60 \times 10^{-3} * 8.87 \times 10^{-2} * 1\ year$

$= 7.26 \times 10^{-9}$

And:

$ICCDP_{base}$ = $\lambda_{seismic\text{-}LOOP}$ * $CCDP_{base}$ * $P(N_{oos})$ * EXP

= 2.27×10^{-5}/year * 3.60×10^{-4} * 8.87×10^{-2} * 1 year

= 7.26×10^{-10}

Therefore:

ICCDP = 7.26×10^{-9} - 7.26×10^{-10}

= 6.53×10^{-9}

External Flooding:

As stated in the Final Safety Analysis Report, Section 2.4.3.7, the only conditions conducive to flooding of the Waterford 3 site are heavy precipitation and failure of the Mississippi river levee. The inspectors determined that a maximum precipitation event that was not exacerbated by a hurricane would not cause flooding to a height that would have impacted the N+1 FLEX diesel generator. Therefore, the only external flooding scenario of impact would be a postulated failure of the Mississippi river levee.

Using best available information, the analyst assumed that a postulated failure of the Mississippi river levee would have the same frequency as an earthen dam less than 50 feet high and greater than 5 years since construction. According to the Risk Assessment of Operational Events Handbook, Volume 2, "External Events," Revision 1.01, Table 5A-1, "Dam Failure Rates," the mean failure frequency would be 1.634×10^{-4}. It is noteworthy that all forms of dams have a failure rate between 1×10^{-4} and 4×10^{-4}, even for blue sky events. The analyst assumed that failure of the levee would result in an unrecoverable loss of offsite power ($\lambda_{flood\text{-}LOOP}$) as well as failure of the N+1 FLEX diesel generator.

Using the values quantified above, the analyst calculated a bounding ICCDP for external flooding as follows:

ICCDP = $ICCDP_{case}$ - $ICCDP_{base}$

Where:

$ICCDP_{case}$ = $\lambda_{flood\text{-}LOOP}$ * $CCDP_{case}$ * $P(N_{oos})$ * EXP

= 1.63×10^{-4}/year * 3.60×10^{-3} * 8.87×10^{-2} * 1 year

= 5.21×10^{-8}

And:

$ICCDP_{base} = \lambda_{flood\text{-}LOOP} * CCDP_{base} * P(N_{oos}) * EXP$

$= 1.63 \times 10^{-4}/year * 3.60 \times 10^{-4} * 8.87 \times 10^{-2} * 1\ year$

$= 5.21 \times 10^{-9}$

Therefore:

$ICCDP = 5.21 \times 10^{-8} - 5.21 \times 10^{-9}$

$= 4.69 \times 10^{-8}$

High Winds – Tornados:

Using the methods described in "Review of Methods for Estimation of High Wind and Tornado Hazard Frequencies," prepared for the U. S. NRC by the Center for Nuclear Waste Regulatory Analyses and the Southwest Research Institute, the Office of Nuclear Reactor Research determined the frequency of exceedance for tornadic winds in excess of 111 mph (F2 on Fujita Tornado Damage Scale) striking reactor sites in the United States. The frequency for this storm was 2.41×10^{-5}/year for Waterford 3. According to the Risk Assessment of Operational Events Handbook, Volume 2, "External Events," Revision 1.01, Section 5.2, "Scenario Definition and Quantification," weather-related loss of offsite power initiating events occur with strong winds greater than 125 mph which is the middle of the F2 scale. As stated in Assumptions 10 and 11, any F2 tornado striking the Waterford 3 site would result in a loss of offsite power and damage the N+1 FLEX diesel generator. Therefore, the tornado-induced loss of offsite power frequency ($\lambda_{tornado\text{-}LOOP}$) was estimated to be 2.41×10^{-5}/year.

Using the values quantified above, the analyst calculated a bounding ICCDP for high winds/tornados as follows:

$ICCDP = ICCDP_{case} - ICCDP_{base}$

Where:

$ICCDP_{case} = \lambda_{tornado\text{-}LOOP} * CCDP_{case} * P(N_{oos}) * EXP$

$= 2.41 \times 10^{-5}/year * 3.60 \times 10^{-3} * 8.87 \times 10^{-2} * 1\ year$

$= 7.69 \times 10^{-9}$

And:

$ICCDP_{base} = \lambda_{tornado\text{-}LOOP} * CCDP_{base} * P(N_{oos}) * EXP$

$= 2.41 \times 10^{-5}/year * 3.60 \times 10^{-4} * 8.87 \times 10^{-2} * 1 year$

$= 7.69 \times 10^{-10}$

Therefore:

$ICCDP = 7.69 \times 10^{-9} - 7.69 \times 10^{-10}$

$= 4.69 \times 10^{-8}$

High Winds – Hurricanes:

On August 30, 2005, Waterford 3 divorced from offsite power based on instability in the regional electrical grid as a result of Hurricane Katrina. No other hurricane-induced loss of offsite power events have occurred during the life of the plant. The analyst noted that Waterford 3 has operated approximately 32.8 years. Using a Jeffreys non-informative prior, the analyst estimated the mean frequency of a hurricane-induced loss of offsite power ($\lambda_{hurricane\text{-}LOOP}$) to be 4.6×10^{-2}/year. The analyst also reviewed information provided by the National Oceanic and Atmospheric Administration (NOAA). This Administration estimated that the return period for a major hurricane striking within 50 miles of the Waterford 3 site was 20 years. This is equivalent to a frequency of 5.0×10^{-2}/year. Assuming that a Category 3 or higher hurricane is likely to cause a loss of offsite power, this NOAA information corroborates the analyst's approximation.

Using the values quantified above, the analyst calculated a bounding ICCDP for hurricane initiators as follows:

$ICCDP = ICCDP_{case} - ICCDP_{base}$

Where:

$ICCDP_{case} = \lambda_{hurricane\text{-}LOOP} * CCDP_{case} * P(N_{oos}) * EXP$

$= 4.60 \times 10^{-2}/year * 3.60 \times 10^{-3} * 8.87 \times 10^{-2} * 1 year$

$= 1.46 \times 10^{-5}$

And:

$ICCDP_{base} = \lambda_{hurricane\text{-}LOOP} * CCDP_{base} * P(N_{oos}) * EXP$

$= 4.60 \times 10^{-2}/year * 3.60 \times 10^{-4} * 8.87 \times 10^{-2} * 1 year$

$= 1.46 \times 10^{-6}$

Therefore:

ICCDP = 1.46×10^{-5} - 1.46×10^{-6}

= 1.31×10^{-5}

Extreme Snow, Ice and Cold:

According to the National Oceanic and Atmospheric Administration, a freeze is expected only about once in 7 years near the mouth of the Mississippi. The lowest recorded temperature in New Orleans was 7°F on February 13, 1899. The average snowfall in Louisiana is 0.2 inches per year. The maximum historical snowfall in New Orleans was an unconfirmed 8.2 inches in 1895.

According to the inspectors, the N+1 FLEX diesel generator is housed in a manufacturer supplied enclosure. This would limit the impact of snow and ice coverage on the diesel generator components themselves. The analyst reviewed Document D-G971.0015, "Flex Diesel Generator Vendor Manual." The section on "Cold start recommendations" provides recommended starting techniques for temperatures to -25° C (-13° F). While no specific lower limit on ambient temperature was provided, this section implied that the diesel generator skid mounted equipment was capable of operating at and below the lowest recorded historical temperature in the New Orleans area. Using this (best available) information, the analyst determined that extreme cold conditions would not affect the operation of the N+1 FLEX diesel generator. Therefore, there is no increase in risk from the performance deficiency on postulated extreme snow, ice and cold initiating events.

Extreme Heat:

The maximum temperature ever recorded in St. Charles Parish was 102° F, according to the St. Charles Parish Hazard Mitigation Plan dated January 2015. The analyst reviewed Document D-G971.0015, "Flex Diesel Generator Vendor Manual." The section on "Fuel lift pump" provides for a maximum fuel inlet temperature of 55° C (131° F). While no specific upper limit on ambient temperature was provided, this section implied that the diesel generator skid mounted equipment was capable of operating at and above the highest recorded historical temperature in the St. Charles Parish. Using this (best available) information, the analyst determined that extreme heat conditions would not affect the operation of the N+1 FLEX diesel generator. Therefore, there is no increase in risk from the performance deficiency on postulated extreme heat initiating events.

Initial Bounding Evaluation Summary:

Assuming that all the initiator-specific analyses were mathematically independent, the analyst calculated the total ICCDP for Waterford 3 associated with the inappropriate staging of the N+1 FLEX diesel generator by adding the individual external initiators ICCDPs. The result was 1.32×10^{-5}. This bounds the significance of the finding to less than Red.

In accordance with IMC 0609, Appendix M, Section 4.1.2, the inspectors evaluated the applicable qualitative attributes because the bounding evaluation indicated that the risk significance of the finding could be greater than green.

IMC 0609, Appendix M – Qualitative Evaluation
Qualitative Decision-Making Attributes for NRC Management Review

NOTE: Where appropriate in this evaluation, the Region assigned qualitative terms as to the potential impact the attribute/procedural action could have in mitigating (i.e., reducing or increasing) the potential risk significance of the performance deficiency. The terms used in order of relative increasing qualitative impact are:

NO IMPACT < LOW < MODERATE < LARGE

Decision Attribute:	Applicable to Decision?
Finding can be bounded using qualitative and/or quantitative information?	Yes

Basis for Input to Decision:

As described in the preceding SRA-generated bounding evaluation, an upper bound estimate for ICCDP is 1.32×10^{-5}, where the ICCDP contribution is dominated by a hurricane-induced external event. The evaluation uses a frequency of 4.6×10^{-2}/year for a hurricane initiated LOOP (loss of offsite power). This is a best estimate given that Waterford has experienced one hurricane-induced LOOP during the plant life (i.e., during Hurricane Katrina in 2005).

Additionally, FLEX equipment and strategies implemented to meet Order EA-12-049 provide a level of defense in depth for beyond-design-basis events resulting in an extended loss of all ac power and loss of access to the ultimate heat sink (ELAP/LUHS) in a similar manner to the equipment and strategies required by 10 CFR 50.54(hh)(2) which are intended to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire. As such, the inspectors reviewed the guidance in IMC 0609, Appendix L, "B.5.b Significance Determination Process," to support an additional qualitative bounding assessment for this performance deficiency.

Per Table 2 of IMC 0609, Appendix L, the unrecoverable unavailability of multiple mitigating strategies such that spent fuel pool cooling, injection to reactor pressure vessel, or injection to steam generators cannot occur related to the equipment required by 10 CFR 50.54(hh)(2) would be characterized as a finding of low-to-moderate safety significance (White). In that the licensee failed to ensure the N capability of the FLEX DG was maintained under all hazards, multiple FLEX strategies (i.e., core cooling and spent fuel pool cooling) could not be assured under all hazards. Therefore, analogous to the unavailable, unrecoverable loss of multiple functions intended to mitigate beyond-design-basis events described in the IMC 0609, Appendix L, this FLEX-related performance deficiency involves the loss of multiple functions intended to mitigate beyond-design-basis events. As such, conservatively assuming the functions as unavailable and unrecoverable, a qualitative bounding assessment of low-to-moderate safety significance is consistent with this deterministically developed methodology.

Decision Attribute:	Applicable to Decision?
Defense-in-Depth affected?	Yes

Basis for Input to Decision:

For Beyond-Design-Basis (BDB) event response, the N+1 FLEX DG is identical to the installed N FLEX DG (with the exception that it is mounted on a towable trailer) and provides the redundancy for the N FLEX DG in accordance with Mitigating Strategies Order. However, the licensee had not established procedures to use the N+1 FLEX DG from within the Nuclear Plant Island Structure (NPIS). Additionally, when the N+1 FLEX DG was staged the outside of the NPIS for 25 days (when the N FLEX DG was unavailable/non-functional) the N+1 FLEX DG was available, yet unprotected from all hazards.

Note as discussed in a later attribute, the licensee did have procedural guidance in place to protect the N+1 FLEX DG by moving it inside the NPIS with a Category 4 or greater hurricane forecast to impact the site. In this limited situation, the N+1 FLEX DG, while not able to be utilized when staged in the NPIS, would be protected from all hazards and potentially available to be moved back outside the NPIS for use after the storm passed.

Decision Attribute:	Applicable to Decision?
Performance Deficiency effect on the Safety Margin maintained?	No

Basis for Input to Decision:

Safety Margins are not defined for the BDB events.

Decision Attribute:	Applicable to Decision?
The extent the performance deficiency affects other equipment.	Yes

Basis for Input to Decision:

The station is required to have two FLEX DGs (N and N+1) per the Order and NEI guidance. The N FLEX DG is installed inside the NPIS, protected from all hazards, and capable of providing the necessary FLEX functions when available/functional. Per the NEI guidance for complying with the Order, the N+1 FLEX DG is intended to be capable of fulfilling the same functions provided by the N FLEX DG should the primary FLEX DG become non-functional.

The functions provided by the FLEX DG include repowering the DC battery chargers and to provide or restore electrical power to the following Phase 2 equipment: (1) permanently installed charging pumps (to provide reactor coolant system makeup capability), (2) FLEX core cooling pumps (which are backups to the turbine driven emergency feedwater pump to supply steam generator makeup capability), (3) permanently installed component cooling water makeup pumps (to provide spent fuel pool makeup capability), (4) fuel oil transfer

Decision Attribute:	Applicable to Decision?
The extent the performance deficiency affects other equipment.	Yes

Basis for Input to Decision:

(Cont'd)

pump, (5) battery room exhaust fan, and (6) various lighting. Therefore, the function of the FLEX DG directly impacts the ability of the station to meet at least two of the three core FLEX functions (core makeup/cooling and spent fuel pool makeup/cooling).

However, the licensee established the FLEX electrical strategies which were inconsistent with the Order, the guidance in NEI 12-06, Revision 0, and NRC Safety Evaluation. Had the inspectors not identified this performance deficiency, it is possible that the flawed FLEX electrical strategies would have continued to be implemented, in that the licensee incorrectly believed that the strategy met the Order, industry guidance, and NRC Safety Evaluation. Additionally, as a consequence of establishing the flawed strategy, the licensee implemented an incorrect allowed outage time for the N FLEX DG. As such, the performance deficiency adversely affected the aforementioned functions provided by the FLEX DG for several weeks beyond the intended allowed outage period. Further, since the controlling Technical Requirements Manual action statement would have only directed the licensee to continue to take actions to restore the N FLEX DG to functional status if the allowed outage time was exceeded, the risk related to this consequence of the performance deficiency could have continued to increase.

Decision Attribute:	Applicable to Decision?
Degree of degradation of failed or unavailable component(s)	Yes

Basis for Input to Decision:

Survivability of the N+1 FLEX DG when staged outside of the NPIS:

Hurricane Winds

The licensee stated that Waterford Procedure OP-901-521, "Severe Weather and Flooding," directs the N+1 FLEX DG to be relocated to inside the reactor auxiliary building when a Hurricane Warning is issued for a Category 4 hurricane or greater for the area. The licensee noted that while they had not developed a method or guidance to operate the N+1 FLEX DG inside the reactor auxiliary building, it would potentially be available to be moved back outside of the NPIS for use after the storm had passed.

Based on questions from the inspectors regarding the ability of the N+1 FLEX DG to survive hurricane force winds if left exposed outside the NPIS, the licensee provided a Certificate of Design Compliance from the manufacturer of the FLEX DGs. The certificate indicated that the station procured the N+1 FLEX DG with a strengthened enclosure which was evaluated to withstand wind forces up to 180 mph (in accordance with International Building Code 2009

Decision Attribute:	Applicable to Decision?
Degree of degradation of failed or unavailable component(s)	Yes

Basis for Input to Decision:

(Cont'd)

and 2012, and ASCE 7-05 and 7-10). However, the manufacturer's certification for the generator was for a configuration which differed from that of the N+1 FLEX DG (i.e., mounted to a surface as opposed to a moveable trailer). Therefore, the licensee completed an engineering calculation on May 3, 2018, to estimate the wind speeds necessary to cause the N+1 FLEX DG to slide and/or overturn as configured on its transport trailer. The calculation demonstrated that the N+1 FLEX DG would not slide, tilt, turnover, or move axially at wind speeds below 159 mph, provided the station staged the unit in accordance with station procedures. (Specifically licensee Procedure UNT-007-060, "Control of Loose Items," Section 5.2.4.1.8, requires in part that loose items with wheels are to be secured with wheel locking devices or with the use of wheel chocks.)

NRC Considerations: The manufacturer's certification provided that the enclosure for the N+1 FLEX DG is capable of withstanding the impacts of, and the generator operating in, wind speeds up to 180 mph. Further the licensee's calculation demonstrated that the N+1 FLEX DG, if staged outside the NPIS, would not displace in wind speeds below 159 mph. A Category 5 hurricane's average minimum wind speed is 157 mph measured at 10 meters. Additionally, the licensee's analysis does not take into account short bursts of wind (i.e., driving winds) which may be much greater than 159 mph, nor potential impacts from wind-driven missiles.

Given that the licensee has a procedural trigger to move the N+1 FLEX DG into the NPIS with a forecast Category 4 or greater (≥130 mph) storm (as discussed further in a later attribute), the calculation demonstrates a level of margin for survivability should the N+1 FLEX DG be staged outside the NPIS and a forecast Category 3 (or lower) storm intensifies to a stronger storm with greater wind speeds just before landfall.

Additionally, the licensee's calculation only assumed using wheel chocks to minimize trailer movement. However, the inspectors identified that Procedure EN-FAP-EP-010, "Severe Weather Response," provides additional guidance for station personnel to consider when preparing for and/or responding to severe weather conditions. EN-FAP-EP-010, Attachment 7.1, Step 23 specifically states "Tie-down trailers and portable buildings with cables and ropes." These actions may provide further margin relative to the survivability of the N+1 FLEX DG due to hurricane winds. Yet, consistent with prior NRC actions/risk evaluations (e.g., Fort Calhoun flooding significance determination EA-10-084, October 6, 2010), no risk credit is typically given for potential licensee actions without comprehensive procedures developed and trained on prior to the event occurring.

While the licensee's additional analysis and procedural actions described above may reduce the likelihood of the loss of the ac power provided by the N+1 FLEX DG, the N+1 FLEX DG would be at risk during other elements of large storm-induced events (as described below); thus the N capability is still not available for "all hazards."

Decision Attribute:	Applicable to Decision?
Degree of degradation of failed or unavailable component(s)	Yes

Basis for Input to Decision:

(Cont'd)

Hurricane-Induced Flooding Impacts

A review of the licensee FSAR, Section 2.4, shows that the predicted flood water levels in the vicinity of the NPIS following a hurricane is highly variable dependent on the approach path of the storm, and the stage (water level) of the Mississippi River during the storm. The Probable Maximum Hurricane (PMH) approaching from the south and not associated with a PMH-induced river levee failure may result in an estimated still-water flood height of 18.1 ft MSL for a period of 27 hours, and up to 23.7 ft MSL when considering wave action induced by the storm (FSAR Sections 2.4.5.1 – 2.4.5.3). In that the N+1 FLEX DG was staged outside the NPIS at a grade level of approximately 17.5 ft MSL, the estimated transient, flood water heights would be approximately 0.5 – 6.2 feet above the grade level, thereby potentially inundating and rendering the N+1 FLEX DG unusable if staged at that location.

Additionally, FSAR Section 2.4.5.6 notes that a PMH is capable of producing a stage in the Mississippi River which is greater than the probable maximum flood and with significant wave action such that river levee failure is possible, dependent on the path of the storm. In this scenario, the maximum flood water height outside the NPIS is estimated to be 25.4 ft MSL (7.9 feet above grade level), with the flood waters flowing at greater than 13 feet per second, which would inundate and render the N+1 FLEX DG unusable if staged at that location.

NRC Considerations: Not included in the FSAR analyses, but of further concern in this case, is that the run up of the aforementioned flood waters would have the potential to create flash flood conditions which could also inundate, displace, and/or otherwise disable the N+1 FLEX DG if staged at the location outside of the NPIS.

As previously noted, Procedure EN-FAP-EP-010, "Severe Weather Response," provides guidance for station personnel to consider when preparing for and/or responding to severe weather conditions. EN-FAP-EP-010, Attachment 7.1, Step 34 includes "Consider installing temporary flood barriers (sandbags or equivalent) in areas which may be susceptible to flooding…. Stage additional temporary flood barriers near susceptible areas…. Consider accessibility to FLEX and B.5.b staged equipment." However, no further guidance or specificity is provided in the procedure relative to how tall temporary flood barriers should be constructed for estimated water heights or velocities. Consistent with prior NRC actions/risk evaluations (e.g., Fort Calhoun flooding significance determination EA-10-084, October 6, 2010), no risk credit is typically given for potential licensee actions without comprehensive procedures developed and trained on prior to the event occurring. As such, the survivability of the N+1 FLEX DG staged outside of the NPIS due to hurricane-induced flooding is variable and uncertain.

Decision Attribute:	Applicable to Decision?
Degree of degradation of failed or unavailable component(s)	Yes

Basis for Input to Decision:

(Cont'd)

Hurricane-Induced Rain Impacts

A review of the licensee FSAR, Section 2.4.2.3, shows that the theoretical predicted Probable Maximum Precipitation (PMP) event for the Waterford site is estimated at 30.7 inches of rain in a 6-hour period, and up to 34.9 inches of rain in a 24-hour period. A review of the vendor manual for the N+1 FLEX DG and design documents for the trailer mounting shows that the engine itself sits approximately 3.5 - 4 feet above the ground level, and includes a rain cap on the engine exhaust. Further the engine enclosure is constructed with limited openings, including access doors with gaskets and air intake louvers, both which are designed to limit water intrusion into the enclosure.

> *NRC Considerations:* The design, orientation, and engineered features of the N+1 FLEX DG and enclosure should limit extensive water intrusion from a PMP event, however, air intake clogging or other limited water intrusion due to wind driven rain cannot be completely discounted.
>
> *Overall NRC Considerations for Survivability of the N+1 FLEX DG Staged Outside the NPIS during Hurricane Conditions:* In consideration of the elements described above relative to hurricane impacts on the N+1 FLEX DG staged in a non-protected configuration outside of the NPIS, there are several design and engineered features relative to the N+1 FLEX DG and the manufacturer provided enclosure which provide a moderate level of protection from anticipated winds up to 159 mph and associated rain effects. When additional licensee procedural steps to enhance the potential survivability of the engine are considered with the design and engineered features, collectively these are assessed to provide a *MODERATE RISK REDUCTION* overall. However, as noted above, should the station experience a PMH with an unfavorable approach track, the survivability of the N+1 FLEX DG becomes more uncertain due to the potential for flood inundation of the areas outside of the NPIS.

Complexity of the failure and corrective actions required for the N FLEX DG

The licensee has indicated that, if an ELAP had occurred concurrent with a hurricane during the period the N+1 FLEX DG was replacing the N FLEX DG in February 2017, Waterford maintenance personnel would have been called on to expedite troubleshooting and repair of the N FLEX DG. The licensee indicated that the fault in the N FLEX DG was associated with the Engineering Control Unit (ECU) was easily identifiable and the N FLEX DG would have been expeditiously repaired by swapping the faulted ECU in the N FLEX DG with the good ECU from the N+1 FLEX DG in that the FLEX DGs are identical. The licensee's staff indicated confidence that the repair could have been accomplished within a 12-hour period.

> *NRC Considerations: NO RISK IMPACT.* Given that the FLEX DGs are identical, the proposed repair strategy appears feasible and attainable for this specific fault condition. However, the licensee chose not to pursue this repair option in

Decision Attribute:	Applicable to Decision?
Degree of degradation of failed or unavailable component(s)	Yes

Basis for Input to Decision:

(Cont'd)

February 2017 based in part on their incorrect interpretation and implementation of the NEI 12-06 guidance (i.e., use of the 45 day allowed outage time). Further, the failure experienced in February 2017 is not the only type of equipment failure which the FLEX DGs could experience, and as such scavenging parts from the N+1 FLEX DG may not be a viable solution in all situations. The inspectors did not identify any station procedures which would have driven the licensee to pursue an expedited repair option (scavenging from the other FLEX DG or otherwise) had the failure of the N FLEX DG occurred during Hurricane Season (June – October), or during any other adverse environmental condition. Finally, consistent with prior NRC actions/risk evaluations (e.g., Fort Calhoun flooding significance determination EA-10-084, October 6, 2010), no risk credit is typically given for potential licensee actions without comprehensive procedures developed and trained on prior to the event occurring.

Decision Attribute:	Applicable to Decision?
Period of time (exposure time) effect on the performance deficiency.	Yes

Basis for Input to Decision:

The exposure time for the performance deficiency was developed from the date in which the licensee declared to be in compliance with the Order (June 1, 2016) until the date the performance deficiency was identified by the inspection team (September 21, 2017) – a period of 477 days. This period was capped at one year per the standards established for the significance determination process (see Quantitative Assessment, Assumption 5, Attachment page 4). As discussed previously, the licensee established the FLEX electrical strategies which were inconsistent with the Order, NRC Safety Evaluation, and the guidance in NEI 12-06, Revision 0 (i.e., the performance deficiency). Had the inspectors not identified this performance deficiency, it is possible that the flawed FLEX electrical strategies would have continued to be implemented, in that the licensee had incorrectly believed that the strategy met the Order, industry guidance, and NRC Safety Evaluation.

Additionally, as a consequence of establishing the flawed strategy, the licensee implemented an incorrect allowed outage time for the N FLEX DG, which increased the unavailability of the N FLEX DG during the period of the performance deficiency. Specifically, the N FLEX DG was declared out of service for 25 days (February 9 – March 6, 2017). However, the FLEX functionality was not provided under all conditions with the N+1 FLEX DG in the unprotected location (i.e., susceptible to damage from natural phenomena). As such, the licensee should have entered the Technical Requirements Manual action statement to restore the FLEX functionality within 72 hours. Additionally, following the on-site inspection, the inspectors discovered that the licensee had written Condition Report CR-WF3-2017-00385 on

Decision Attribute:	Applicable to Decision?
Period of time (exposure time) effect on the performance deficiency.	Yes

Basis for Input to Decision:

(Cont'd)

January 23, 2017, which documented the initial discovery of the low temperature alarm on the N FLEX DG. Yet the licensee did not fully troubleshoot the alarm to establish a reasonable assurance of functionality of the N FLEX DG at that time. This total period of unavailability for the N FLEX DG was considered as an input to the senior reactor analyst's bounding risk evaluation (see Attachment page 4).

> *NRC Considerations:* As noted, because the licensee established a flawed electrical strategy from the date of compliance (i.e., the performance deficiency), the exposure period was determined capped at one year in accordance with the significance determination process. The total unavailability of the N FLEX DG (42 days) (i.e., a consequence of the performance deficiency) was taken into account in the senior reactor analyst's quantitative bounding risk evaluation in the calculation of the probability of the N FLEX DG being out of service for maintenance and testing.

Decision Attribute:	Applicable to Decision?
The likelihood that the licensee's recovery actions would successfully mitigate the performance deficiency.	Yes

Basis for Input to Decision:

Per OP-901-521, "Severe Weather & Flooding" (Rev 324) (the adverse weather off normal procedure), the licensee established several procedural actions which could mitigate the risk of the performance deficiency in response the hurricane-induced events.

Section E_0, Step 4. Upon receipt of a Tropical Storm Watch/Warning, or a Hurricane Watch/Warning from the National Weather Service, the Operations staff will enter Section E_4 of OP-901-521, and take the following actions:

E_4, Step 2. Review equipment out of service per OP-100-010 and "expedite restoration of vital plant systems and components to service."

> *NRC Considerations:* The availability of FLEX equipment which directly implements one or more of the core FLEX strategies (including the FLEX DGs) is controlled through the licensee's Technical Requirements Manual (TRM) Section 3.13. Procedure OP-100-010, "Equipment Out of Service" provides instructions on the documentation and control of equipment operability in accordance with the Technical Specification (TS) and TRM Limiting Conditions for Operations. However, there are no definitions in OP-100-010, or other licensee documents or training identified, which define what is included as "vital plant systems and components."

Decision Attribute:	Applicable to Decision?
The likelihood that the licensee's recovery actions would successfully mitigate the performance deficiency.	Yes

Basis for Input to Decision:

(Cont'd)

E_4, Step 3. If a Hurricane Watch/Warning is issued, then perform the following:

1st Bullet. Start and then place in standby each Emergency Diesel Generator (EDG) in accordance with OP-009-002, Emergency Diesel Generator. (A note prior to this step restricts testing the EDGs one at a time, and an EDG is not required to be started if it had been run within the prior 48 hours.)

> *NRC Considerations:* Testing of the EDGs and validating their operability prior to the onset of hurricane conditions may offset some of the risk contribution due to an EDG "failure to start" upon demand.

E_4, Step 7.1. If Temporary Emergency Diesels [TEDs] are installed, then ensure a walkdown of the TED is performed per Attachment 4.

> *NRC Considerations:* The TEDs are not protected from the BDB external events and the assumed probability of survival is considered low.

E_4, Step 13. Advise Shift Manager to evaluate the need to call in additional personnel for the duration of the storm. [i.e., Augmented ERO sequestration on-site].

> *NRC Considerations:* The additional on-site emergency response organization [ERO] staff who may be sequestered on-site for hurricane response are unlikely to have a significant impact in reducing the risk associated with the performance deficiency without pre-established procedural guidance in place for the staging and utilization of the N+1 FLEX DG inside the NPIS. This is consistent with prior NRC actions/risk evaluations (e.g., Fort Calhoun flooding significance determination EA-10-084, October 6, 2010) in not giving risk credit for potential ERO actions without comprehensive procedures developed and trained on prior to the event occurring.

E_4, Step 14. If a Hurricane Warning is issued, then perform the following:

4th Bullet. If the hurricane warning is for greater than or equal to a Category 4 Hurricane, then the N+1 FLEX DG is to be moved into a location inside the NPIS regardless of the functional status of the N FLEX DG. (Similar action taken if in Section E_3 (Mississippi River flooding) and river level at the levee fronting the site is ≥ 25 ft MSL.)

> *NRC Considerations:* As discussed in a prior attribute, the licensee provided a vendor certification and additional engineering evaluation which demonstrated that the N+1 FLEX DG could survive without sliding or overturning in hurricane wind speeds up to 159 mph if staged outside of the NPIS. In that those wind speeds are greater than those of a Category 4 storm, the calculation demonstrates a level of margin for

Decision Attribute:	Applicable to Decision?
The likelihood that the licensee's recovery actions would successfully mitigate the performance deficiency.	Yes

Basis for Input to Decision:

(Cont'd)

survivability should the N+1 FLEX DG be staged outside the NPIS and a forecast Category 3 (or lower) storm intensifies to Category 4 or weak Category 5 storm just before landfall. However, while the additional analysis and procedural actions reduce the likelihood of the loss of the ac power provided by the N+1 FLEX DG, the N+1 FLEX DG survivability would still be at risk during a large storm-induced flooding event (also as discussed in a previous attribute); thus the N capability is still not available for "all hazards."

E_4, Step 17. Twelve (12) hours prior to the arrival of hurricane conditions on-site, as projected by the National Weather Service, perform the following: (a) Commence a Plant Shutdown in accordance with OP-010-005, Plant Shutdown; and (b) When Plant Shutdown is complete, then commence a plant cooldown, as directed by Plant Management, in accordance with OP-010-005, Plant Shutdown. (Notes prior to this step indicate that the shutdown is performed in anticipation of a Loss of Offsite Power, and the shutdown should be completed two hours prior to the expected hurricane conditions on-site).

NRC Considerations: As described in the FIP and FLEX program document, the station timelines for an ELAP event assume the event starts with the unit in operation (Mode 1). Under this assumption, the FLEX DG function is not required until T+12.5 hours (for repowering the battery chargers) and T+17 hours (for RCS makeup via repowering 1 of 3 charging pumps or the FLEX core cooling pump).

As stated in the FIP, the passive injection of borated water from the safety injection tanks and the reduced RCP seal leakage with the use of Flowserve N-9000 seals ensure adequate shutdown margin and RCS natural circulation until 17 hours from event initiation. RCS makeup is necessary after 17 hours to compensate for the assumed RCP seal leakage and to prevent transition into reflux boiling.

The actions in OP-901-521, Step 17 to initiate shut down of the unit 12 hours prior to, and attain hot standby 2 hours prior to the onset of hurricane winds on-site would reduce the heat assumed in the FLEX program analysis and increase the margin in the timeline to implement the FLEX strategies. Therefore, while shutting down the unit prior to the onset of hurricane force winds on-site may provide additional time for the licensee to re-establish the FLEX electrical function, the level risk reduction is variable based on the factors described above.

Overall NRC Consideration for Recovery Actions: Collectively considered, the station's Adverse Weather Off Normal Procedure (OP-901-521) described above contains several actions which could provide a *LOW RISK REDUCTION* from the performance deficiency.

Decision Attribute:	Applicable to Decision?
Additional qualitative circumstances associated with the finding that regional management should consider in the evaluation process.	Yes

Basis for Input to Decision:

Performance Deficiency Occurrence Outside of Hurricane Season

NRC Considerations: NO RISK IMPACT. The licensee established the electrical portion of the FLEX strategy which did not ensure that the N-set capability of the strategy could be ensured by either the N or N+1 FLEX DG under all hazards. One of the consequences of the performance deficiency was that the licensee incorrectly implemented an extended (45 day) allowed outage time when the N FLEX DG was non-functional due to a failed component, and they did not restore this N-set capability with the N+1 FLEX DG within 72 hours as required by the guidance the station was committed to meet. The fact that this consequence of the performance deficiency occurred outside the nominal Hurricane Season (June – October) is not directly applicable to the risk-informed (quantitative bounding) evaluation, in that there were no clear procedural actions established which would have specifically changed the licensee's actions during the Hurricane Season. As also discussed in a previous attribute, since the controlling Technical Requirements Manual action statement would have only directed the licensee to continue to take actions to restore the N FLEX DG to functional status if the allowed outage time was exceeded, the risk related to this consequence of the performance deficiency could have continued to increase.

That said, based in part on prior licensee response to hurricane threats, despite the lack of procedural guidance, and notwithstanding that the NRC has not historically provided risk credit for procedure development by the ERO (see previous attribute), the licensee's actions to troubleshoot and repair the N FLEX DG were not conducted at the level of urgency that would be expected had the station been under threat of a possible hurricane.

Availability of Phase 3 Equipment from the National SAFER Response Center (NSRC)

NRC Considerations: NO RISK IMPACT. As described in the licensee's FIP (Table 12), the licensee expects to receive a 1000 KW 480 VAC turbine generator from the NSRC as part of the standard deployment of equipment that all stations would receive for Phase 3 response. However, Phase 3 equipment from the NSRC is not expected to begin arriving on-site for any station until ~24 hours after initiation of the event and with completion of delivery by T+72 hours. Therefore, the Phase 3 equipment would not improve the timeline for the recovery of the FLEX electrical strategy.

(Continued on the next page…)

Result of Management Review:

Result of Management Review (COLOR): GREEN

In consideration of the bounding quantitative risk evaluation in the Yellow band and the qualitative factors described above, there is sufficient evidence to support that this finding should be characterized as having very low safety significance (Green).

However, since the violation is associated with a failure to meet the requirements of orders issued by the Commission which will require subsequent specific follow up inspection to ensure compliance has been established, the NRC determined the issuance of Notice of Violation is appropriate in this case, requiring the licensee to provide a written response describing corrective actions to restore compliance, as permitted by Sections 2.3.2 and 2.3.3 of the Enforcement Policy.

WATERFORD STEAM ELECTRIC STATION, UNIT 3 – INSPECTION OF THE IMPLEMENTATION OF MITIGATION STRATEGIES AND SPENT FUEL POOL INSTRUMENTATION ORDERS AND EMERGENCY PREPAREDNESS COMMUNICATION/STAFFING/MULTI-UNIT DOSE ASSESSMENT PLANS – INSPECTION REPORT 05000382/2017009 AND NOTICE OF VIOLATION – July 20, 2018

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ADAMS ACCESSION NUMBER: ML18201A492
☒ SUNSI Review By: GMiller ADAMS: ☒ Yes ☐ No ☐ Non-Publicly Available ☒ Publicly Available ☒ Non-Sensitive ☐ Sensitive Keyword: NRC-002

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