



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

August 29, 2016

Mr. Thomas A. Vehec  
Site Vice President  
NextEra Energy Duane Arnold, LLC  
3277 DAEC Road  
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER - REPORT FOR THE ONSITE AUDIT REGARDING IMPLEMENTATION OF MITIGATING STRATEGIES AND RELIABLE SPENT FUEL POOL INSTRUMENTATION RELATED TO ORDERS EA-12-049 AND EA-12-051 (CAC NOS. MF1000 AND MF1001)

Dear Mr. Vehec:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A148), NextEra Energy Duane Arnold, LLC (NextEra, the licensee) submitted its OIP for Duane Arnold Energy Center (Duane Arnold) in response to Order EA-12-049. By letters dated August 27, 2013, February 24, 2014, August 25, 2014, February 19, 2015, August 14, 2015, and February 29, 2016 (ADAMS Accession Nos. ML13242A007, ML14063A065, ML14239A493, ML15054A006, ML15246A409, and ML16064A023, respectively), NextEra submitted its first six, six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). This audit process led to the issuance of the Duane Arnold interim staff evaluation (ISE) (ADAMS Accession No. ML14007A676) on February 21, 2014, and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A014), the licensee submitted its OIP for Duane Arnold in response to Order EA-12-051. By letter dated September 16, 2013 (ADAMS Accession No. ML13255A198), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated August 27, 2013, October 10, 2013, February 24, 2014, August 25, 2014, February 16, 2015, August 27, 2015, and February 29, 2016 (ADAMS Accession No. ML13242A008, ML13284A122, ML14063A066, ML14239A494, ML15050A039, ML15243A033, and ML16064A022, respectively), the licensee submitted its RAI responses and six-month updates to the OIP. The NRC staff's review of these submittals led to the issuance of the Duane Arnold ISE and RAI dated November 26, 2013 (ADAMS Accession No. ML13323B443). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at Duane Arnold from June 6-9, 2016, per the audit plan dated April 27, 2016 (ADAMS Accession No. ML16106A031). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and gain key insights most easily obtained at the plant as to whether the licensee is on the correct path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussion, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

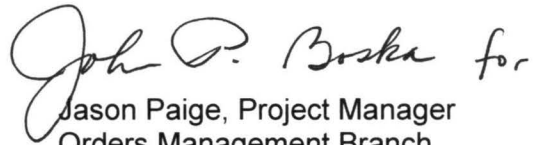
The enclosed audit report provides a summary of the activities for the onsite audit portion. Additionally, this report contains an attachment listing all open audit items currently under NRC staff review.

T. Vehec

- 3 -

If you have any questions, please contact me by e-mail at [Jason.Paige@nrc.gov](mailto:Jason.Paige@nrc.gov).

Sincerely,

Handwritten signature in black ink that reads "John P. Boska for". The signature is written in a cursive style.

Jason Paige, Project Manager  
Orders Management Branch  
Japan Lessons-Learned Division  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure:  
Audit report

cc w/encl: Distribution via Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO ORDERS EA-12-049 AND EA-12-051 MODIFYING LICENSES  
WITH REGARD TO REQUIREMENTS FOR  
MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS  
AND RELIABLE SPENT FUEL POOL INSTRUMENTATION  
NEXTERA ENERGY DUANE ARNOLD, LLC  
DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

BACKGROUND AND AUDIT BASIS

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). Order EA-12-049 directs licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities in the event of a beyond-design-basis external event (BDBEE). Order EA 12-051 requires, in part, that all operating reactor sites have a reliable means of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery actions in the event of a BDBEE. The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A148), NextEra Energy Duane Arnold, LLC (NextEra, the licensee) submitted its OIP for Duane Arnold Energy Center (Duane Arnold) in response to Order EA-12-049. By letters dated August 27, 2013, February 24, 2014, August 25, 2014, February 19, 2015, August 14, 2015, and February 29, 2016 (ADAMS Accession Nos. ML13242A007, ML14063A065, ML14239A493, ML15054A006, ML15246A409, and ML16064A023, respectively), NextEra submitted its first six, six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No.

Enclosure

ML082900195). This audit process led to the issuance of the Duane Arnold interim staff evaluation (ISE) (ADAMS Accession No. ML14007A676) on February 21, 2014, and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A014), the licensee submitted its OIP for Duane Arnold in response to Order EA-12-051. By letter dated September 16, 2013 (ADAMS Accession No. ML13255A198), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated August 27, 2013, October 10, 2013, February 24, 2014, August 25, 2014, February 16, 2015, August 27, 2015, and February 29, 2016 (ADAMS Accession No. ML13242A008, ML13284A122, ML14063A066, ML14239A494, ML15050A039, ML15243A033, and ML16064A022, respectively), the licensee submitted its RAI responses and six-month updates to the OIP. The NRC staff's review of these submittals led to the issuance of the Duane Arnold ISE and RAI dated November 26, 2013 (ADAMS Accession No. ML13323B443). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at Duane Arnold from June 6-9, 2016, per the audit plan dated April 27, 2016 (ADAMS Accession No. ML16106A031). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and gain key insights most easily obtained at the plant as to whether the licensee is on the correct path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussion, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

Following the licensee's declarations of order compliance, the NRC staff will evaluate the OIPs, as supplemented, the resulting site-specific OPDs/FIPs, and, as appropriate, other licensee submittals based on the requirements in the orders. For Order EA-12-049, the staff will make a safety determination regarding order compliance using the Nuclear Energy Institute (NEI) guidance document NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, issued in August 2012 (ADAMS Accession No. ML12242A378), or Revision 2, issued in December 2015 (ADAMS Accession No. ML16005A625). These guidance documents are endorsed by NRC Japan Lessons-Learned Directorate (JLD) interim staff guidance (ISG) JLD-ISG-2012-01 "Compliance with Order EA-12-049, 'Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events'" Revision 0 (ADAMS Accession No. ML12229A174), and Revision 1 (ADAMS Accession No. ML15357A163), with certain clarifications, as providing an acceptable means of meeting the order requirements. For Order EA-12-051, the staff will make a safety determination regarding order compliance using the NEI guidance document NEI 12-02,

"Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation' " (ADAMS Accession No. ML12240A307), as endorsed, with exceptions and clarifications, by NRC JLD-ISG-2012-03 "Compliance with Order EA-12-051, 'Reliable Spent Fuel Pool Instrumentation' " (ADAMS Accession No. ML12221A339) as providing one acceptable means of meeting the order requirements. Should the licensee propose an alternative strategy or other method deviating from the guidance, additional staff review will be required to evaluate if the alternative strategy complies with the applicable order.

## AUDIT ACTIVITIES

The onsite audit was conducted at the Duane Arnold facility from June 6, 2016, through June 9, 2016. The NRC audit team staff was as follows:

<b>Title</b>	<b>Team Member</b>
Team Lead / Project Manager	John Boska
Project Manager	Milton Valentin
Technical Support	On Yee
Technical Support	Matthew McConnell
Technical Support	Joshua Miller
Technical Support	Bruce Heida
Technical Support	Khoi Nguyen

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the April 27, 2016, plan, to include conducting a tabletop discussion of the site's integrated mitigating strategies compliance program, a review of specific technical review items, and discussion of specific program topics. Activities that were planned to support the above included detailed analysis and calculation discussions, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

## AUDIT SUMMARY

### 1.0 Entrance Meeting (June 6, 2016)

At the audit entrance meeting, the NRC staff audit team introduced itself followed by introductions from the licensee's staff. The NRC audit team provided a brief overview of the audit's objectives and anticipated schedule.

### 2.0 Integrated Mitigating Strategies Compliance Program Overview

Per the audit plan and as an introduction to the site's program, the licensee provided a presentation to the NRC audit team titled "Duane Arnold Energy Center, Mitigating Strategies for Beyond Design Basis External Events." The licensee provided an overview of its strategy to maintain core cooling, containment, and SFP cooling in the event of a BDBEE, and the plant modifications being done in order to implement the strategies. Also presented was the design and location of the FLEX equipment storage facilities, the FLEX equipment that would be stored there, the interface with the National

SAFER (Strategic Alliance for FLEX Emergency Response) Centers (NSRC), and the SFP level indication modification.

### 3.0 Onsite Audit Technical Discussion Topics

Based on the audit plan, and with a particular emphasis on the Part 2 "Specific Technical Review Items," the NRC staff technical reviewers conducted interviews with licensee technical staff, site walk-downs, and detailed document review for the items listed in the plan. Results of these technical reviews that require additional information from the licensee are documented in the audit item status table in Attachment 3, as discussed in the Conclusion section below.

#### 3.1 Reactor Systems Technical Discussions and Walk-Downs

The NRC staff met with licensee staff to discuss the amount of leakage expected from the reactor recirculation pump seals, the use of the Reactor Core Isolation Cooling (RCIC) system to maintain reactor pressure vessel (RPV) level, the availability of water sources, and the heat up of the suppression pool due to steam release from the RPV. The NRC staff reviewed the analysis and flow calculations along with applicable procedures. The NRC staff reviewed the licensee's strategy for utilizing raw water sources (the Cedar River), including water filtration and monitoring of core parameters to ensure adequate cooling. The NRC staff also walked down the licensee's strategies and reviewed plant procedures for implementing the core cooling and makeup strategies.

#### 3.2 Electrical Technical Discussions and Walk-Downs

The NRC staff reviewed the calculations on extending battery life based on load shedding, calculations on sizing for the FLEX diesel generators (DGs), and walked down the switchgear, direct current (dc) equipment, and battery rooms to evaluate strategies for hydrogen and temperature control. The licensee will begin the dc load shed within one hour of the beginning of the extended loss of alternating current (ac) power (ELAP) event and will complete the load shed within 2 hours of the start of the event. The licensee performed a load shed analysis to determine the maximum coping times for the batteries, which concluded 8 hours for the Division 1 batteries and 10 hours for the Division 2 batteries. The licensee plans to have the Phase 2 FLEX generators deployed and supplying power to the battery chargers before the depletion of the batteries. The licensee will utilize one portable diesel-driven 480 Volts alternating current (Vac) generator (about 405 kilowatts) and some small 240/120 Vac generators (6 kilowatts) for Phase 2. The licensee performed a sizing evaluation and concluded that each of the portable generators will be of sufficient size to readily power required loads allowing additional margin for other use in defense in depth. To support Phase 3, Duane Arnold will receive two 4160 Vac turbine generators and one 480 Vac generator from the NSRCs.

#### 3.3 SFPI Technical Discussions and Walk-Downs

The NRC staff walked down the SFP area, SFP instrumentation locations, and related equipment mounting areas. No concerns were identified during the walk-downs.

### 3.4 Other Technical Discussion Areas and Walk-Downs

- a. The NRC staff reviewed and walked down the location of the local staging area for the NSRC equipment and the access routes to the site. Duane Arnold and the NSRC have developed and evaluated primary and secondary staging areas and routes to the site. The primary and secondary staging area and routes are identified in the Duane Arnold SAFER Response Plan. In addition, the SAFER Response Plan addresses alternatives for transport of off-site resources to the on-site staging area that include diverse land routes and also includes the option of airlifting equipment to the on-site staging area. The primary on-site staging area is adjacent to the north FLEX storage building and the alternate on-site staging area is adjacent to the south FLEX storage building.

In addition, the NRC staff reviewed the deployment paths for the possibility of soil liquefaction. The licensee indicated that the protected area of the site in the area of plant structures was addressed with respect to liquefaction during original plant construction. The FLEX storage buildings are located separate from the protected area of the plant. Therefore, the FLEX storage buildings are on ground that may not have been previously excavated. As discussed above, two deployment routes have been identified from each storage building. The soil conditions for the FLEX storage building locations and the assumed transport paths from the FLEX storage buildings to the protected area were evaluated for FLEX purposes. The licensee concluded that soil conditions were found to be acceptable for all locations with the exception of approximately 300 feet of roadway north of the plant cooling towers. The licensee remediated this section of roadway to improve the reliability of that transport path.

- b. The NRC staff reviewed the licensee's Phase 2 strategy for RPV and SFP makeup. The licensee stated that Duane Arnold has two portable diesel-driven pumps, and one of these pumps is the existing B.5.b pump. The two pumps have similar flow characteristics, rated at about 500 gallons per minute (gpm) at 170 pounds per square inch gage discharge pressure. The licensee indicated that Duane Arnold's Phase 2 FLEX strategy is to simultaneously supply the RPV and SFP with a single portable diesel-driven pump. Therefore, the licensee performed an evaluation to determine the capability of one pump to provide the required flow to both destinations. The evaluation considered the makeup rate to exceed decay heat levels at the time of deployment of the pump in order to support restoring RPV water level and SFP boiling and the associated requirement to establish SFP makeup, which occurs later in the ELAP event. Based on the evaluation, one pump will have to simultaneously deliver 100 gpm for RPV injection and 200 gpm for SFP spray. The licensee concluded that each pump is capable of supplying water to the reactor and the SFP simultaneously at the required flow rates needed for RPV and SFP makeup, and therefore only one pump needs to be deployed.
- c. The NRC staff reviewed the licensee's room heat-up analyses to ensure that adequate cooling is provided to equipment needed during an ELAP event. The licensee indicated that an analysis was developed to determine temperatures in select areas during a Station Blackout (SBO). The areas of concern are the control room and the reactor core isolation cooling (RCIC) room. The analysis models the SBO event for a 24 hour period; therefore, it will be used as the basis analysis for



FLEX response. The analysis concludes that the peak temperature in the control room is 120 degrees Fahrenheit (°F) after 24 hours, which is for the case with doors open and natural circulation established. The licensee noted that this peak temperature is within the qualification limits for control room equipment. Regarding the RCIC room, the peak temperature in the room reaches 125 °F after 24 hours, and assumes the RCIC room door remains closed throughout the run. The licensee noted that this peak temperature is conservative as the Duane Arnold FLEX strategy assumes the RCIC pump operates only for the first 7.5 hours of the ELAP event. In addition, the licensee stated that the RCIC is designed to operate satisfactorily in accident mode with ambient temperatures up to 148 °F.

- d. The NRC staff reviewed the plant-specific refueling strategy and procedures that provide guidance for refueling the diesel-powered portable equipment. The licensee performed a fuel consumption evaluation, which determined that the fuel consumption rate for the diesel-powered equipment used in FLEX Strategies is 38.3 gallons per hour when run at full load. This is approximately 920 gallons per 24 hour period. To accomplish refueling of FLEX equipment, the licensee has a FLEX transfueler that has a storage capacity of 990 gallons of diesel fuel. The licensee noted that the FLEX transfueler capacity of 990 gallons will add more than 24 hours to the equipment run time after their onboard fuel storage is consumed. Additionally, the FLEX transfueler has the capability and equipment to be refilled from the standby diesel generator underground storage tank. The licensee indicated that the minimum level in the underground storage tank has the capability to refill the FLEX transfueler tank eight times, which would extend the onsite refueling capability to 1 week. Offsite fuel would be able to be supplied to the site by Duane Arnold's normal fuel supplier 24 hours after the event to ensure indefinite coping supply. The FLEX transfueler has a gasoline-powered and dc-powered (powered by a FLEX tow vehicle) onboard transfer pumps, and fuel transfer hoses and nozzles to accomplish the refueling of diesel-powered portable FLEX equipment.
- e. The NRC staff reviewed the licensee's strategy for maintaining containment function during Phase 2. The licensee indicated that the containment venting system uses nitrogen bottles as the pneumatic supply for the operation of the hard pipe vent isolation valves and vent pipe purging, and a method to open the rupture disc at a containment pressure below its design rupture pressure. The nitrogen bottles are independent of plant air supplies that are supplied by electric compressors. In addition, the nitrogen bottles are located in the reactor building, which is a seismic Class I structure. Normally, the operation of the hard pipe vent, vent pipe purging operation and rupture disc opening is controlled from the main control room. In the event the control room operation is unavailable, the hard pipe vent isolation valve, vent pipe purging, and rupture disc opening can be performed at a remote operating station by the manipulation of manual valves.
- f. The NRC staff reviewed and walked down the connection points to ensure that at least one connection for the FLEX equipment will be accessible through a seismically robust structure. The licensee stated that the FLEX connection points are located in Seismic Category I structures (reactor building and control building). Access to FLEX connection points is entirely through Seismic Category I structures with the exception of the turbine building. However, the licensee indicated that the turbine building is seismically robust.

#### 4.0 Exit Meeting (June 9, 2016)

The NRC staff audit team conducted an exit meeting with the licensee staff following the closure of onsite audit activities. The NRC staff highlighted items reviewed and noted that the results of the onsite audit trip will be documented in this report. The following items that require additional information from the licensee were discussed at the exit meeting (see Attachment 3):

- a. Safety evaluation (SE) Review Item 10, Robust Water Source for the FLEX Pump Consistent with NEI 12-06, Section 3.2.1.3.3, licensees should have cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles are available. In addition, Section 5.3.2.3 states that if a plant's FLEX strategy relies on a water source that is not seismically robust, the deployment of FLEX coping capabilities should address how water will be accessed. During the onsite audit, the licensee stated that the FLEX's pump water source is the circulating water pit, which could be drained to a level below the suction capability of the FLEX pumps if the connected non-seismic circulating water pipes were to fail. Therefore, the NRC staff requested that the licensee make available a justification that the FLEX strategy can be implemented with the use of the circulating water pit during a seismic event or identify a seismically qualified water source for the FLEX pump. Subsequent to the onsite audit, the licensee made available to the NRC staff a seismic evaluation of the circulating water pipes connected to the circulating water pit. The NRC staff concluded that the circulating water pit was a robust source of water and closed SE Review Item 10.

#### CONCLUSION

The NRC staff completed all three parts of the April 27, 2016, onsite audit plan. Each audit item listed in Part 2 of the plan was reviewed by NRC staff members while on site. In addition to the list of NRC and licensee onsite audit staff participants in Attachment 1, Attachment 2 provides a list of documents reviewed during the onsite audit portion.

In support of the continuing audit process as the licensee proceeds towards orders compliance for this site, Attachment 3 provides the status of any open audit review items that the NRC staff is evaluating in anticipation of issuance of a combined SE for the Mitigation Strategies (MS) and Spent Fuel Pool Instrumentation (SFPI) orders. The five sources for the audit items referenced below are as follows:

- a. Interim Staff Evaluation (ISE) Open Items (OIs) and Confirmatory Items (CIs)
- b. Audit Questions (AQs)
- c. Licensee-identified Overall Integrated Plan (OIP) Open Items (OIs)
- d. SFPI Requests for Additional Information (RAIs)
- e. Additional information needed to support the SE

The attachments provide audit information as follows:

- a. Attachment 1: List of NRC staff and licensee staff audit participants
- b. Attachment 2: List of documents reviewed during the onsite audit
- c. Attachment 3: Duane Arnold MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input as delineated

While this report notes the completion of the onsite portion of the audit per the audit plan dated April 27, 2016, the ongoing audit process continues as per the letters dated August 28, 2013, and March 26, 2014, to all licensees and construction permit holders for both orders.

Additionally, while Attachment 3 provides a progress snapshot of the NRC staff's review of the licensee's OIPs, as supplemented, and as augmented in the audit process, the status and progress of the NRC staff's review may change based on licensee plan changes, resolution of generic issues, and other NRC staff concerns not previously documented. Changes in the NRC staff review will be communicated in the ongoing audit process.

Lastly, the licensee has identified open items that need to be completed to implement orders EA-12-049 and EA-12-051, and the staff expects that the licensee continue to provide updates on the status of the licensee identified open items in their 6-month updates or on the ePortal.

Attachments:

- 1. NRC and Licensee Staff Onsite Audit Participants
- 2. Onsite Audit Documents Reviewed
- 3. Duane Arnold MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input

## Onsite Audit Participants

### NRC Staff:

John Boska	NRR/JLD/JOMB
Milton Valentin	NRR/JLD/JOMB
On Yee	NRR/JLD/JCBB
Matthew McConnell	NRR/JLD/JERB

Bruce Heida	NRR/JLD/JCBB
Joshua Miller	NRR/JLD/JERB
Khoi Nguyen	NRR/JLD/JERB

### Duane Arnold Staff:

Brian Wohlers	FLEX Program Manager
Tim Holt	FLEX Project Lead
Ronnie Lingle	FLEX Corporate Support
Mike Wood	FLEX implementation team
Al Roderick	FLEX implementation team
Wayne Render	FLEX implementation team
Mike Fetzer	FLEX implementation team
Paul Brozenich	FLEX implementation team
Ken Putnam	FLEX implementation team
Juan Santiago	Engineering
John Hoffman	Engineering
Jeff Miell	Operations
Eugene Vann	FLEX implementation team
Rebecca Palmer	Emergency Planning
Jonathan Aller	Communications Equipment
Mike Davis	Regulatory Affairs
Laura Swenzinski	Regulatory Affairs
Clara Rushworth	FLEX implementation team

## Documents Reviewed

- Procedure SAMP 703, RCIC Operation Following Loss of Electric Power, Revision 0
- Procedure SAMP 707, Emergency SRV Operation Using Portable DC Power, Revision 0
- Procedure SAMP 708, Emergency RPV Makeup with the Portable Diesel Fire Pump, Revision 0
- Procedure SAMP 710, Emergency CST Makeup with the Portable Diesel Fire Pump, Revision 0
- Procedure SAMP 712, Spent Fuel Pool Makeup and Spray, Revision 0
- Procedure SAMP 715, Portable Diesel Fire Pump Operation, Revision 0
- Procedure SAMP 721, FLEX 480 VAC Diesel Generator Operation, Revision 0
- Procedure SAMP 722, FLEX Repowering Battery Chargers from FLEX 480 VAC DG, Revision 0
- Procedure SAMP 723, FLEX Repowering MCC 1B32 from FLEX 480 VAC Portable Diesel Generators, Revision 0
- Procedure SAMP 724, FLEX Damage Assessment and Portable Equipment Deployment, Revision 0
- Procedure SAMP 725, FLEX Alternative Power to Instrument AC, Revision 0
- Procedure SAMP 726, FLEX Adverse Environment Conditions Guideline, Revision 0
- Procedure SAMP 727, FLEX Local Instrument Readings, Revision 0
- Procedure SAMP 728, FLEX Replenishment of Water Inventories, Revision 0
- Procedure SAMP 729, FLEX Ventilation of the Reactor Building Without AC Power, Revision 0
- Procedure SAMP 730, FLEX Guidelines for RCIC Use During A Beyond Design Basis External Event, Revision 0
- Procedure SAMP 731, FLEX Restoration of CV-4371A DW Valves N2 Supply Isolation, Revision 0
- Abnormal Operating Procedure, AOP 301.1, Station Blackout, Revision 61
- Abnormal Operating Procedure, AOP 435, Loss of Fuel Pool Cooling
- Abnormal Operating Procedure, AOP 902, Flood, Revision 54
- Emergency Operating Procedure EOP-1, Reactor Pressure Vessel Control
- Emergency Operating Procedure EOP-2, Primary Containment Control
- Emergency Operating Procedure EOP-3, Secondary Containment Control
- SAMP 301.3, Torus Vent Via Hardpipe Vent
- FLEX-AA-100, FLEX Equipment Preventive Maintenance Basis Program, Revision 4
- FLEX-AB-100-1000, Guidance for FLEX Equipment When it is Unavailable
- Calculation CAL-M07-018, B.5.b Phase 2 and 3 Hydraulic Evaluation, Revision 0
- Duane Arnold UFSAR, Section 9.1.2, Spent Fuel Storage, 9.1.2.3.2 Cooling Considerations
- Calculation CAL-M13-005, Hydraulic Analysis of Portable Diesel Fire Pump Reactor Pressure Vessel Injection for Beyond-Design-Basis External Event-FLEX, Revision 0
- ERIN Engineering Report, Evaluation Report of DAEC Capabilities to Respond to Extended Loss of AC Power (ELAP), Revision 2
- Calculation CAL- M06-007, Room Heatup Analysis for DAEC During Station Blackout, Revision 0
- RWA 1744135-43, Evaluate Fuel Oil Consumption Rates, Revision 1

- RWA 1744135-95, Cold Weather Effect on FLEX Strategies
- Evaluation EVAL-14-E02, ENGR Evaluation of Extended Battery Operation to Support Flex Coping Plans, Revision 0
- Evaluation EVAL-15-M12, RCIC Operation At High Containment Temperature And Pressure
- Stevenson and Associates (S&A) seismic evaluation, Seismic Review of Buried Pipe at DAEC, 16C4415-LSC-001, Revision 1, dated August 8, 2016
- Calculation E08-007, 250 VDC System Battery Sizing, Voltage Drop, Short Circuit, Coordination, and Charger Sizing, Revision 0
- Specification D-9300, Facilities for Storage of FLEX equipment, Revision 0
- FLEX 480 VAC Cables-Connector Assemblies: SPEC-E-060, Section 2.1.3, Revision 2
- Additional B5b Pumps for Fukushima Response: SPEC-M-198, Appendix 1, Revision 0
- EC 280489, FLEX Equipment Operation During Flood, Revision 3
- EC-280490, Design Change Package Form, Revision 0
- AR01744135, Create New Procedure for Use of Phase 3 Generators
- AR02134616, Verify Phase Rotation of Phase 2 480V Generator A
- AR02134619, Verify Phase Rotation of Phase 2 480V Generator B
- AR02137084, FLEX Program Changes
- Calculation CAL-E08-004, Main AC Electrical Distribution Analysis, Revision 2
- CAL-M08-003, Battery Room Hydrogen Gas Buildup, Revision 0
- CAL-C15-004, Evaluation of SFPLIS Mounting Bracket Anchorage
- Procedure I.LI-W120-001, FLEX-Fuel Pool Level Instrument Loop Calibration
- BECH-E327, Reactor Building-South Conduits Above EL. 855'-0", Rev. 7
- BECH-E326, Reactor Building-North Conduits Above EL. 855'-0", Rev. 11
- BECH-E325, Reactor Building-South Conduits Above EL. 833'-6", Rev. 10
- BECH-E323, Reactor Building-South Conduits & Trays Above EL. 812'-0", Rev. 20
- BECH-E322, Reactor Building-North Conduits & Trays Above EL. 812'-0", Rev. 37
- BECH-E320, Reactor Building-North Conduits & Trays Above EL. 786'-0", Rev. 71
- BECH-E339, Control Building-South Conduits & Trays Above ELEV. 786'-0", Rev. 58

**Duane Arnold**  
**Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:**

**Audit Items Currently Under NRC Staff Review And Requiring Licensee Input**

<b>Audit Item Reference</b>	<b>Item Description</b>	<b>Licensee Input Needed</b>
No open items		

T. Vehec

- 3 -

If you have any questions, please contact me by e-mail at Jason.Paige@nrc.gov.

Sincerely,

/RA by John P. Boska for/

Jason Paige, Project Manager  
Orders Management Branch  
Japan Lessons-Learned Division  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure:  
Audit report

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC

JOMB R/F

RidsNrrDorlLpl3-1 Resource

RidsNrrPMDuaneArnold Resource

RidsNrrLASLent Resource

JBoska, NRR

RidsRgn3MailCenter Resource

SBailey, NRR/JLD

MHalter, NRR/JLD

RidsAcrcAcnw\_MailCTR Resource

JQuichocho, NRR/JLD

JPaige, NRR

**ADAMS Accession No. ML16217A157**

\*via email

OFFICE	NRR/JLD/JOMB/PM*	NRR/JLD/JOMB/PM*	NRR/JLD/JOMB/PM	NRR/JLD/LA
NAME	JPaige	JBoska	MValentin	SLent
DATE	08/09/2016	08/09/2016	08/09/2016	08/15/2016
OFFICE	NRR/JLD/JERB/BC	NRR/JLD/JCBB/BC	NRR/JLD/JOMB/BC(A)	NRR/JLD/JOMB/PM
NAME	SBailey	JQuichocho	MHalter	JPaige (JBoska for)
DATE	08/16/2016	08/19/2016	8/29/16	8/29/16

OFFICIAL RECORD COPY