FENOC
First Energy Nuclear Operating Company

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Samuel L. Belcher
President and Chief Nuclear Officer

August 27, 2015
L-15-219

10 CFR 2.202

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-001

SUBJECT:
Beaver Valley Power Station, Unit Nos. 1 and 2
Docket No. 50-334, License No. DPR-66
Docket No. 50-412, License No. NPF-73
Davis-Besse Nuclear Power Station
Docket No. 50-346, License No. NPF-3
FirstEnergy Nuclear Operating Company's (FENOC's) Fifth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) (TAC Nos. MF0841, MF0842, and MF0961)

On March 12, 2012, the Nuclear Regulatory Commission (NRC or Commission) issued an order (Reference 1) to FENOC. Reference 1 was immediately effective and directs FENOC to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document Nuclear Energy Institute (NEI) 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the FENOC initial status report regarding mitigation strategies. Reference 5 provided the FENOC overall integrated plan for Beaver Valley Power Station (BVPS), Unit Nos. 1 and 2, Davis-Besse Nuclear Power Station (DBNPS), and Perry Nuclear Power Plant (PNPP).

Reference 1 requires submission of a status report at six-month intervals following submittal of the overall integrated plan. Reference 3 provides direction regarding the

content of the status reports. The purpose of this letter is to provide the fifth six-month status report pursuant to Section IV, Condition C.2, of Reference 1, that delineates progress made in implementing the requirements of Reference 1. The attached reports for BVPS and DBNPS (Attachments 1 and 2, respectively) provide an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at 330-315-6810.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 27, 2015.

Respectfully,

Samuel L. Belcher

Attachments:
1. Beaver Valley Power Station Fifth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events
2. Davis-Besse Nuclear Power Station Fifth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

References:
1. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012.
2. NRC Interim Staff Guidance JLD-ISG-2012-01, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0, dated August 29, 2012.
3. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, dated August 2012.
4. FirstEnergy Nuclear Operating Company's (FENOC's) Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated October 26, 2012.
5. FirstEnergy Nuclear Operating Company's (FENOC's) Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard

to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 27, 2013.

cc: Director, Office of Nuclear Reactor Regulation (NRR)
NRC Region I Administrator
NRC Region III Administrator
NRC Resident Inspector (BVPS)
NRC Resident Inspector (DBNPS)
NRC Project Manager (BVPS)
NRC Project Manager (DBNPS)
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC
Director BRP/DEP (without Attachments)
Site BRP/DEP Representative (without Attachments)
Utility Radiological Safety Board (without Attachments)

1 Introduction

FirstEnergy Nuclear Operating Company (FENOC) developed an Overall Integrated Plan (OIP) for Beaver Valley Power Station, Unit Nos. 1 and 2 (Reference 1 in Section 8), documenting the diverse and flexible strategies (FLEX), in response to Reference 2. This attachment provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

The following milestone(s) have been completed since January 31, 2015 and are current as of July 31, 2015.

- Update 4 was submitted
- Completed 1R23 outage modifications
- Completed the FLEX equipment storage building design
- Commenced construction of the FLEX equipment storage building
- Completed ordering on-site FLEX equipment
- Completed strategy development with the National Strategic Alliance for FLEX Emergency Response (SAFER) Response Center (NSRC)
- Completed Phase 3 site access strategies

3 Milestone Schedule Status

The following provides an update to Attachment 2 of the OIP. It provides the activity status of each item and whether the expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed.

The following milestones replaced the previous milestones of Walk-throughs or Demonstrations and FLEX Equipment Delivered:

- Walk-throughs or Demonstrations-Unit 2
- FLEX Equipment Delivered-Unit 2

The following milestones were added:

- Walk-throughs or Demonstrations-Unit 1
- FLEX Equipment Delivered-Unit 1

The revised milestone target completion dates do not impact the order implementation date.

Milestone	Target Completion Date	Activity Status (as of 7/31/15)	Revised Target Completion Date
Submit FLEX Integrated Implementation Plan	02/28/13	Complete	
6 Month NRC Status Updates	08/28/16	Started	
Update 1	08/28/13	Complete	
Update 2	02/28/14	Complete	
Update 3	08/28/14	Complete	
Update 4	02/27/15	Complete	
Update 5	08/28/15	Started	
*Update 6**	02/28/16	Not Started	
*Update 7**	08/28/16	Not Started	
Complete FLEX Strategy Review	March-2013	Complete	
Validation	September-2015	Started	September-2016
Walk-throughs or Demonstrations-Unit 2	September-2015	Started	
*Walk-throughs or Demonstrations-Unit 1**	N/A	Started	September-2016
Complete Staffing Analysis	November-2014	Complete	
Submit NEI 12-01 Phase 1 Staffing Study	April-2013	Complete	
Submit NEI 12-01 Phase 2 Staffing Study	November-2014	Complete	
Complete Plant Modifications	November-2016	Started	
Target plant modifications	April-2013	Complete	
Unit 1 Modifications complete	November-2016	Started	
Complete 1R22 outage modifications	November-2013	Complete	
Complete on-line modifications	September-2016	Started	
Complete 1R23 outage modifications	May-2015	Complete	
*Complete 1R24 outage modifications**	November-2016	Started	
Unit 2 Modifications complete	November-2015	Started	
Complete 2R17 outage modifications	May-2014	Complete	
Complete on-line modifications	August-2015	Started	September-2015
Complete 2R18 outage modifications	November-2015	Started	
FLEX Storage Complete	October-2015	Started	
Complete Building Design	March-2015	Complete	
Commence Construction	March-2015	Complete	
Complete Construction	October-2015	Started	
River (UHS) Access Complete	October-2014	Complete	
Fence & Gate Modification Design	February-2014	Complete	
New Fence & Gate Construction	August-2014	Complete	
Security Barrier Pipe Penetrations Design	March-2014	Complete	
Security Barrier Pipe Penetration Construction	October-2014	Complete	
On-site FLEX Equipment	October-2015	Started	September-2016
Confirm FLEX Equipment Requirements	November-2013	Complete	
FLEX Equipment Ordered	April-2015	Complete	
FLEX Equipment Delivered-Unit 2	October-2015	Started	
*FLEX Equipment Delivered-Unit 1**	N/A	Started	September-2016
Off-site FLEX Equipment	October-2015	Started	
*Develop Strategies with RRC****	June-2015	Complete	
Phase 3 Site Access Strategies in Place	June-2015	Complete	

Milestone	Target Completion Date	Activity Status (as of 7/31/15)	Revised Target Completion Date
Complete Near Site Staging Location (as needed)	October-2015	Started	
Procedures Complete	October-2016	Started	
PWROG issues NSSS-specific guidelines	June-2013	Complete	
*Issue Beaver Valley Unit 2 FLEX Support Guideline (FSG)**	October-2015	Started	
*Issue Beaver Valley Unit 1 FSG**	October-2016	Started	
Issue Maintenance Procedures	October-2015	Started	
Training Complete	September-2016	Started	
Develop Training Plan	December-2014	Complete	
*Implement Unit 2 Training**	September-2015	Started	
*Implement Unit 1 Training**	September-2016	Started	
Submit Completion Report	January-2017**	Not Started	

* Milestones added as a result of relief/relaxation for Unit 1 (Reference 4)
** Submittal of completion report occurs after end of refueling outage.
*** Regional Response Center (RRC) is now called National SAFER Response Center (NSRC)

4 Changes to Compliance Method

The following change to the compliance method as documented in the OIP (Reference 1) is being made. The change does not impact compliance with Nuclear Energy Institute (NEI) 12-06.

- Based on results of the NEI 12-01 Phase 2 staffing study, revisions to the Phase 3 compliance method (as reported in the last six-month update), table top reviews, and other validation activities for FSGs, the BVPS FLEX timeline has been revised from the timeline that was reported in the original OIP. The revised timeline is provided at the end of this report.

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

Relief/relaxation of the Reference 2 requirement for completion of full implementation for Beaver Valley Power Station Unit No. 1 (BVPS-1) until the completion of the fall of 2016 refueling outage for reactor coolant pump shutdown (RCP) seal installation was granted on May 20, 2014 (Reference 4). No relief/relaxation is required at this time for Beaver Valley Power Station Unit No. 2 (BVPS-2).

6 Open Items from Overall Integrated Plan and Interim Staff Evaluation

The following tables provide a summary of the open items documented in the OIP or the Interim Staff Evaluation (ISE) (Reference 3) and the status of each item.

Overall Integrated Plan Open Item	Status
OI 1. Finalize the location of the FLEX storage building. The deployment routes, distances, and	Complete. (Described in February-2014 status report

Overall Integrated Plan Open Item	Status
times provided in this report are bounded for the currently proposed locations but will be updated as necessary.	and updated in the February-2015 status report.)
OI 2. Perform containment evaluation based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, required actions to ensure maintenance of containment integrity and required instrument function will be developed.	Complete. (Described in February-2015 status report.)
OI 3. Modify the RWST [refueling water storage tank] at each unit to protect it from tornado missiles or identify a borated source that is protected from tornados and can be utilized to provide core cooling when steam generators are not available.	Complete. (Described in February-2014 status report.)

Interim Staff Evaluation Open Item	Status
3.2.1.6.A Verify that the TDAFW [turbine driven auxiliary feedwater] pump exhaust stacks are adequately protected from tornado missile hazards.	Started.
3.2.1.8.A Verify resolution of the generic concern associated with the modeling of the timing and uniformity of the mixing of a liquid boric acid solution injected into the RCS [reactor coolant system] under natural circulation conditions potentially involving two-phase flow.	Complete. (Described in February-2014 status report.)

ISE Confirmatory Item	Status
3.1.1.4.A Confirm that primary and secondary staging areas for the RRC [regional response center] equipment have been selected and will meet the requirements of the applicable site response plan.	Complete. The primary and secondary staging areas for NSRC (previously called RRC) equipment have been selected and meet the requirements of the site response plan.
3.1.2.4.A Confirm that the primary and secondary staging areas have been identified and that the plan for the use of offsite resources will comply with NEI 12-06, Section 6.2.3.4 regarding the need to evaluate for flooding hazard. This confirmation should include a description of the methods to be used to deliver the equipment to the site.	Complete. The primary and secondary staging areas for NSRC equipment have been selected. The logistical information associated with the delivery of NSRC equipment is provided in the site SAFER plan.
3.1.3.1.A Confirm that the location of the storage and protection building for FLEX equipment has been identified. Confirm that the FLEX storage building is designed to withstand tornado missiles at	Complete. The BVPS FLEX storage building for N sets of equipment is located west of the protected area (PA). In

ISE Confirmatory Item	Status
a level equal to, or greater than, the plant's tornado missile design basis.	addition, the BVPS-1 auxiliary building and BVPS-2 auxiliary building will be used for storing the FLEX RCS boration pumps. The FLEX storage building is designed to withstand tornado driven missiles. The BVPS-1 auxiliary building concrete structure, below elevation (EL) 752'-6" and for certain portions above EL 752'-6", is designed for wind pressure resulting from a hypothetical tornado and for the associated missile described in the BVPS-1 Updated Final Safety Analysis Report (UFSAR) Section 2.7.2. The BVPS-1 FLEX RCS boration pumps will be stored on EL 735'-6". The BVPS-2 auxiliary building, below EL 773'-6" and for certain portions above EL 773'-6", is tornado protected. The BVPS-2 FLEX RCS boration pumps will be stored on EL 735'-6". The commercial warehouse may be used for storing +1 sets of equipment and is in a diverse location. All FLEX portable equipment and support equipment will be stored in the new FLEX Equipment Storage Building (FESB), which is robust with respect to all hazards for BVPS-2 compliance. Storage of +1 equipment is contingent on approval of NEI 12-06, Revision 1, or prior approval as

ISE Confirmatory Item	Status
	an alternate method prior to compliance on both units in fall 2016.
3.1.3.4.A Confirm that the licensee's plan for the use of offsite resources would provide reasonable assurance that the plan will comply with NEI 12-06, Section 7.3.4 regarding high wind hazards.	Complete. The primary and secondary staging areas for NSRC equipment have been selected. The logistical information associated with the delivery of NSRC equipment is provided in the site SAFER plan.
3.1.4.4.A Confirm that the licensee's plan for the use of offsite resources would provide reasonable assurance that the plan will comply with NEI 12-06 Section 8.3.4 regarding snow, ice and extreme cold hazards.	Complete. The primary and secondary staging areas for NSRC equipment have been selected. The logistical information associated with the delivery of NSRC equipment is provided in the site SAFER plan.
3.2.1.1.A Confirm that the licensee has verified that reliance on the NOTRUMP code for the ELAP [extended loss of AC power] analysis of Westinghouse plants is limited to the flow conditions prior to reflux condensation initiation. This includes specifying an acceptable definition for reflux condensation cooling.	Complete. Report PWROG-14064, *Application of NOTRUMP Code Results for PWRs in Extended Loss of AC Power Circumstances*, shows that for plants with high leakage RCP seals, onset of two phase flow occurs around 17 hours. By reference to report WCAP-17601, *Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs*, it is apparent that with RCP shutdown seals installed in BVPS RCPs, the decrease in RCS leak rate will maintain inventory to support single phase natural circulation flow for longer than the time required for establishment of shutdown margin.
3.2.1.1.B Confirm that the application of the WCAP-17601 analysis simulating the ELAP	Complete. It is planned to use the Westinghouse

ISE Confirmatory Item	Status
transient is properly established.	Generation III SHIELD® passive thermal shutdown seal (SDS) in each BVPS-1 and BVPS-2 RCP. With the installation of SDSs in BVPS RCPs, maintaining RCS inventory is not a challenge during an ELAP scenario, as supported by Section 5.7.1 of WCAP-17601.
3.2.1.2.A Confirm that, if the licensee continues to credit SHIELD shutdown seals, as planned, (e.g., 1 gallon per minute leakage/seal) in the ELAP analyses for the RCS response, then the impacts of the Westinghouse 10 CFR Part 21 report, "Notification of the Potential Existence of Defects Pursuant to 10 CFR Part 21," dated July 26, 2013 (ADAMS Accession No. ML13211A168) on the use of the low seal leakage rate in the ELAP analysis are addressed.	Complete. It is planned to use the Westinghouse Generation III SHIELD® passive thermal SDS in each BVPS-1 and BVPS-2 RCP. The referenced 10 CFR Part 21 report is applicable to the Westinghouse Generation II RCP shutdown seal. The report does not pertain to the Westinghouse Generation III SHIELD® passive thermal SDS.
3.2.1.2.B Confirm that if the seals are changed, the acceptability of the seals used is addressed, and the RCP seal leakage rates for use in the ELAP analysis are justified.	Complete. It is planned to use the Westinghouse Generation III SHIELD® passive thermal SDS in each BVPS-1 and BVPS-2 RCP. The acceptability of the SDS and its leakage rate was addressed for the BVPS application. BVPS-1 and BVPS-2 RCPs are Westinghouse Model 93A RCPs. The maximum steady-state RCS cold leg temperature does not exceed 571°F during the ELAP because the main steam safety valves will limit steam pressure, and with the small decay heat amount (relative to rated thermal power), the RCS cold leg temperature will be within a few degrees of the saturated steam

ISE Confirmatory Item	Status
	pressure. The maximum RCS pressure during the ELAP (notwithstanding the brief pressure transient directly following the reactor trip) remains bounded by TR-FSE-14-1-P Figure 7.1-2, 93A O-Ring Endurance Testing Depressurization Over 7 Days, for Westinghouse Model 93A RCPs. A constant seal leakage rate of 1 gallon per minute (gpm) after SHIELD® seal actuation is assumed, as appropriate, in calculations: (a) Westinghouse calculation CN-SEE-III-12-69-NP considers conditions with no RCS leakage for boration inventory purposes (Section 4.3.3) and with the highest applicable leakage rate for the RCP seals (1 gpm per RCP * 3 RCPs) and unidentified reactor coolant system leakage (1 gpm) for a total of 4 gpm for single-phase natural circulation purposes (Section 4.3.2.1). (b) The containment temperature response analysis, BVPS calculation 10080-DMC-3687, assumes 4 gpm RCS leakage.
3.2.2.A Since the RWSTs are not currently fully protected against tornado missiles, confirm that the licensee has completed their review to determine whether or not the RWST will need to be further protected against missile hazards.	Complete. (Described in February-2014 status report.)
3.2.2.B Confirm that opening doors provides adequate ventilation for SFP [spent fuel pool] area.	Complete. As described in Engineering Evaluation Request 600924924, opening the large overhead doors is

ISE Confirmatory Item	Status
	adequate to maintain the temperatures in the building less than or equal to 212°F. High temperature rated hoses and deployment in the building prior to degraded environmental conditions with the ability to select and control function (spray or makeup) and connection point selection from outside the building ensures that SFP strategies can be executed with just the single overhead doors open for building ventilation. Later use of components in the building (such as the SFP cooling pumps) would require forced ventilation to cool and dry the motors. However, the use of any components in the building (other than the FLEX portable equipment) is not required for indefinite coping.
3.2.3.A Confirm that containment evaluations for all phases are performed based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, confirm that required actions to ensure maintenance of containment integrity and required instrument function have been developed.	Complete. (Described in February-2015 status report).
3.2.4.2.A Confirm that the licensee has clarified why the Integrated Plan stated the maximum temperature of the Unit 1/Unit 2 AFW [auxiliary feedwater] pump rooms would reach 115.9/112.3 degrees Fahrenheit (°F), respectively, while Calculation 8700-DMC-2312, described during the audit process, indicated that the maximum temperature would reach 142.9°F.	Complete. BVPS-1 calculation DMC-2312 and BVPS-2 calculation DMC-0056 determine the average steady state temperature for a station black-out (SBO) situation assuming an initial temperature of 104°F. It is assumed that no door is opened to create a ventilation path. The results of these calculations are 115.9°F for BVPS-1 and 112.3°F for BVPS-2.

ISE Confirmatory Item	Status
	BVPS-1 calculation DMC-2312 determines whether maximum steam leakage from the TDAFW pump would result in a challenge to equipment. The calculation employed a conservative approach and produced an acceptable result (142.9°F) for its stated purpose, so more refined analysis was not performed. This also assumed an initial temperature of 104°F and that no door is opened to create a ventilation path.
3.2.4.2.B Confirm that the licensee has provided an analysis or calculation to demonstrate that the dissipation of heat generated by the batteries via natural circulation will be adequate to maintain the temperatures in the battery rooms within acceptable levels.	Complete. Per BVPS-1 calculation DMC-2312, an initial battery room temperature, including the temperature of the heat sinks, is assumed to be 104°F. A station battery discharging in a SBO situation involving a heat generation rate of 1,000 watts results in a steady state room temperature of 119.9°F. Per BVPS-2 calculation DMC-0056, an initial battery room temperature, including the temperature of the heat sinks, is assumed to be 104°F. A station battery discharging in a SBO situation involving a heat generation rate of 1,060 watts results in a steady state room temperature of 116°F. IEEE Std 485-1997 (R2003), *IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications*, provides cell correction factors for temperatures from 25°F to 125°F for lead-acid nominal

ISE Confirmatory Item	Status
	1.215 specific gravity vented cells. The correction factor at 77°F is 1.000 and at 125°F is 0.850, indicating that battery capacity increases within this temperature range. It is concluded that the maximum steady state temperature for the BVPS-1 and BVPS-2 safety-related station batteries discharging inside their room with no ventilation in operation will not result in ambient temperatures within the battery rooms that would result in battery failures.
3.2.4.2.C Confirm that the licensee has addressed how hydrogen concentration in the battery rooms will be limited to acceptable levels.	Complete. As noted in NRC Regulatory Guide 1.128, "...the batteries also release hydrogen (a potential fire hazard) to the battery room during charging..." Thus, hydrogen generation is not a concern when the batteries are being discharged. During an ELAP event, the FLEX 480V diesel generators will be deployed to charge the batteries. These generators are also used to reestablish the existing normal exhaust ventilation in the battery rooms. BVPS-1 calculation DMC-3585 and BVPS-2 calculation B-211 demonstrate that the existing normal ventilation is capable of removing hydrogen generated while charging batteries. Therefore, the existing normal ventilation will be available to remove hydrogen generated while charging the batteries.
3.2.4.6.A Confirm that the licensee has completed a review of Unit 1 AFW room and developed any	Complete. A MAAP-DBA computer model of the BVPS-1

ISE Confirmatory Item	Status
plans required to maintain a suitable environment.	AFW pump room was developed using geometrical and heat loading information available in existing calculations. The evaluation is documented in Engineering Evaluation Request 600979836, which describes the methodology, inputs/assumptions, and results/conclusions. The action of propping open a door or installing temporary portable ventilation has a positive effect at reducing the room temperature.
3.4.A Confirm that the licensee has fully addressed considerations (2) through (10) of NEI 12-06, Section 12.2, Minimum Capability of Off-Site Resources, which requires each site to establish a means to ensure the necessary resources will be available from off-site.	Complete. NEI letter on the NSRC Operational Status provides the programmatic aspects and implementation plans for the SAFER program to be in conformance with the applicable portions of NEI 12-06. The NSRCs will also maintain on file an operational checklist annotating the specific criteria that will be validated for each individual licensee to support an operational status. BVPS has a site specific SAFER plan and a fuel oil contract established.

As indicated in the ISE, the NRC staff review determined that the generic concerns related to shutdown and refueling requirements, battery duty cycles beyond 8 hours, and maintenance and testing of FLEX equipment are applicable to BVPS. These concerns were resolved generically through the following NRC endorsements of NEI position papers.

- Shutdown/Refueling Modes (ADAMS Accession No. ML13267A382)
- Battery Life Issue (ADAMS Accession No. ML13241A188)
- Maintenance and Testing (ADAMS Accession No. ML13276A224)

FENOC intends to follow the NRC-endorsed guidance for these generic concerns at BVPS.

The response to ISE Open Item 3.2.1.8.A provided the BVPS resolution of the generic concern associated with the modeling of the timing and uniformity of the mixing of a liquid boric acid solution injected into the RCS under natural circulation conditions potentially involving two-phase flow.

7 Potential Interim Staff Evaluation Impacts

FENOC is making a change to the compliance method as documented in the OIP (Reference 1). Although the planned change does not impact compliance with NEI 12-06, there is a potential impact on the ISE. The impact may affect Section 3.2.1.6, Sequence of Events.

8 References

The following references support the updates to the OIP described in this attachment.

1. FirstEnergy Nuclear Operating Company's (FENOC's) Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 27, 2013.
2. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012.
3. Beaver Valley Power Station, Units 1 and 2 – Interim Staff Evaluation Related To Overall Integrated Plan In Response To Order EA-12-049 (Mitigation Strategies), dated January 29, 2014.
4. NRC Letter, Beaver Valley Power Station, Unit 1 – Relaxation of the Schedule Requirements for Order EA-12-049 "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events" (TAC No. MF0841), dated May 20, 2014.

BVPS FLEX Timeline				
Action Item	**Elapsed Time (Hr:Min)**	**Action**	**Time constraint Y/N Level of Validation (A, B, C, N/A)**	**Remarks/Applicability**
	0	Event Starts	N/A	Plant @ 100% power
1	0	Commence station blackout coping actions per ECA-0.0	N	
2	0:04	Recall Operators	N	All shift personnel report to Control Room
3	0:15	Monitor Control Room Temperature	N	Prior to 104 deg F, Control Room doors are opened for ventilation.
4	U1 – 0:21 U2 – 0:24	Troubleshoot EDGs	N	Assumed Durations: Unit 1 – 12 min (EOP Att 2E) Unit 2 – 15 min (EOP Att A-1.5)
5	**0:30**	**Declare ELAP**	**Y (A)**	**Required by 1 hour Assumption used in Battery Coping Calculations**
6	0:35	Isolate RCP Seals	N	Requires RP coverage
7	**Unit 1 0:40 Unit 2 0:45**	**Preserve 1 train of Batteries**	**Y (A)**	**Required by 2 hours Assumption used in Battery Coping Calculations**
8	1:00	Commence Initial Damage Assessment	N	Determine priorities and available equipment/connection points

9	**1:03**	**Initiate ventilation for AFW Room Habitability (U1 only) & Control AFW Flow Locally (AFW Throttle Valves)**	**Y (A)**	**Required by 1 hour 12 minutes** **Prevent S/G overfill** **AFW Throttle Valves located in AFW Room where temperature can reach 125 deg F without ventilation (Unit 1 only, N/A for U2).**
10	1:05	Contact SAFER	N	SAFER will have equipment on site within 24 hours of notification. BVPS requires purified water by 72 hours
11	1:20	Vent H2 from MUG	N	1OM-35.4.J / 2OM-35.4.I
12	**1:25**	**Secure Air Side Seal Oil Pump (Unit 2 only)**	**Y (A)**	**Required by 1 hour 30 minutes** **Assumption used in 2-5 Battery Calculation**
13	**1:40**	**Complete Load Shed**	**Y (A)**	**Required by 3 hours** **Assumption used in Battery Coping Calculations**
14	2:00	Complete Initial Damage Assessment	N	Determine priorities and available equipment/connection points
15	2:20	Commence actions for Debris Removal & to deploy FLEX PPDWST Make Up Pumps & Hoses	N	Earliest start time based on operator availability. Validated time must be less than 4 hours 40 minutes.
16	2:25	Commence actions to Open SFP Doors for Ventilation	N	Start time based on Phase 2 Staffing Study Tabletop
17	**3:15**	**Open SFP Doors for Ventilation**	**Y (B)**	***Required by 13 hours** **Provide heat release path prior to boiling (based on SFP starting temp of 140 deg F)**

18	6:00	Commence actions to deploy FLEX 480VAC Generators & Cables	N	Earliest start time based on personnel & tow equipment availability (4 hours allowed for completion)
19	6:00	Commence actions to deploy FLEX RCS Boration Pumps & Hoses	N	Earliest start time based on personnel beyond minimum staffing required (4 hours allowed for completion)
20	6:00	Commence actions to deploy FLEX Control Room Portable Ventilation & Lighting	N	Earliest start time based on personnel beyond minimum staffing required (2 hours allowed for completion)
21	6:00	Commence actions to install jumpers between safety related MCCs	N	Earliest start time based on personnel beyond minimum staffing required (4 hours allowed for completion)
22	**7:00**	**Start Make Up to the PPDWST**	**Y (A)**	**Required by 9 hours** **Based on PPDWST minimum volume & nominal DHR**
23	7:00	Commence actions to deploy and set up Hoses in SFP Building	N	Earliest start time based on deployment equipment limitations (2 hours allowed for completion)
24	8:00	Portable Lighting & Ventilation available for Control Room	N	
25	**9:00**	**SFP hoses deployed in SFP Building**	**Y (B)**	****Required by 13 hours** **Boiling in SFP Building (U1 – 13.02; U2 – 13.61; assuming normal heat load & starting temperature of 140 deg F)**
26	**10:00**	**FLEX 480VAC Generator deployed for Battery Charging / RCS Boration; Start Charging Battery**	**Y (B)**	**Required by 14 hours based on need to start boration** **Required by 22.5 hours for battery charging per battery coping calculations**

27	**10:00**	**FLEX RCS Boration Pump deployed to support RCS boration**	**Y (B)**	**Required by 14 hours based on need to start RCS boration**
28	**10:00**	**Jumpers installed between safety related MCCs**	**Y (B)**	**Required by 12 hours to support SI Accumulators isolation**
29	10:00	Commence actions to deploy FLEX Alternate AFW Pumps & hoses	N	Earliest start time based on deployment equipment limitations (2 hours allowed for completion)
30	10:00	Commence actions to isolate SI Accumulators	N	Earliest start time based on need for FLEX 480VAC Generator deployed and MCC jumpers installed
31	10:35	Start Control Room U1 Air Recirculation Fan, U2 Supply & Exhaust Fan	N	Provides air circulation in the Control Room using power from FLEX 480VAC Generator
32	**14:00**	**SI Accumulators isolated**	**Y (B)**	**Required by 15 hours to support RCS cool down below 520 deg F Thot** **RCS cool down shrinkage is required for BAST injection**
33	14:00	FLEX Alternate AFW Pump deployed to support RCS Cool Down & Depressurization	N	Change from TDAFWP to Alternate AFW Pump when S/G pressure no longer supports TDAFWP operation.
34	14:00	Commence RCS Cool Down to 425 deg F Thot (Unit 1) 445 deg F Thot (Unit 2) & RCS Boration	N	RCS boration, cool down & depressurization commences when FLEX portable equipment is staged & operators available for local control of ASDVs.

				Target Temperature Basis: U1- prevent SI accum N2 injection; U2 – TDAFWP critical speed steam pressure (Note: if SI accumulators are isolated, limit does not apply)
35	14:00	Commence deployment of FLEX SFP Make Up Pumps & Hoses	N	Earliest start time based on deployment equipment limitations (2 hours allowed for completion)
36	14:30	Commence FLEX Portable Equipment Refueling	N	Based on 250 gph use for the 480VAC generators & 5 gph use for PPDWST Make Up Pumps
37	**14:40**	**Complete Cool Down to 520 deg F Thot / Commence Boration**	**Y**	**Required by 15 hours to establish RCS pressure (<1500 psig) & volume for boration**
38	**16:00**	**FLEX SFP Make Up Pumps & Hoses deployed**	**Y (C)**	**Required by 71 hours** **Prevent SFP level decrease below 15 ft above top of fuel assemblies**
39	20:00	Complete RCS Cool Down to 425 deg F Thot (Unit 1), 445 deg F Thot (Unit 2)	N	6 hours allotted for controlled cool down on natural circulation
40	**22:40**	**Complete RCS Boration**	**Y (B)**	**Required by 23 hours** **6,105 gal of high concentration boric acid from the Boric Acid Storage Tanks injected into the RCS at 12 gpm to maintain sub-criticality Allows 1 hour for mixing to achieve required concentration by 24 hours**
41	25:00	Commence set up of Water Purification Units from NSRC	N	First equipment from NSRC begins to arrive on site 24 hours following notification

42	30:00	Determine timing for Cool Down & Depressurization of RCS to Mode 4 Conditions	N	Minimize RCS inventory loss & energy input into containment
43	36:00	Change to RWST for Boration / Make Up	N	BAST inventory is expended by 41 hours
44	**48:00**	**Provide Purified Water to the S/Gs to maintain Secondary Heat Sink**	**Y (C)**	**Required by 72 hours** **Satisfactory S/G heat exchange capability can be maintained until 72 hours. Requires water purification units from the NSRC.**
45	72:00	Provide ability to make up to Borated Water Source (RWST)	N	Borated water used to borate RCS / make to RCS or SFP inventory needs to be replenished. Requires mobile boration units from the NSRC.

*Actual historical times to boiling immediately following refueling outages have always been greater than 24 hours

AFW = Auxiliary Feed Water
ASDV = Atmospheric Steam Dump Valve
BAST = Boric Acid Storage Tank
DHR = Decay Heat Removal
EDG = Emergency Diesel Generator
EOP = Emergency Operating Procedure
F = Fahrenheit
gph = gallons per hour
gpm = gallons per minute
MCC = Motor Control Center
MUG = Main Unit Generator
PPDWST = Primary Plant Demineralized Water Storage Tank
psig = pounds per square inch
RCP = Reactor Coolant Pump
RCS = Reactor Coolant System
RP = Radiation Protection
RWST = Refueling Water Storage Tank
S/G = Steam Generator
SI = Safety Injection
TDAFWP = Turbine Driven Auxiliary Feed Water Pump
Thot = RCS Hot Leg Temperature

Davis-Besse Nuclear Power Station Fifth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

1 Introduction

FirstEnergy Nuclear Operating Company (FENOC) developed an Overall Integrated Plan (OIP) for Davis-Besse Nuclear Power Station (Reference 1 in Section 8), documenting the diverse and flexible strategies (FLEX), in response to Reference 2. This attachment provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

The following milestone(s) have been completed since January 31, 2015 and are current as of July 31, 2015.

- Update 4 was submitted
- Commenced construction of FLEX storage building

3 Milestone Schedule Status

The following provides an update to Attachment 2 of the OIP. It provides the activity status of each item and whether the expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed.

The revised milestone target completion dates do not impact the order implementation date.

Milestone	Target Completion Date	Activity Status (as of 7/31/15)	Revised Target Completion Date
Submit FLEX Integrated Implementation Plan	02/28/13	Complete	
6 Month NRC Status Updates	02/28/16	Started	
Update 1	08/28/13	Complete	
Update 2	02/28/14	Complete	
Update 3	08/28/14	Complete	
Update 4	02/27/15	Complete	
Update 5	08/28/15	Started	
Update 6	02/28/16	Not Started	
Validation	April-2016	Not Started	May-2016
Walk-throughs or Demonstrations	April-2016	Not Started	May-2016
Complete Staffing Analysis	October-2015	Started	
Submit NEI 12-01 Phase 2 Staffing Study	October-2015	Started	
Complete Plant Modifications	April-2016	Started	May-2016
Target plant modifications	May-2013	Complete	
Modifications complete	April-2016	Started	May-2016
Complete 1R18 outage modifications	June-2014	Complete*	
Complete on-line modifications	January-2016	Started	
Complete 1R19 outage modifications	April-2016	Started	May-2016
Complete Communications Modifications	April-2016	Started	May-2016
Complete SFP Level Indication Modifications	April-2016	Started	
FLEX Storage Complete	April-2016	Started	May-2016
Complete Building Design	June-2015	Started	September-2015
Commence Construction	June-2015	Complete	
Complete Construction	April-2016	Started	May-2016
On-site FLEX Equipment	February-2016	Started	
Confirm FLEX Equipment Requirements	October-2014	Complete	
FLEX Equipment Ordered	October-2015	Started	February-2016
FLEX Equipment Delivered	February-2016	Started	March-2016
Off-site FLEX Equipment	February-2016	Started	
*Develop Strategies with RRC****	October-2015	Started	
Phase 3 Site Access Strategies in Place	October-2015	Started	
Complete Near Site Staging Location (as needed)	February-2016	Started	
Procedures Complete	April-2016	Started	May-2016
PWROG issues NSSS-specific guidelines	August-2013	Complete	
Issue Davis-Besse FLEX Strategy Guidelines	April-2016	Started	May-2016
Issue Maintenance Procedures	April-2016	Started	May-2016
Training Complete	April-2016	Not Started	May-2016
Develop Training Plan	September-2015	Started	
Implement Training	April-2016	Started	May-2016
Submit Completion Report	June-2016**	Not Started	July-2016**

* Modifications are targeted for 1R19 and on-line; none targeted for 1R18.

** Submittal of completion report occurs after end of refueling outage.

*** Regional Response Center (RRC) is now called National SAFER Response Center (NSRC)

4 Changes to Compliance Method

The following change to the compliance method as documented in the OIP (Reference 1) is being made. The change does not impact compliance with Nuclear Energy Institute (NEI) 12-06.

The following discussion details a significant change to the coping strategies planned for the Davis-Besse Nuclear Power Station OIP:

- OIP Open Item (OI 1) - Finalize locations for FLEX storage buildings. Deployment routes, distances, and times contained in the submittal are bounded for the currently proposed locations but will be updated as necessary: A separate FLEX storage building has been eliminated from the FLEX mitigation strategies. Rather than utilizing a separate, newly constructed FLEX storage building, the primary (or N) FLEX equipment will be stored in other robust structures (Auxiliary Building or Emergency Feedwater Facility) constructed to withstand design basis high wind, missile (airborne object), seismic, flooding, and ambient temperature/snow/ice events or stored in diverse locations consistent with the requirements of NEI 12-06. Because the change to the storage locations results in equipment being stored within the protected area, overall deployment times are not significantly impacted. While deployment time to locations inside the protected area are decreased by a few minutes, deployment times to the areas outside the protected area are increased by a few minutes. Actual deployment times will be confirmed during strategy validation in accordance with industry guidance.

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

FENOC expects to comply with the order implementation date. Relief/relaxation is not required at this time.

6 Open Items from Overall Integrated Plan and Interim Staff Evaluation

The following tables provide a summary of the open items documented in the OIP or the Interim Staff Evaluation (ISE) and the status of each item.

Overall Integrated Plan Open Item	Status
OI 1. Finalize locations for FLEX storage buildings. Deployment routes, distances and times contained in the submittal are bounded for the currently proposed locations but will be updated as necessary.	Started.
OI 2. Finalize the strategy for providing a protected source of borated water to support FLEX strategies.	Complete. (Described in August-2014 status report and updated in February-2015 status report.)

OI 3. Determine if a mobile boration unit and/or water purification unit is required to support the FLEX strategies.	Complete. (Described in August-2014 status report)

Interim Staff Evaluation Open Item	Status
3.2.1.2.A Verify the following with respect to reactor coolant pump (RCP) seals: (1) the DBNPS [Davis-Besse Nuclear Power Station] plant condition during an ELAP [extended loss of all alternating current power] is bounded by the seal leakage test conditions with respect to relevant parameters. (2) the pop-open failure mechanism resulting from hydraulic instability that is discussed in WCAP-16175-P and WCAP-17601-P would not occur or would be bounded by the assumed leakage rate. (3) a basis for the assumed leakage rate of 2 gpm [gallons per minute] is justified in light of recommendations for a larger value of leakage for similarly designed RCPs and seals discussed in WCAP-16175-P and WCAP-17601-P. (4) the modeling of the pressure-dependence of the seal leakage rate is justified. (5) the seal design performance under stresses induced by the cooldown of the RCS [reactor coolant system] is justified.	Started.
3.2.1.4.A Verify that any industry-identified gaps and recommendations applicable to the generically developed mitigating strategies proposed for DBNPS are addressed (e.g., those documented in WCAP-17792-P (transmittal letter located at ADAMS Accession No. ML14037A237) and the appropriate revision of the PWROG's [Pressurized Water Reactors Owners Group] Core Cooling Management Interim Position Paper).	Started.
3.2.1.6.B Verify that a revised sequence of events that is consistent with the final ELAP analyses is developed.	Started.
3.2.1.8.A Verify resolution of the generic concern associated with the modeling of the timing and uniformity of the mixing of a liquid boric acid solution injected into the RCS under natural circulation conditions potentially involving two-phase flow.	Started.

ISE Confirmatory Item	Status
3.1.1.1.A Confirm that the diesel-driven service water pumps have deployment and storage plans developed in accordance with the provisions of NEI [Nuclear Energy Institute] 12-06.	Started.
3.1.1.2.A Confirm that the routes that plant operators will have to access to deploy and control the strategy will only require access through seismically robust structures.	Started.
3.1.1.2.B Confirm that, if power is required to operate the storage building doors, either power supplies will be available to operate the doors or the doors will be equipped with manual overrides to permit manual door opening.	Started.
3.1.1.3.A Confirm that guidance is provided for critical actions to perform until alternate indications can be connected and on how to control critical equipment without associated control power.	Not Started.
3.1.1.4.A Confirm the RRC [regional response center] local staging area, evaluation of access routes, and method of transportation to the site.	Started.
3.1.2.A Confirm that the licensee has identified the warning time and persistence of the external flooding hazard.	Started.
3.1.2.2.A Confirm that the licensee plans to conform to deployment consideration 1 and 2 of NEI 12-06, Section 6.2.3.2.	Started.
3.1.3.1.A Confirm that the chosen storage locations are sufficiently separated in distance and axially from the typical tornado path as compared to the local tornado data for tornado width.	Complete. (Described in August-2014 status report) Update: See Section 4 above.
3.2.1.1.A Confirm that reliance on the RELAP5/MOD2-B&W code in the ELAP analysis for Babcock and Wilcox plants is limited to the flow conditions prior to boiler-condenser cooling initiation.	Started.
3.2.1.1.B Confirm that the licensee has: (1) Identified the specific analysis case(s) from WCAP-17792-P that are being referenced as the basis for demonstrating the acceptability of the mitigating strategies for DBNPS, and (2) Provided justification that the analyses from WCAP-17792-P that are being credited for DBNPS are adequately representative of the actual plant design, FLEX equipment, and planned mitigating strategies.	Started.

ISE Confirmatory Item	Status
3.2.1.1.C Confirm the continuity of natural circulation by demonstrating the adequacy of the modeling of operator actions associated with primary-to-secondary heat transfer.	Started.
3.2.1.2.B Confirm that either: (1) closure of valve MU38 will not be credited in the ELAP analysis for DBNPS, or (2) procedures to close valve MU38 prior will be implemented to provide assurance that its closure can be credited in the ELAP analysis.	Complete. Procedures are to be implemented providing guidance that reactor coolant pump seal return valve, MU38, is closed by a time critical action within 10 minutes of the event. Deep load shedding, which could remove control power, is not initiated until 15 minutes after the event.
3.2.1.3.A Confirm the basis for the decay heat modeling assumptions present in the analysis credited for DBNPS in WCAP-17792-P, which was not available to the staff during the audit.	Started.
3.2.1.3.B Confirm that the cooldown directed by the DBNPS mitigating strategy is consistent with the capability of the atmospheric vent valves.	Started.
3.2.1.6.A Confirm licensee's hydraulic analysis supports that injecting borated water into the RCS within 6 hours after the event is initiated will maintain subcriticality.	Started.
3.2.1.8.B Confirm adequate shutdown margin for ELAP scenarios: (1) with the highest applicable reactor coolant system leakage, and (2) with no reactor coolant system leakage. In addition, confirm that core reload calculation procedures would ensure that these shutdown margin calculations remain bounding for future fuel cycles.	Started.
3.2.1.8.C Confirm that adequate RCS venting capability exists to support the ELAP mitigating strategy for DBNPS.	Started.
3.2.3.A Confirm that the containment pressure and temperature after an event initiated in Modes 1 through 4 will stay at acceptable levels during Phases 1, 2, and 3 and that no additional installed equipment or operator actions are required to maintain containment integrity.	Started.
3.2.4.4.A Confirm that upgrades to the site's communications systems have been completed.	Started.

ISE Confirmatory Item	Status
3.2.4.8.A Clarify the discrepancy between the Integrated Plan stated size of the Phase 2 FLEX 480v [volt] portable DGs [diesel generators] (500kW [kilowatt]) and the stated size of the Phase 2 FLEX 480v portable DGs in response to the sizing audit question (600kW).	Started.
3.4.A Confirm that the licensee has fully addressed considerations (2) through (10) of NEI 12-06, Section 12.2, Minimum Capability of Off-Site Resources, which requires each site to establish a means to ensure the necessary resources will be available from off-site.	Started.

As indicated in the ISE, the NRC staff review determined that the generic concerns related to shutdown and refueling requirements, battery duty cycles beyond 8 hours, and maintenance and testing of FLEX equipment are applicable to DBNPS. These concerns were resolved generically through the following NRC endorsements of NEI position papers.

- Shutdown/Refueling Modes (ADAMS Accession No. ML13267A382)
- Battery Life Issue (ADAMS Accession No. ML13241A188)
- Maintenance and Testing (ADAMS Accession No. ML13276A224)

FENOC intends to follow the NRC-endorsed guidance for these generic concerns at DBNPS.

ISE Open Item 3.2.1.8.A tracks the resolution of the generic concern associated with the modeling of the timing and uniformity of the mixing of a liquid boric acid solution injected into the RCS under natural circulation conditions potentially involving two-phase flow.

7 Potential Interim Staff Evaluation Impacts

FENOC is making a change to the compliance method as documented in the OIP (Reference 1). Although the planned change does not impact compliance with NEI 12-06, there is a potential impact on the ISE. The impact may affect the following sections: (1) Section 3.1.1.1, Protection of FLEX Equipment – Seismic Hazard; (2) Section 3.1.1.2, Deployment of FLEX Equipment – Seismic Hazard; (3) Section 3.1.2.1, Protection of FLEX Equipment – Flooding Hazard; (4) Section 3.1.2.2, Deployment of FLEX Equipment – Flooding Hazard; (5) Section 3.1.3.1, Protection of FLEX Equipment – High Wind Hazard; (6) Section 3.1.3.2, Deployment of FLEX Equipment – High Wind Hazard; (7) Section 3.1.4.1, Protection of FLEX Equipment – Snow, Ice and Extreme Cold Hazard; (8) Section 3.1.4.2, Deployment of FLEX Equipment – Snow, Ice and Extreme Cold Hazard; (9) Section 3.1.5.1, Protection of FLEX Equipment – High

Temperature Hazard; (10) Section 3.1.5.2, Deployment of FLEX Equipment – High Temperature Hazard; and (11) Section 3.2.1.9, Use of Portable Pumps.

8 References

The following references support the updates to the OIP described in this attachment.

1. FirstEnergy Nuclear Operating Company's (FENOC's) Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 27, 2013.
2. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012.