UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PA 19406-2713

May 3, 2018

Mr. Richard Bologna
Site Vice President
First Energy Nuclear Operating Company
Beaver Valley Power Station
P. O. Box 4 – Route 168
Shippingport, PA 15077-0004

SUBJECT: BEAVER VALLEY POWER STATION – UNITS 1 AND 2
TEMPORARY INSTRUCTION 2515/191, MITIGATION STRATEGIES SPENT FUEL POOL INSTRUMENTATION AND EMERGENCY PREPAREDNESS INSPECTION REPORT 05000334/2018010 AND 05000412/2018010

Dear Mr. Bologna:

On February 23, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Beaver Valley Power Station (BVPS) Units 1 and 2; and the team discussed the preliminary results of this inspection with you, and other members of your staff. An exit meeting was conducted with Mr. Brian Kremer, Regulatory Compliance Manager, via telephone on March 21, 2018, to discuss the final results of the inspection. The results of this inspection are documented in the enclosed report.

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 the 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 denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; and the NRC resident Inspector at Beaver Valley.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and the NRC's Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Part 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Marc S. Ferdas, Chief
Technical Support and Assessment Branch
Division of Reactor Projects

Docket Numbers: 50-334 and 50-412
License Numbers: DPR-66 and NPF-73

Enclosure:
Inspection Report 05000334/2018010
and 05000412/2018010

cc w/encl:
Distribution via ListServ

SUBJECT: BEAVER VALLEY POWER STATION – UNITS 1 AND 2
TEMPORARY INSTRUCTION 2515/191, MITIGATION STRATEGIES
SPENT FUEL POOL INSTRUMENTATION AND EMERGENCY
PREPAREDNESS INSPECTION REPORT 05000334/2018010 AND
05000412/2018010 DATED MAY 3, 2018

DISTRIBUTION w/encl:
DLew, RA
DCollins, DRA
DPelton, DRP
MGray, DRP
JYerokun, DRS
BWelling, DRS
MFerdas, DRP
CLally, DRP
MYoung, DRP
SShaffer, DRP
CSafouri, DRP
SHorvitz, DRP
BPinson, DRP
FArner, DRS
AGould, AA
JBowen, RI, OEDO
RidsNrrPMBeaverValley Resource
RidsNrrDorlLpl1 Resource
ROPreports Resource

DOCUMENT NAME: G:\DRS\DIRECTOR\Arner\Beaver Valley FLEX\Beaver Valley TI 191 Final IR 2018010.docx
ADAMS ACCESSION NUMBER: ML18124A002

☑ SUNSI Review		☑ Non-Sensitive ☐ Sensitive		☑ Publicly Available ☐ Non-Publicly Available	
OFFICE	RI/DRS	RI/DRP	RI/DRS		
NAME	FArner	MYoung	MFerdas		
DATE	5/01/18	5/01/18	5/03/18		

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number:	50-334 and 50-412
License Number:	DPR-66 and NPF-73
Report Number:	05000334/2018010 and 05000412/2018010
Enterprise Identifier:	I-2018-010-0047
Licensee:	FirstEnergy Nuclear Operating Company (FENOC)
Facility:	Beaver Valley Power Station, Units 1 and 2
Location:	Shippingport, PA 15077
Inspection Dates:	February 20, 2018 to February 23, 2018
Inspectors:	F. Arner, Senior Reactor Analyst (Team Leader) M. Patel, Operations Inspector S. Horvitz, Resident Inspector
Approved By:	Marc S. Ferdas, Chief Technical Support and Assessment Branch Division of Reactor Projects

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring FENOC's performance at Beaver Valley Units 1 and 2 by conducting Temporary Instruction 2515/191, "Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans," 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

Inadequate Diesel Fuel Oil Temperature Protection			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000334 and 05000412/2018010-01	H.7-Documentation	TI 2515/191
The team identified a finding of very low safety significance (Green) for the failure to ensure that diesel powered Diverse and Flexible Coping Strategies (FLEX) equipment would be reliable to mitigate postulated beyond-design basis external events during very low temperature conditions. Specifically, at temperatures below the site fuel cloud point (4 degrees Fahrenheit (F) to -7 degrees F), portable FLEX equipment, such as emergency diesel powered pumps, were susceptible to conditions in which their capability of starting and operating would be impacted due to fuel crystallizing or gelling and subsequent coating of fuel filter elements.			

INSPECTION SCOPES

This inspection was conducted using the appropriate portions of the Temporary Instruction (TI) in effect at the beginning of the inspection unless otherwise noted. Currently approved TIs 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. Documents reviewed by inspectors are listed in the documents reviewed section of this report. The inspectors 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 INSTRUCTION, INFREQUENT AND ABNORMAL

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 inspectors 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," (ADAMS Accession No. ML12056A045) and EA–12–051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," (ADAMS Accession 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 Accession 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 Accession No. ML12339A262).

(1) Based on samples selected for review, the inspectors verified that the licensee satisfactorily implemented appropriate elements of the Diverse and Flexible Coping Strategies (FLEX) as described in the plant specific submittals and the associated safety evaluation (ADAMS Accession No. ML17095A276) and determined that 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." The inspectors verified 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 inspectors verified that the licensee satisfactorily implemented appropriate elements of the FLEX strategy as described in the plant specific submittals and the associated safety evaluation and determined that the licensee is in compliance with NRC Order NRC Order EA–12–051, “Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation.” The inspectors verified the licensee satisfactorily:

a. Installed the spent fuel pool (SFP) 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 SFP 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 SFP instrumentation; and

d. Developed and issued procedures for maintenance, testing and use of the reliable SFP instrumentation.

(3) The inspectors 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, and verified that the licensee satisfactorily implemented enhancements pertaining to Near-Term Task Force (NTTF) Recommendation 9.3 response to a large scale natural emergency event that results in an extended loss of all ac power to all site units and impedes access to the site. The inspectors verified the following:

a. The licensee satisfactorily implemented required staffing changes to support a multi-unit extended loss of alternating current (ac) power (ELAP) scenario;

b. Emergency preparedness (EP) communications equipment and facilities are sufficient for dealing with a multi-unit ELAP scenario; and

c. The licensee implemented multi-unit dose assessment capabilities (including releases from spent fuel pools) using the licensee’s site-specific dose assessment software and approach.

The inspectors verified that non-compliances with requirements, and standards identified during the inspection were entered into the licensee's corrective action program as appropriate. The corrective action program documents generated as a result of the inspection are listed in the Documents Reviewed section of this inspection report.

This TI is considered closed.

INSPECTION RESULTS

Inadequate Diesel Fuel Oil Temperature Protection			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000334 and 5000412/2018010-01	H.7 – Documentation	TI 2515/191

The team identified a finding of very low safety significance (Green) for the failure to ensure that diesel powered Diverse and Flexible Coping Strategies (FLEX) equipment would be reliable to mitigate postulated beyond-design basis external events during very low temperature conditions. Specifically, at temperatures below the site fuel cloud point (4 degrees Fahrenheit (F) to -7 degrees F), portable FLEX equipment such as emergency diesel powered pumps, were susceptible to conditions in which their capability of starting and operating would be impacted due to fuel crystallizing or gelling and subsequent coating of fuel filter elements.

Description: The team reviewed the ability of the FLEX equipment to operate across the site's specific temperature hazard ranges. The Nuclear Energy Institute (NEI) developed NEI 12-06, which provides guidelines for nuclear stations to assess extreme event hazards and implement mitigation strategies to ensure compliance with NRC Order EA-12-049. FENOC's Final Integrated Plan, L-16-321, "Completion of Required Action by NRC Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events," stated that Beaver Valley Power Station complies with the requirements as described in NEI 12-06, Revision 2, as endorsed by the NRC. As discussed in NEI 12-06, Section 8.2.1, all sites should consider the temperature ranges and weather conditions for their site in storing and deploying FLEX equipment consistent with normal design practices.

The team identified that Beaver Valley's Diesel Flex Fuel powered equipment with fuel filters when exposed to an extreme cold weather event were susceptible to conditions in which their capability of starting and operating could be impacted. The team noted that based on the site fuel cloud point which ranged from 4 degrees to -7 degrees F, diesel fuel crystallization or gelling could occur below these temperatures. The FLEX program for Beaver Valley supports extreme cold weather conditions down to -20 degrees F as documented in the site final integrated plan (FIP). The cloud point of the fuel is the temperature at which paraffin (a wax-like gel, which is naturally present in #2 diesel fuel), begins to form cloudy wax crystals. At the cloud point, these wax crystals flow with the fuel, coat the fuel filter element, and can quickly reduce the fuel flow, potentially challenging the engines.

When deployment begins, the equipment could be subjected to temperatures which could be well below the cloud point for the fuel, with the equipment potentially not being started for many hours. Specifically, once deployed, the diesel driven pumps could be subjected to harsh ambient conditions, potentially as low as -20 degrees F, prior to their start. The team noted FENOC had "Hard Card" procedures which referenced the use of an additive (anti-gel) when ambient temperatures fell below 20 degrees F. However the team noted that the additive wouldn't have been added until the equipment was being placed into service. The affected FLEX equipment may remain idle and positioned in the field for many hours after deployment in the extreme conditions before this fuel additive would be added. If crystallization and gelling had already begun, the additive would be ineffective.

The team noted that 10M-53E.1.FSG-5, Initial Assessment and FLEX Equipment Staging, provides guidelines for deployment of FLEX equipment with priority based on system conditions. Table 1, "Key FLEX Actions," states that the FLEX Alternate Auxiliary Feedwater Pump is to be staged at 8 hours from the loss of all alternating current (AC) power event, prior to plant cooldown, and used as backup to the Turbine Driven Auxiliary Feedwater Pump (TDAFW). FSG-11, "Alternate Spent Fuel Pool (SFP) Makeup and Cooling," was referenced to be implemented for pump deployment no later than 12 hours after the event.

The NRC safety evaluation report (SER) states that the preferred strategy for core cooling in Phase 1 and Phase 2 is to use the TDAFW pump and it is expected to maintain functionality by FENOC given their cooldown strategies throughout Phase 2. However, FLEX requirements and FENOC procedures deploy the alternate AFW pump as a backup to the TDAFW during Phase 2 which could result in being subjected to extreme cold conditions for many hours. The SFP FLEX pumps may also sit idle in extreme conditions for many hours. The team noted with normal decay heat levels, it would take a nominal 71 hours of boil-off before SFP inventory reaches 15 feet above the top of the fuel racks before makeup would be required.

Corrective Action(s): Immediate actions taken by the licensee included adding the fuel additive to all diesel fuel operated equipment (including the N+1 equipment) that has a fuel filter and all associated 110 gallon fuel tanks. All engines were operated to distribute the treated diesel fuel through the fuel filters and system. This action will remove the dependence on operator actions to add the fuel additive during a FLEX event. This was also performed on all diesel fuel tanks in the FLEX building.

Corrective Action Reference(s): CR-2018-01549

Performance Assessment:

Performance Deficiency: Per the NEI 12-06 FLEX guidelines, all sites should consider the temperature ranges and weather conditions for their site in storing and deploying FLEX equipment. FENOC's FIP, section 2.6.4, states that all FLEX pumps are specified to ensure they are capable of starting and operating for the most challenging low temperature conditions. FENOC's procedures failed to ensure that the portable diesel equipment would be capable of starting and operating for the most challenging low temperature conditions and this was considered a performance deficiency.

Screening: The performance deficiency was more than minor because it was associated with the protection against external factors attribute of the Mitigating Systems cornerstone and adversely affected the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, FENOC's procedures did not ensure that the alternate AFW FLEX and SFP portable diesel pumps would be capable of starting and operating for the most challenging low temperature conditions.

Significance: The significance of the finding was evaluated using NRC inspection Manual Chapter 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 finding was determined to be of very low safety significance (Green) because the team answered no to all questions in Appendix O. Specifically, this condition was not associated with Spent Fuel Pool Level Instrumentation and did not result in a complete loss of function to maintain or restore core cooling, containment pressure control/heat removal and/or spent fuel pooling cooling capabilities. FENOC Phase 2 cooling strategies are designed to permit continued use of the TDAFW pump. The FLEX AFW pumps serve as backups, and functionality of the TDAFW pump is expected throughout Phase 2 associated with the event.

Additionally, the Phase 3 FLEX strategy results in additional equipment delivered onsite, which could allow the spent fuel pool cooling and inventory function to be maintained given the expected time available before water addition is required. Therefore there would not be a complete loss of any function given existing procedures and FENOC's FLEX strategy. Cross-cutting Aspect: The team determined that this finding had a cross-cutting aspect in the area of Human Performance, Documentation, because FENOC had not created complete and accurate documentation in that the development of the existing FLEX procedures had not adequately considered protection of the FLEX equipment fuel throughout the time of deployment through starting of the equipment. [H.7]
Enforcement: The inspectors did not identify a violation of regulatory requirements associated with this finding.

EXIT MEETINGS AND DEBRIEFS

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

- On February 23, 2018, the team presented the preliminary FLEX inspection results to Mr. Rich Bologna, Site Vice President, and other members of the licensee staff. An exit meeting was conducted with Mr. Brian Kremer, Regulatory Compliance Manager, via telephone on March 21, 2018, to discuss the final results of the inspection.

DOCUMENTS REVIEWED

TI 2515/191

Condition Reports initiated in response to inspection
CR-2018-01582
CR-2018-01549
CR-2018-01591

Calculations
10080-DEC-3586, FLEX Electrical Load and Voltage Evaluation, Revision 0

Miscellaneous
Beaver Valley Power Station, Units 1 and 2 –Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA 12 049 and EA-12-051), dated May 18, 2017 Final Integrated Plan, L-16-321, Completion of Required Action by NRC Order EA-12-049 Order Modifying Licenses with Regard to Requirements for Mitigation Strategies For Beyond-Design-Basis External Events

Procedures
1OM-53A.1.ECA-0.0(ISS3), Loss of All Emergency 4Kv Ac Power, Revision 1
2OM-53A.1.ECA-0.0(ISS3), Loss of All Ac Power, Revision 0
1OM-53C.4.1.36.1, Loss of All Emergency 4Kv Ac Power While On Shutdown Cooling, Revision 7
2OM-53C.4.2.36.1, Loss Of All Ac Power When Shutdown, Revision 10
2OM-53E.1.FSG-8, Alternate RCS Boration, Revision 1
2OM-53E.1.FSG-10, Passive RCS Management, Revision 0
1OM-53E.1.FSG-4, ELAP Dc Bus Load Shed / Management, Revision 1
1OM-53E.1.FSG-5, Initial Assessment and Flex Equipment Staging, Revision 2
1OM-53E.1.FSG-6, Alternate PPDWST Makeup, Revision 2
2OM-53E.1.FSG-4, ELAP Dc Bus Load Shed / Management, Revision 1