



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION I  
2100 RENAISSANCE BOULEVARD, SUITE 100  
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

February 24, 2020

Mr. Rod L. Penfield  
Site Vice President  
FirstEnergy Nuclear Operating Company  
Beaver Valley Power Station  
P.O. Box 4  
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNITS 1 AND 2 – TEMPORARY  
INSTRUCTION 2515/194 INSPECTION REPORT 05000334/2020010 AND  
05000412/2020010

Dear Mr. Penfield:

On January 30, 2020, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Beaver Valley Power Station, Units 1 and 2 and discussed the results of this inspection with Mark Manoleras and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

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 at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

**/RA/**

Glenn T. Dentel, Chief  
Engineering Branch 2  
Division of Reactor Safety

Docket Nos. 05000334 and 05000412  
License Nos. DPR-66 and NPF-73

Enclosure:  
As stated

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SUBJECT: BEAVER VALLEY POWER STATION, UNITS 1 AND 2 – TEMPORARY  
INSTRUCTION 2515/194 INSPECTION REPORT 05000334/2020010 AND  
05000412/2020010 DATED FEBRUARY 24, 2020

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194 Inspections (Region 1)\Beaver Valley\BV OPC IR 2020010.docx  
 ADAMS ACCESSION NUMBER: ML20058D181

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**U.S. NUCLEAR REGULATORY COMMISSION  
Inspection Report**

Docket Numbers: 05000334 and 05000412

License Numbers: DPR-66 and NPF-73

Report Numbers: 05000334/2020010 and 05000412/2020010

Enterprise Identifier: I-2020-010-0010

Licensee: FirstEnergy Nuclear Operating Company

Facility: Beaver Valley Power Station

Location: Shippingport, PA

Inspection Dates: January 27, 2020 to January 31, 2020

Inspectors: L. Dumont, Reactor Inspector  
C. Hobbs, Reactor Inspector

Approved By: Glenn T. Dentel, Chief  
Engineering Branch 2  
Division of Reactor Safety

Enclosure

## **SUMMARY**

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting Temporary Instruction 2515/194 at Beaver Valley Power Station, Units 1 and 2 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.

### **List of Findings and Violations**

No findings or violations of more than minor significance were identified.

### **Additional Tracking Items**

None.

## INSPECTION SCOPES

The inspection was conducted using Temporary Instruction 2515/194 (ADAMS Accession No. ML17137A416), effective November 1, 2017. The inspectors reviewed the licensee's implementation of the Nuclear Energy Institute's voluntary industry initiative in compliance with Commission guidance. The inspectors discussed Beaver Valley's open phase condition system design and ongoing implementation plans with plant staff. The inspectors reviewed licensee and vendor documentation, and performed system walkdowns to verify that the installed equipment was supported by the design documentation. Beaver Valley had recently completed physical installation and the equipment was being operated in a monitoring mode with the trip functions disabled.

## OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

### 2515/194 - Inspection of the Licensee's Implementation of Industry Initiative Associated With the Open Phase Condition Design Vulnerabilities In Electric Power Systems (NRC Bulletin 2012-01)

The inspectors reviewed the licensee's implementation of the "Nuclear Energy Institute Voluntary Industry Initiative," (ADAMS Accession No. ML15075A454) dated March 16, 2015. This included reviewing how the licensee updated their licensing basis to reflect the need to protect against open phase conditions.

### Inspection of the Licensee's Implementation of Industry Initiative Associated With the Open Phase Condition Design Vulnerabilities In Electric Power Systems (NRC Bulletin 2012-01) (1 Sample)

- (1) FirstEnergy selected the open phase detection system designed and manufactured by Power System Sentinel Technologies, LLC, as the design vendor for the open phase condition system at Beaver Valley Power Station. The open phase protection system is designed to protect the offsite power sources from a loss of phase condition.

The offsite electrical distribution system is functionally the same for both Beaver Valley Unit 1 and Unit 2. Two general design criteria (GDC-17) offsite power sources are credited for each unit. At each unit offsite power is provided by two independent system station service transformers (SSSTs), each powered from a different bus of the 138 kV switchyard to supply reliable power to two safety-related 4kV buses for each Beaver Valley unit. The 138 kV connections between the switchyard buses and the SSSTs are made with overhead lines having separate towers for each line. At the time of the inspection the active trip feature of the open phase detection systems installed at Beaver Valley was not enabled for either unit.

## INSPECTION RESULTS

Temporary Instruction 2515/194-03.01 - Voluntary Industry Initiative	2515/194
<u>Detection, Alarms, and General Criteria</u>	
1. 03.01(a)(1) OPC are detected and alarmed in the control room for Unit 1 and 2.	
2. 03.01(a)(2) Detection circuits are sensitive enough to identify an OPC for credited loading conditions (i.e., high and low loading).	
3. 03.01(a)(3) OPC design and protective schemes minimize misoperation or spurious action in the range of voltage unbalance normally expected in the transmission	

system that could cause separation from an operable off-site power source. In the design of the OPC system, multiple features have been added to prevent spurious trips of the system. FirstEnergy solutions demonstrated that the actuation circuit design does not result in lower overall plant operation reliability.

4. 03.01(a)(4) No class 1E circuits were replaced with non class 1E circuits during installation of the open phase detection system.

Protective Actions Criteria

1. 03.01(b)(1) Two SSSTs at both Unit 1 and Unit 2 were identified as susceptible to an open phase condition and the licensee has implemented design changes on all four transformers to mitigate the effects.
2. 03.01(b)(2) With an open phase condition present and no accident condition signal, the open phase design would not adversely affect the function of important-to-safety systems, structures, or components. The licensee's OPC design solution added two PSSTech systems on each SSST, TR-1A, TR-1B, TR-2A, and TR-2B. The credited plant response was unaffected and would be the same regardless of the conditions that generated the lockout of the transformer.

<u>Detection, Alarms, and General Criteria Exceptions</u>	2515/194
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03.01(a)(5) The Beaver Valley Unit 1 UFSAR has been updated to discuss the design features of the open phase condition detection system. However, the Unit 2 UFSAR was not updated at the time of the inspection. This has been noted in CR-2020-00263 and as part of the self-assessment conducted prior to the start of the inspection under SA-BN-2020-1796. The licensee provided to the inspectors the proposed changes to the licensing basis that discussed the system requirements related to the effects of, and protection for, any open phase condition design vulnerability.

<u>Protective Actions Exceptions</u>	2515/194
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03.01(b)(3) Inspectors determined that with an open phase condition and an accident condition signal present, the open phase detection system would not adversely affect the function of the load shedding and sequencing system to provide a means of disconnecting and sequencing of loads on the safety related buses. The open phase protection trip circuit was installed; however, this trip function will remain disabled until cessation of plant operations. FirstEnergy issued a letter, dated November 19, 2018, to inform the NRC that based on the previously announced near-term plant shut downs, Beaver Valley's OPC detection equipment will remain in the monitor mode up until the respective shut down dates for each site. As such, the OPC equipment on both units were not placed in the trip mode of operation.

03.01(b)(4) The licensee had not established documentation for periodic tests, calibrations, setpoint verifications, or inspection procedures associated with the PSS Tech equipment. This action was being tracked in their corrective action program (CR-2020-00586) and was identified as part of the self-assessment conducted prior to the start of the inspection under SA-BN-2020-1796.

## **EXIT MEETINGS AND DEBRIEFS**

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

- On January 30, 2020, the inspectors presented the Temporary Instruction 2515/194 inspection results to Mark Manoleras and other members of the licensee staff.

**DOCUMENTS REVIEWED**

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Corrective Action Documents	CR-2020-00263		
		CR-2020-00585		
		CR-2020-00586		
	Corrective Action Documents Resulting from Inspection	CR-2020-00708		
		CR-2020-00732		
	Drawings	RE-0001C	Beaver Valley Power Station Unit 2 Equipment One Line Diagram	15
		RE-0001C	Beaver Valley Power Station Unit 1 Equipment One Line Diagram	32
	Engineering Changes	ECP 15-0060-000	Unit 2 Open Phase Detection System Reference Documents	5/31/2018
		ECP-15-0059-000	Unit 1 Open Phase Detection System Reference Documents	11/30/2015
		ECP-18-0156-000	Unit 1 Main Transformer Leads Protection Replacement	4/18/2019
	Miscellaneous		Open Phase Protection (OPP) System Factory Acceptance Test (FAT) Plan for FENOC	5/18/2016
			Open Phase Protection (OPP) System Site Acceptance Test Procedure for Single Channel System	8/3/2016
			Open Phase Protection (OPP) System Procedure for OPP System Online Commissioning	12/5/2018
			PSSTech OPD System Enhanced Test Execution, Results and Conclusions	0
			Shiftly readings of SSST Secondary Phase Voltages	1/26/2020 and 1/27/2020
		Daily SSST 1A High line Drop Inspection	1/26/2020 and 1/27/2020	
		PSSTech Open Phase Protection (OPP) System Preventive Maintenance Guide	0.0.1	



Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		L-18-219	First Energy Solutions letter to NRC announcing intent to leave OPC systems in monitoring mode until plant closures in 2021.	11/19/2018
	Procedures	1OM-36.4.AFY	SS Service Transformer 1B Open Phase Alarm	1
		1OM-36.4.AFZ	SS Service Transformer 1A Open Phase Alarm	0
		1OM-54.3.OUT1	Beaver Valley Unit 1 Outside Log Readings	71
		2OM-36.4.AFK	SS Service Transformer 2A Open Phase Alarm	0
		2OM-36.4.AFK	SS Serv Tfmr Open Phase Alarm	1
		2OM-36.4.AFL	SS Service Transformer 2B Open Phase Alarm	1
	Self-Assessments	SA-BN-2020-1796	BVPS self assessment for TI-194 Open Phase Condition inspection	1/24/2020