



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
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December 4, 2019

Mr. Daniel G. Stoddard
Senior Vice President
and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Blvd., Floor: IN-2SW
Glen Allen, VA 29060

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION – UNIT 1 – NRC INSPECTION OF
TEMPORARY INSTRUCTION 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),
INSPECTION REPORT 05000395/2019013

Dear Mr. Stoddard:

On October 24, 2019, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Virgil C. Summer Nuclear Station and discussed the results of this inspection with Mr. George Lippard 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/

Steven D. Rose, Chief
Construction Inspection Branch 2
Division of Construction Oversight

Docket No. 05000395
License No. NPF-12

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number: 05000395

License Number: NPF-12

Report Number: 05000395/2019013

Enterprise Identifier: I-2019-013-0010

Licensee: Dominion Energy

Facility: Virgil C. Summer Nuclear Station

Location: Jenkinsville, SC

Inspection Dates: October 21, 2019 to October 24, 2019

Inspectors: M. Schweg, Reactor Inspector

Approved By: Steven D. Rose, Chief
Construction Inspection Branch 2
Division of Construction Oversight

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a NRC inspection at Virgil C. Summer Nuclear Station, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

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

Additional Tracking Items

None.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The 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 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)

This inspection was conducted using Temporary Instruction 2515/194 (ADAMS Accession No. ML17137A416), dated October 31, 2017. The inspector reviewed the licensee's implementation of Nuclear Energy Institute (NEI) voluntary industry initiative (VII) in compliance with regulatory requirements and current licensing bases. The inspector discussed the licensee's open phase protection (OPP) system design and ongoing implementation plans with plant staff. The inspector reviewed licensee documentation, vendor documentation, and performed system walkdowns to verify that the installed equipment was supported by the design documentation. The inspector verified that the licensee had completed the installation and testing of equipment, installed and tested alarm circuits both local and in the control rooms, and analyzed potential impacts associated with the design implementation on the current licensing basis. At the time of this inspection, V.C Summer is still under their monitoring period. Therefore, the final implementation to enable the trip function is pending final decision for a later date.

V.C. Summer selected the Open Phase Isolation System (OPIS) which is designed and manufactured by PCS2000 Solutions, L.L.C. The OPIS system will detect by monitoring the line currents of each transformer that connects a GDC-17 offsite source to the class 1E onsite power system. The applicable transformers are XTF4, XTF5 and XTF31. There were separate and independent OPIS for each transformer. Each OPIS was comprised of two redundant channels, referred to as Channel 1 and Channel 2. In order for the system to alarm there must be an agreement between the channels (2 out of 2) that an OPC has been detected. Each channel consists of a relay panel containing various components including two redundant Schweitzer SEL451 relays that provide OPC detection and a channel trip on a 1 out of 2 basis, a Schweitzer SEL3355 for sequence of events recording and an associated high voltage CT on each high side bushing of the transformer being monitored. Additionally, the XTF4 will also have low voltage CT's that monitor low voltage side line currents. Low side OPC detection is not necessary for XTF5 or XTF31 thus no modifications were made for that purpose. If an OPC is detected by an OPIS, the system will provide an alarm on the main control board and if the trip function were implemented, then it will isolate the affected transformer by tripping its respective 86T transformer lockout relay.

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) Temporary Instruction 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) (1 Sample)

The objective of Temporary Instruction 2515/194 is to verify that licensees have appropriately implemented the NEI VII (ADAMS Accession No. ML15075A454), dated March 16, 2015, including updating their licensing basis to reflect the need to protect against OPCs.

INSPECTION RESULTS

Assessment	2515/194
<p><u>Detection, Alarms, and General Criteria; TI 2515/194-03.01 – VII (Part 1)</u></p> <p>a. Detection, Alarms and General Criteria.</p> <p>1. OPCs can be detected by the OPIS system and OPC alarms will be indicated in the main control room (MCR). The alarm annunciator procedure was changed to verify the OPC alarm is valid before manually tripping the affected transformer feeder breaker.</p> <p>2. The OPIS detection circuits are sensitive enough to identify an OPC for any credited loading conditions (i.e., high and low transformer loading).</p> <p>3. OPIS design/protective schemes will 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. Licensees have demonstrated that the actuation circuit design does not result in lower overall plant operation reliability. With the following exception, there are faulty OPC alarms on 115kV XTF4 transformer during the 'A' diesel monthly runs. These alarms are caused by sub-harmonics and the PCIS system cannot be updated to filter these alarms. The licensee is planning to disable the OPIS trip function if implemented during "A" diesel runs.</p> <p>4. There are no new non-Class-1E circuits being used to replace the existing Class-1E circuits.</p> <p>5. At the time of the inspection, the UFSAR was not updated to discuss the design features and analyses related to the effects of, and protection for, any OPC design vulnerability. The USFAR update (Rev. 16) is due by the final implementation at a later date.</p> <p>b. Protective Actions.</p> <p>2. With OPC occurrence and no accident condition signal present, an OPC will not adversely affect the function of important-to-safety SSCs. The OPIS trip function, if enabled, will occur within 3 seconds to prevent any SSCs overload trips from occurring.</p> <p>3. With OPC occurrence and an accident condition signal present: the automatic detection and automatic or operator initiated actuation will transfer loads required to mitigate postulated accidents to an alternate source to ensure that safety functions are preserved, as required by the current licensing bases. If the trip enable function is implemented, the associated 86T</p>	

transformer lockout relay will be tripped within 3 seconds to ensure the OPC fault is isolated prior to the emergency diesel generator starting. If the operator initiated actuation occurs, the feeder breaker to the affected transformer will be opened from the main control board.

4. Periodic tests, calibrations, setpoint verifications or inspections (as applicable) have not been established for the new OPC protective trip features. The OPC plant procedures will be updated prior to system turnover. There are no new surveillance requirements needed for the plant Technical Specifications (T.S). T.S. basis documents will be updated to incorporate the OPIC system as a check for the availability of offsite power.

Observation: Compensatory measure and USFAR update	2515/194
<p>The compensatory measure may not be adequate to protect some safety related components following an OPC event. The OPC alarm response procedure has the operators verify a valid OPC event. If the alarm is considered valid, the operator will open the associate transformer feeder breaker. This operator action is not considered time critical and it could take some time to initiated. Inspector reviewed the calculation DC08210-006 Open Phase Isolation System Relay Settings and determined the (ESF) running loads could trip on thermal overload within 5 to 10 seconds from an OPC event. Therefore, the manual action may be insufficient to protect some safety relate loads during an actual event. If the automatic trip function is enabled, the OPC will be isolated within 3 seconds to protect any ESF running loads.</p> <p>At the time of the inspection, the UFSAR was not updated to discuss the design features and analyses related to the effects of, and protection for, any OPC design vulnerability. The UFSAR update (Rev. 16) is due at a later date. Inspector reviewed the draft revision and determined it did not include a discussion of the automatic trip function. Licensee is planning to update the USFAR revision prior to the final implementation date.</p>	

EXIT MEETINGS AND DEBRIEFS

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

- On October 24, 2019, the inspectors presented the NRC inspection results to Mr. George Lippard and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Calculations	DC08210-006	Open Phase Isolation System Relay Settings	Rev. 0
	Corrective Action Documents	CR-19-00183 CR-19-00249 CR-19-00625 CR-19-00678 CR-19-01038 CR-19-01058 CR-19-01116 CR-19-01123 CR-19-01275 CR-19-01659 CR-19-02356 CR-19-03020 CR-19-03021 CR-19-03209		
	Drawings	E-206-005	Plant Electrical Distribution	Rev. 32
	Engineering Changes	ECR-50884	Open Phase Condition {OPC} Strategy for the GDC-17 Offsite Power Sources	Rev. 0
		ECR-50884E	Open Phase Condition (OPC) Strategy for the GDC-1 7 Offsite Power Sources	Rev. 0
	Miscellaneous		PCS2000 Open Phase Detection System Failure Modes and Effects Analysis	08/23/2017
			PCS2000 Open Phase Detection System VC Summer User Manual	03/21/2017
			XTF31 Open Phase Detection Monitoring Period Report December 2018 - July 2019	08/12/2019
			PCS2000 Open Phase Detection System Factory Acceptance Test	Rev. 0
			XTF4 Open Phase Detection Monitoring Period Report December 2018 – July 2019	08/15/2019

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Procedures	ARP-001-XCP-638	ANNUNCIATOR RESPONSE PROCEDURE ARP-001-XCP-638 MAIN CONTROL BOARD	Rev. 8
		MTP-50884.001	OPEN PHASE ISOLATION SYSTEM SITE ACCEPTANCE TESTING	Rev. 0
		OAP-106.1	OPERATIONS ADMINISTRATIVE PROCEDURE OAP-106.1 OPERATING ROUNDS	Rev. 17