



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, ILLINOIS 60532-4352

December 6, 2021

Mr. Joel P. Gebbie
Senior VP and Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT – 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) REPORT 05000315/2021013 AND 05000316/2021013

Dear Mr. Gebbie:

On October 29, 2021, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Donald C. Cook Nuclear Plant and discussed the results of this inspection with you 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,

A handwritten signature in cursive script that reads "Richard A. Skokowski".

Signed by Skokowski, Richard
on 12/06/21

Richard A. Skokowski, Chief
Engineering Branch 3
Division of Reactor Safety

Docket Nos. 05000315 and 05000316
License Nos. DPR-58 and DPR-74

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV®

Letter to Joel P. Gebbie from Richard A. Skokowski dated December 6, 2021.

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

Docket Numbers: 05000315 and 05000316

License Numbers: DPR-58 and DPR-74

Report Numbers: 05000315/2021013 and 05000316/2021013

Enterprise Identifier: I-2021-013-0013

Licensee: Indiana Michigan Power Company

Facility: Donald C. Cook Nuclear Plant

Location: One Cook Place

Inspection Dates: October 25, 2021 to October 29, 2021

Inspectors: A. Dahbur, Senior Reactor Inspector

Approved By: Richard A. Skokowski, Chief
Engineering Branch 3
Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting an 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) at Donald C. Cook Nuclear Plant, 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.

Starting on March 20, 2020, in response to the National Emergency declared by the President of the United States on the public health risks of the coronavirus (COVID-19), inspectors were directed to begin telework. In addition, regional baseline inspections were evaluated to determine if all or a portion of the objectives and requirements stated in the IP could be performed remotely. If the inspections could be performed remotely, they were conducted per the applicable IP. In some cases, portions of an IP were completed remotely and on site. The inspections documented below met the objectives and requirements for completion of the IP.

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 (OPCs).

The objective of Temporary Instruction 2515/194 is to verify that licensees have appropriately implemented the Nuclear Energy Institute voluntary industry initiative (ADAMS Accession No. ML15075A454), dated March 16, 2015, including updating their licensing basis to reflect the need to protect against OPCs. The inspector discussed the impacts of OPCs on the licensee's electrical system design, the ability to detect and alarm OPCs on station transformers, and ongoing implementation of training and updates to operating procedures with plant staff. The inspector reviewed licensee and 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 (with the exception of the tripping functions), installed and tested alarming circuits both locally and in the control room, and analyzed potential impacts associated with the design implementation on the current licensing basis. The inspector also reviewed licensee analysis and calculations, and performed distribution system equipment walkdowns.

The inspector performed Section 03.01 of the Temporary Instruction in order to determine whether the licensee appropriately implemented the voluntary industry initiative, dated March 16, 2015, (ADAMS Accession No. ML15075A454). This included reviewing how the licensee updated their licensing basis to reflect the need to protect against OPCs.

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) Donald C. Cook Nuclear Plant Unit 1 and Unit 2 (D. C. Cook) has two qualified sources of offsite power, 345 KV/34.5 KV Reserve Feed is the preferred source and 69 KV/4.16 KV Emergency Power TR12EP-1 is the alternate source. The preferred offsite power source auxiliary system for both units can be arranged so that Transformer No. 4 or Transformer No. 9 supplies Reserve Auxiliary Transformers (RATs) TR101CD and TR201CD and Transformer No. 5 or Transformer No. 9 supplies RATs TR101AB and TR201AB.

Normal plant operation; station loads including the safety buses are powered from Unit Aux Transformers (TR1AB, TR1CD for Unit 1 and TR2AB, TR2CD for Unit 2). These transformers are supplied by the Main Generators via the Isophase Bus. For loss of source from the Unit Aux Transformers, an automatic fast transfer to the Reserved Feed via the RATs. The OPC modifications did not alter the fast transfer scheme.

D. C. Cook selected the open phase detection system designed and manufactured by Schweitzer Engineering Laboratories (SEL) and are model type SEL-487E. The SEL-487E is a multifunction programmable device, which uses software and separate algorithms to detect open phase in a three-phase power supply. The SEL-487E relay (1-11-T101CD) for Train A RAT (TR101CD) and SEL-487E relay (1-11-T101AB) for Train B RAT (TR101AB) were located in Unit 1 Control Room. The SEL-487E relay (2-11-T201CD) for Train A RAT (TR201CD) and SEL-487E relay (2-11-T201AB) for Train B RAT (TR201AB) were located in Unit 2 Control Room. The SEL-487E relay (12-11-TR12EP1) for Transformer 12-TR12EP-1 was located in the switchyard house. An output contact from each SEL-487E relays will be connected to separate annunciator window in the control room to provide an open phase alarm.

D.C. Cook selected to use a probabilistic risk assessment risk-informed evaluation to implement the OPPS via alarms and operator response vice having the system automatically trip the offsite sources. This is in accordance with NEI 19-02, Rev 0, "Guidance for Assessing Open Phase Condition Implementation Using Risk Insights."

During the site visit, the inspectors walkdown the SEL-487E relays and the annunciator alarm windows in the control room and observed the relays were were in the monitoring mode of operation and would alarm the control room if a loss of phase conditions are detected. In addition, the inspectors observed operations response to a simulated plant trip condition coincident with open phase on one of the RATs in the simulator.

INSPECTION RESULTS

Observation: Temporary Instruction 2515/194-03-01 Voluntary Industry Initiative	2515/194
Based on discussions with D. C. Cook staff, review of design and testing documentation, and walkdowns of installed equipment, the inspectors had reasonable assurance that D. C. Cook is appropriately implementing, with a noted exception discussed below, the voluntary industry initiative at D. C. Cook Nuclear Power Plant. The inspectors verified the following criteria:	

Detection, Alarms and General Criteria

1. [03.01(a)(1)] Open phase conditions are detected and alarmed in the control room.
2. [03.01(a)(2)] Detection circuits are sensitive enough to identify an OPC for credited loaded conditions (i.e., high and low loading).
3. [03.01(a)(4)] No Class 1E circuits were being replaced with non-Class 1E circuits in this design.
4. [03.01(a)(5)] The Final Safety Analysis Report was updated to discuss the design features and analyses related to the effects of any open phase condition design vulnerability. One exception was noted by the inspectors and documented in a separate observation.
5. [03.01(a)(6)] The open phase condition detection and alarm components are maintained in accordance with station procedures or maintenance program, and periodic tests, calibrations setpoint verifications or inspections (as applicable) have been established.

Use of Risk-Informed Evaluation Method

1. [03.01(c)(1)] The plant configuration matched the changes made to the probabilistic risk assessment model to address an open phase condition, and the logic of the probabilistic risk assessment model changes is sound.
2. [03.01(c)(2)] The procedures which validate that the open phase condition alarm would identify the proper indication to validate the open phase conditions at all possible locations.
3. [03.01(c)(3)] Observations associated with procedure(s) and operator actions required to respond to an open phase condition alarm and potential equipment trip match the Human Reliability Analysis.
4. [03.01(c)(4)] Assumptions listed in the NEI 19-02 Appendix A evaluation and the sensitivity analyses listed in Section 5 of the evaluation were verified.
5. [03.01(c)(5)] Assumptions, procedures, operator actions and D. C. Cook's analyses specified above are consistent with the plant-specific design and licensing basis, including:
 - a. Initiating events considered in the analysis
 - b. Boundary conditions specified in Attachment 1 of the NEI Voluntary Industry Initiative, Revision 3
 - c. Operating procedures for steps taken to recover equipment assumed tripped/locked out or damaged due to the open phase conditions (or use of alternate equipment)

Observation: Exception(s)

2515/194

[03.01(a)(5)] The Final Safety Analysis Report was updated to discuss the design features and analyses related to the effects of any open phase condition design vulnerability.

One exception was identified by the inspectors related to lack of clarity on the UFSAR update. The station installed OPC detection systems to monitor open phase condition and provided alarms in the control room for all three Reserve Auxiliary Transformers (RATs) and on the 12-TR12EP1 transformer. The UFSAR was revised and added discussion related to the OPC modification for the RATs but did not discuss the installation of an OPC detection system for the EP transformer. The licensee entered this exception into their corrective action program as AR 2021-8843 to add clarity to include the full extend of the OPC system.

EXIT MEETINGS AND DEBRIEFS

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

- On October 29, 2021, the inspectors presented the 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) results to Joel P. Gebbie, Senior VP and Chief Nuclear Officer and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Calculations	PRA-OPC-RISK	Open Phase Risk Assessment	10/08/2020
	Corrective Action Documents Resulting from Inspection	AR 2021-8819	Annunciator Response Procedures Still Reference OPC TRIP	10/26/2021
		AR 2021-8843	Update UFSAR to Include the Full Extend of the OPC System	10/27/2021
	Drawings	OP-1-12001-98	Unit 1 - Main Auxiliary One-Line Diagram Bus A and B	10/19/2021
		OP-1-12002-80	Unit 1 - Main Auxiliary One-Line Diagram Bus C and D	10/19/2021
		OP-2-12001-56	Unit 2 - Main Auxiliary One-Line Diagram Bus A and B	4/16/2021
		OP-2-12002-50	Unit 2 - Main Auxiliary One-Line Diagram Bus C and D	4/22/2021
		OP-2-98042A-1	Transformer TR201CD Open Phase Detection	12/2/2019
	Engineering Changes	EC 55035	Installation of Open Phase Detection Relay for Transformers 2-TR201AB and 2-TR201CD	0
		EC 55036	Installation of Open Phase Detection Relay for Transformers 12-TR12EP-1	0
	Miscellaneous	B.3.8	Technical Specifications Basis - Electrical Power System	13
		Chapter 8	UFSAR - Electrical Systems	30
	Procedures	1-OHP-4023 E-0	Reactor Trip or Safety Injection	46
		1-OHP-4024-120 Drop 69	Annunciator #120 Response Station Auxiliary CD - TR101CD Open Phase or Relay Failure	55