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

January 9, 2020

Mr. Anthony J. Vitale
Site Vice President
Entergy Nuclear Operations, Inc.
450 Broadway, General Services Building
P.O. Box 249
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING, UNITS 2 AND 3 – TEMPORARY INSTRUCTION 2515/194 INSPECTION REPORT 05000247/2019012 AND 05000286/2019012

Dear Mr. Vitale:

On December 19, 2019, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Indian Point Nuclear Generating, Units 2 and 3 and discussed the results of this inspection with Mr. Richard Drake, Acting Design and Programs Engineer Manager 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. 05000247 and 05000286
License Nos. DPR-26 and DPR-64

Enclosure:
As stated

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SUBJECT: INDIAN POINT NUCLEAR GENERATING, UNITS 2 AND 3 – TEMPORARY INSTRUCTION 2515/194 INSPECTION REPORT 05000247/2019012 AND 05000286/2019012 DATED JANUARY 9, 2020

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Numbers:	05000247 and 05000286
License Numbers:	DPR-26 and DPR-64
Report Numbers:	05000247/2019012 and 05000286/2019012
Enterprise Identifier:	I-2019-012-0035
Licensee:	Entergy Nuclear Operations, Inc.
Facility:	Indian Point Nuclear Generating, Units 2 and 3
Location:	Buchanan, NY
Inspection Dates:	December 16, 2019 to December 19, 2019
Inspectors:	C. Hobbs, Reactor Inspector A. Patel, Senior 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 a Temporary Instruction inspection at Indian Point Nuclear Generating, Units 2 and 3, 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 Entergy's implementation of the Nuclear Energy Institute's voluntary industry initiative in compliance with Commission guidance. The inspectors discussed Entergy's open phase condition system design and ongoing implementation plans with plant staff. The inspectors reviewed Entergy and vendor documentation, and performed system walkdowns to verify that the installed equipment was supported by the design documentation. Entergy had recently completed physical installation and the equipment was being operated in a monitoring mode with the trip functions enabled.

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) Entergy Operations Inc. selected the open phase detection system designed and manufactured by PCS2000 Solutions, LLC, as the design vendor for the open phase condition system at Indian Point Nuclear Generating. The onsite and offsite electrical distribution system is functionally the same for both Indian Point Unit 2 and Unit 3. Two general design criteria (GDC-17) offsite power sources are credited for each unit. The normal offsite power source is a 138 kV feeder from the Buchanan switchyard that supplies a station auxiliary transformer (SAT) which in turn feeds two 6.9 kV buses in the onsite electrical distribution. If the normal source of offsite power is lost, the two 6.9 kV buses can be manually connected to the alternate offsite power source which is the gas turbine autotransformer (GTA). The GTA is fed by a 13.8 kV feeder from a different section of the Buchanan switchyard. The 6.9 kV buses then feed the four safety-related 480 V engineered safeguards (ESF) buses through station service transformers (SSTs).

During normal operation with the reactor at power, the SAT will feed 6.9 kV buses 5 and 6. These (6.9 kV buses 5 and 6) will then feed 480 V ESF buses 5A and 6A through SSTs 5 and 6. If 138 kV offsite power is lost, or if a lockout of the SAT occurs due to an electrical fault such as an open phase condition, power will be lost to 6.9 kV buses 5 and 6 as well as as 480 V bus 5A and 6A temporarily. Each 480 V ESF is supplied by an emergency diesel generator and the respective emergency diesel generator for 480 V bus 5A and 6A will start and supply power to its respective bus. Operators can then manually shift power from the SAT to the GTA and supply 13.8 kV offsite power to 6.9 kV buses 5 and 6, thus restoring offsite power to the buses. Once offsite power has been restored to 6.9 kV buses 5 and 6, the emergency diesel generator supplying power to the respective 480 V bus may be

secured. Throughout the loss of offsite power, 6.9 kV buses 1 through 4 will continue to supply power to 480 V ESF buses 2A and 3A. Power to 6.9 kV buses 1 through 4 are supplied from the main generator through the unit auxiliary transformer while the reactor is at power. These buses also supply power to all four reactor coolant pumps, therefore, a loss of offsite power by itself does not result in a reactor and turbine trip. In the event of a reactor and turbine trip, 6.9 kV buses 1 through 4 will fast transfer to 6.9 kV buses 5 and 6 so that power will be supplied to all six 6.9 kV buses from offsite power, thus continuity of power is retained. This same configuration is used during a refueling outage when the reactor is offline.

Indian Point has installed redundant open phase detection systems on each offsite power transformer for each unit. For a single offsite power transformer, there are duplicate current sensors installed on each phase on the line side of the transformer bushings, as well as duplicate electronic relay cabinets. Coincidence logic is utilized for the electronic relays to prevent spurious trips of the system. At the end of this inspection, the PCS2000 system was operating with all functions enabled for each SAT and GTA.

INSPECTION RESULTS

Voluntary Industry Initiative (Part 1)	2515/194

Based on discussions with licensee staff; review of design, installation, and testing documentation; and walkdowns of installed equipment; the inspectors had reasonable assurance the licensee is appropriately implementing the voluntary industry initiative. No exceptions were noted. The inspectors verified by design document review, walkdowns, staff discussions, and observation the following criteria:

Detection, Alarms, and General Criteria

(1) Open phase conditions will be detected and alarmed in the both the Unit 2 and Unit 3 control rooms.

(2) Detection circuits are sensitive enough to identify an open phase condition for all credited loading conditions.

(3) The PCS2000 system is designed to minimize misoperation or spurious action in the range of voltage unbalance normally expected in the transmission system that could cause separation from an operable offsite power source. The licensee has demonstrated that the actuation circuit design did not result in lower overall plant operation reliability.

(4) No Class-1E circuits were replaced with non-Class 1E circuits in the design.

(5) The licensee had updated the Unit 2 and Unit 3 Final Safety Analysis Reports to discuss the design features and analyses related to the effects of, and protection for, any open phase condition vulnerabilities.

Protective Actions Criteria

(1) The SATs and the GTAs at both Unit 2 and Unit 3 were identified as susceptible to an open phase condition and the licensee has implemented design changes to mitigate the effects.

(2) With an open phase condition present, and no accident condition signal present, the PCS2000 system would not adversely affect the function of important-to-safety systems, structures, or components. The PCS2000 open phase condition design solution added a set of additional tripping inputs in parallel with existing transformer isolation controls. This addition added a new tripping condition (open phase) to the previously analyzed electrical faults, which result in isolation of the offsite power transformer. The credited plant response was unaffected and would be the same independent of the conditions that would generate electrical isolation of the offsite power transformer.

(3) With an open phase condition present, and an accident condition signal present, the PCS2000 system would not adversely affect the transfer of 480 V ESF buses to the onsite emergency diesel generators as required by the current licensing bases. Only a new tripping condition (open phase) was added to the electrical faults which result in isolation of the offsite source of power.

(4) Periodic tests, calibrations, and setpoint verifications have been established for the open phase detection system for both Unit 2 and Unit 3.

No findings were identified.

EXIT MEETINGS AND DEBRIEFS

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

- On December 19, 2019, the inspectors presented the Temporary Instruction results to Mr. Richard Drake, Acting Design and Programs Engineer Manager and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Calculations	IP-CALC-15-00103	Open Phase Detection Time Delay Trip Setting for Unit 2	0
		IPC-CALC-16-00023	Open Phase Detection Time Delay Trip Setting for Unit 3	0
	Corrective Action Documents	Condition Reports	CR-HQN-2018-02169, CR-IP3-2017-03153, CR-IP2-2018-03631, CR-IP3-2018-02862, CR-IP3-2018-02656, CR-IP2-2019-04438, CR-IP2-2019-04439, CR-IP3-2019-03728, CR-IP3-2019-04217, CR-IP3-2019-03496, CR-IP3-2019-03727	
	Drawings	504277	Indian Point Unit 2 Station Aux Transformer OPD Systems 1 & 2 Trip and Alarm Schematic Diagram	0
		504288	Indian Point Unit 2 GT1 Autotransformer OPD Systems 1 & 2 Trip and Alarm Schematic Diagram	0
		504379	Indian Point Unit 3 Station Aux Transformer OPD Systems 1 & 2 Trip and Alarm Schematic Diagram	0
		504391	Indian Point Unit 3 GT1 Autotransformer OPD Systems 1 & 2 Trip and Alarm Schematic Diagram	0
		617F645	Indian Point Unit 3 Main One Line Diagram	24
		908	Indian Point & Buchanan System Ties	46
		9321-LL-3132-15	Schematic Diagram Pilot Wire and Misc. Lockout Relays, Sheet 3	15
		A208377-21	Indian Point Unit 2 Main One Line Diagram	21
	Engineering Changes	EC-52526	Open Phase Detection on Unit 2 Station Aux Transformer and GT Autotransformer	0
		EC-52527	Open Phase Detection on Unit 3 Station Aux Transformer and GT Autotransformer	0
	Miscellaneous	Maintenance Rule	IPEC Maintenance Rule Basis Document for 13.8 kVAC Electrical System	3
		Maintenance Rule	IPEC Maintenance Rule Basis Document for 138 kVAC Electrical System	4
		UFSAR	Indian Point Unit 2 UFSAR	26
		UFSAR	Indian Point Unit 3 UFSAR	7
		Work Orders	00433527, 00433529	

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Procedures	2-ARP-SCF	ARP - Condensate and Boiler Feed	54
		2-ARP-SHF	ARP - CCR Electrical	32
		3-ARP-010	ARP - 13.8 KV Substation Trouble	36
		3-ARP-011	ARP - Station Aux XFMR Trouble	38
	Self-Assessments	LO-IP3LO-2019-00121	NRC Inspection of Implementation of Open Phase Detection Modifications	10/29/2019