UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

December 20, 2019

Mr. Brad Sawatzke
Chief Executive Officer
Energy Northwest
MD 1023, P.O. Box 968
Richland, WA 99352

SUBJECT: COLUMBIA GENERATING STATION – TEMPORARY INSTRUCTION 2515/194 (INSPECTION REPORT 05000397/2019013)

Dear Mr. Sawatzke:

On November 21, 2019, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Columbia Generating Station and discussed the results of this inspection with Mr. G. Hettel, Chief Nuclear Officer, 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/

Nicholas H. Taylor, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 05000397
License No. NPF-21

Enclosure:
As stated

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COLUMBIA GENERATING STATION – TEMPORARY INSTRUCTION 2515/194 (INSPECTION REPORT 05000397/2019013) – DECEMBER 20, 2019

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DATE	12/13/2019	12/20/2019	12/20/2019	12/20/2019

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number:	05000397
License Number:	NPF-21
Report Number:	05000397/2019013
Enterprise Identifier:	I-2019-013-0021
Licensee:	Energy Northwest
Facility:	Columbia Generating Station
Location:	Richland, WA
Inspection Dates:	November 18, 2019, to November 21, 2019
Inspector:	N. Okonkwo, Reactor Inspector
Approved By:	Nicholas H. Taylor, 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 2515/194 at Columbia Generating 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 Temporary Instruction (TI) in effect at the beginning of the inspection unless otherwise noted. 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 inspector 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

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)

This inspection was conducted using Temporary Instruction 2515/194 (ADAMS Accession No. ML17137A416) effective November 1, 2017, 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 open phase conditions. The inspector reviewed the licensee's implementation of Nuclear Energy Institute's voluntary industry initiative in compliance with Commission guidance. The inspector reviewed and discussed the licensee's open phase condition system design, installation, testing and maintenance plans with plant staff, and performed system walkdowns to verify that the installed equipment was supported by the design documentation.

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)

Temporary Instruction 2515/194-03.01 - Voluntary Industry Initiative (Part 1)

Energy Northwest Inc. selected the Open Phase Detection System (OPDS), designed by Columbia Generating Station, assisted by Bonneville Power Administration - Transmission Business Line (BPA-TBL) as the protection system design vendor. The design utilizes digital relays SEL-451 and SEL-735, developed and manufactured by Schweitzer Engineering Laboratories, Inc. (SEL).

During normal operations, auxiliary power for plant electrical loading is supplied by the unit's main generator through the normal unit auxiliary transformer (E-TR-N1).

Columbia Generating Station has two credited independent offsite power sources, which provide power to the 4KV safety buses, SM-7 and SM-8, through 230KV Ashe Substation connected to Startup Auxiliary Transformer E-TR-S, and the Backup offsite power from 115KV Benton substation connected to the backup startup Auxiliary Transformer E-TR-B.

E-TR-S is a 70MVA 4-winding transformer with a solidly-grounded Y connected winding on the 230KV primary, two secondary high resistance grounded Y connected windings to a 4.16KV and 6.9KV, and a third delta connected buried tertiary winding.

E-TR-B is a 14MVA 3-phase, 3-winding power transformer with grounded wye 115KV primary, embedded intermediate delta, and resistance grounded wye (4.16KV) secondary.

Columbia Generating Station installed OPDS to monitor the 230KV interconnection to E-TR-S and 115KV interconnection to E-TR-B, which are the credited offsite power sources. Two OPD relay sets were installed to provide monitoring, alarm and trip functions for each transformer. The SEL-451 relay processes alarm and trip functions while supervising the SEL-735 relay which monitors standby transformer loading. If an open phase condition is detected with transformer in standby, SEL-735 will provide output signal to SEL-451 which will initiate a main control room alarm. The design also includes local relays and annunciation in the station switchyard relay house.

At the time of the inspection, the system was installed and operating in a monitoring and alarming mode with the trip switches bypassed. The licensee enabled the trip function on December 13, 2019.

INSPECTION RESULTS

Observation: Temporary Instruction 2515/194-03.01 - Voluntary Initiative (Part 1)	2515/194

Based on discussions with licensee staff, review of design, installation, testing and preventive maintenance documentation, corrective action reports and walkdowns of installed equipment, the inspector had reasonable assurance the licensee has appropriately implemented the voluntary industry initiative.

The inspector determined by design document review, walkdowns, staff discussions, system demonstrations and observations that:

<u>For Detection, Alarms, and General Criteria</u>

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

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

(3) The SEL OPDS is designed to minimize mis-operation 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 had demonstrated that the actuation circuit design did not result in lower overall plant operation reliability.

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

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

<u>Protective Actions Criteria</u>

(1) The primary offsite interconnects to startup auxiliary transformer E-TR-S, and backup startup auxiliary transformer E-TR-B were identified as susceptible to an open phase condition and the licensee had implemented design changes to mitigate the effects.

(2) With an open phase condition present and no accident condition signal present, the SEL OPDS would not adversely affect the function of important-to-safety systems, structures, or components.

(3) With an open phase condition present and accident condition signal present, the SEL OPD system would automatically detect Open Phase Condition (OPC) and actuate a transfer of the loads required to mitigate postulated accidents to an alternate source and ensure that safety-related functions are preserved, as required by the current licensing bases.

If an OPC is detected when the onsite 4.16KV AC power is connected to the offsite power, the OPDS relay will provide alarm and trip the associated E-TR-S or E-TR-B lockout relay. In turn, the transformer lockout relay will initiate a trip of the breaker of the source that has the OPC. Sensing the subsequent undervoltage condition at the 4.16KV ESF bus, a transfer to the next available source of power in the transfer sequence will be initiated depending upon initial conditions and bus transfer design.

In summary, the 4.16KV engineered safeguards buses (SM-4, SM-7, and SM-8) are normally energized from the main generator through the normal unit auxiliary transformer (E-TR-N) and the non-engineered safeguards busses. Upon loss of the normal power source, the engineered safeguards load (SM-7 and SM-8) are automatically transferred to the selected (backup) Startup Transformer. Isolation of the Startup Transformer due to an open phase condition results in the engineered safeguards loads being automatically transferred and energized from the respective emergency diesel generator in the same manner as required by the current licensing bases.

Protective Actions Criteria Exception

At the time of this inspection, the licensee is still identifying and enhancing periodic tests, calibrations, surveillances, and inspection procedures for open phase protection system equipment. The licensee had performed a pre-inspection self-assessment and documented actions in Condition Report AR 261654. These actions included the licensee's plans to determine the open phase detection components needed to be included in the maintenance rule program, turn on the trip function, and analyze open phase condition during the 500KV back feed operation mode during refueling and maintenance.

EXIT MEETINGS AND DEBRIEFS

The inspector confirmed that proprietary information was controlled to protect from public disclosure.

- On November 21, 2019, the inspector presented the Temporary Instruction 2515/194 inspection results to Mr. G. Hettel, 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	E/I-02-16-04	Open Phase Analysis	1
		E/I-02-16-05	Open Phase Detection Scheme Settings	1
	Corrective Action Documents	Action Requests	AR-00401466, AR-00334543, AR-00318878, AR-00387320, AR-00366372, AR-00367013, AR-00368519, AR-00369054, AR-00370908, AR-00372256, AR-00376698, AR-00377987, AR-00377993, AR-00378638, AR-00382361, AR-00386440, AR-00389837, AR-00392539, AR-00396616, AR-00400385, AR-00400535, AR-00400503, AR-00310273, AR-00401326	
	Corrective Action Documents Resulting from Inspection	Action Requests	AR-00392300, AR-00401524, AR-00401525, AR-00401526 AR-00401527	
	Drawings	322496	Current Schematic Diagram 115KV OPDS Bank TRB Relay Set 1 & Set 2	1
		322497	Potential Schematic Diagram 115KV OPDS Bank TRB Relay Set 1 & Set 2	1
		322501	Communication BLK Diagram 115KV OPDS Bank TRB Relay Set 1 & 2	2
		322510	One Line Diagram 115KV OPDS Bank TRB Open Phase Detection Scheme	1
		322511	Current Schematic Diagram 230KV OPDS Bank TRS Relay Set 1 & Set 2	1
		322512	Potential Schematic Diagram 230KV OPDS Bank TRS Relay Set 1 & Set 2	1
		322525	One Line Diagram 230KV OPDS Bank TRS Open Phase Detection Scheme	1
		323725	Schematic Diagram Comm. RM 525, RK 3, PWR & Alarms 230KV Open Phase Detection	2
		323726	Schematic Diagram Comm. RM 525, RK 3, PWR & Alarms 115KV Open Phase Detection	
		E502-1	Main One Line Diagram,	61
		E502-2	Main One Line Diagram	56

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Drawings	E502-2	Main One Line Diagram	65
		E503-2A	Auxiliary One Line Diagram, E-MC-1B, E-MC-2D, E-MC-2P & E-MC-3C	25
		E503-6	Auxiliary One Line Diagram	114
		E503-9	Auxiliary One Line Diagram	91
		E507-2	Main Three Line Diagram	27
		E507-3	Main Three Line Diagram	40
		E507-4	Main Three Line Diagram, E-SM-4 HPCS Bus	24
		E512-1	Protective Relaying & Control Elementary Drawings	36
		E513-3	One Line Diagram 230 KV Line Protection, Relay Circuits	2
		E513-3A	Open Phase Detection System 230 KV Line Protection TR-S, Relay Circuits	0
		E513-4A	Open Phase Detection System 115KV Line Protection TR-B, Relay Circuits	0
		E514-11	Switchgear Under Voltage Relay Settings List	26
		E539-10A	Connection Diagram 4160 V Switchgear E-SM-4 Unit 101 Breaker E-CB-4/2 Cubicle	1
		E539-10C	Connection Diagram 4160 V Switchgear E-SM-4 Unit 102 Auxiliary Cubicle	1
		EWD-46E-044A	Electrical Wiring Diagram AC Electrical Distribution System, E-TR-B, Open Phase Detection System	1
		EWD-46E-060	Electrical Wiring Diagram Main Control Room, BOP Annunciator Engraving ANN-ANN-C/C1, -C/C2 & -C/C3	20
		EWD-46E-308	Electrical Wiring Diagram AC Electrical Distribution System, OPDS-BLDG-B, Power Panel OPDS-PP-B	2
		EWD-46E-308	Electrical Wiring Diagram AC Electrical Distribution System, OPDS-BLDG-B, Power Panel OPDS-PP-B	2
		EWD-46E-309	Electrical Wiring Diagram AC Electrical Distribution System, OPDS-BLDG-S, Power Panel OPDS-PP-S	3
		EWD-50E-003	Electrical Wiring Diagram DC Electrical Distribution System, Distribution Panel E-DP-S1/1C	11
		EWD-50E-004	Electrical Wiring Diagram DC Electrical Distribution System, Distribution Panel E-DP-S1/1C1	5
		EWD-50E-009	Electrical Wiring Diagram DC Electrical Distribution System,	13

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Drawings		Distribution Panel E-DP-S1/2B	
		EWD-50E-010	Electrical Wiring Diagram DC Electrical Distribution System, Distribution Panel E-DP-S1/2C	9
		EWD-50E-011	Electrical Wiring Diagram DC Electrical Distribution System, Distribution Panel E-DP-S1/2C1	9
		EWD-50E-019	Electrical Wiring Diagram DC Electrical Distribution System, Distribution Panel E-DP-S1/1C3	8
		EWD-50E-029	Electrical Wiring Diagram DC Electrical Distribution System, Distribution Panel E-DP-S1/7	7
	Engineering Changes	0000011331	Critical 4.16 KV Switchgear SM-4 Undervoltage Relay Enhancement	2
		0000013851	Engineering Change (EC) Open Phase Design Vulnerability (OPDV) Vulnerability (OPDV) Project Installation Design For E-TR-S	4
		0000013901	Engineering Change (EC) Open Phase Design Vulnerability (OPDV) Project Installation Design for E-TR-B	5
	Miscellaneous	1025772	EPRI Report for Analysis of Station Auxiliary Transformer Response to Open Phase Condition	6/2012
		15314	Specification for Switch yard Relay Buildings and Relay Equipment for Open Phase Detection System (OPDS) TRS & TRB	5/26/2016
		15315	Specification for OPDS HV Instrument Transformers	1
		GO2-12-152	Columbia Generating Station Docket No. 50-397 Response to NRC Bulletin 2012-01, Design Vulnerability in Electric Power System	10/25/2012
		LDCN-16-016	Implementation Open Phase Detection System	0
		Presentation	Open Phase Detection System (OPDS) at Columbia Presentation	n/a
	Procedures	10.25.119	Testing and Setting Schweitzer SEL Relays	0
		10.25.179	Flexible and Rigid Link Removal, Inspection, and Installation	12
		4-OPDS.TR-B	TR-B Open Phase Detection System (OPDS) Annunciator Panel Alarms	0
		4-OPDS.TRS	TR-S Open Phase Detection System (OPDS) Annunciator Panel Alarms	0

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Procedures	4.800.C3	800.C3 Annunciator Panel Alarms	17
		ABN-ELEC-DG4-Crosstie/MC-8A	DG4 Crosstie to MC-8A	7
		ABN-ELEC-GRID	Degraded Offsite Power Grid	11
		OSP-ELEC-W101	Offsite Station Power Alignment Check	32
		SOP-ELEC-115KV-LU	TR-B Valve, Breaker and Control Switch Lineup	4
		SOP-ELEC-230KV-LU	TR-S Valve, Breaker and Control Switch Lineup	5
		SOP-ELEC-OPDS-TRB	TR-B Open Phase Detection System (OPDS) Operation	0
		SOP-ELEC-OPDS-TRS	TR-S Open Phase Detection System (OPDS) Operation	00
		SOP-HVAC/OPDS-START	OPDS Relay Building Ventilation System Start	0
	Work Orders	02094215 70	OPDS - EC-13901 Electrical Installation	4/19/2017