

REGULATORY AUDIT IN SUPPORT OF CONFIRMATION OF A PLANTS' IMPLEMENTATION

OF NEI 19-02, "GUIDANCE FOR ASSESSING OPEN PHASE CONDITION

IMPLEMENTATION USING RISK INSIGHTS"

1.0 BACKGROUND

An Open Phase Condition (OPC) is when there is a loss of one or two of the three phases of the high-voltage side of a transformer that connects an offsite power circuit to the transmission system. An OPC can be coincident with or without a high-impedance ground fault, can originate from circuit breakers and disconnect switches poles not opening or closing, or can be the failure of transformer bushings or line insulators leading to a loss of circuit continuity. This condition can cause voltage and current imbalances in the AC electrical distribution system for both safety and non-safety related electrical systems that may be detrimental to operating equipment. Inadequate protection from an OPC may result in station blackout (SBO) conditions and challenge plant safety. Specifically, it may lead to a condition in which neither the offsite power system nor the onsite power system is able to support the safety function(s). An OPC that affects the safety function(s), if not detected and disconnected promptly, represents a design vulnerability for nuclear power plants. Operating experience in different countries has shown that the currently installed instrumentation and protective schemes have not been adequate to detect this condition and take appropriate action.

On January 30, 2012, Byron Station, Unit 2 experienced an event in which the 4.16 kV engineered safety feature buses were not energized by an operable power source for eight minutes. The event was initiated by a mechanical failure of an electrical insulator in the 345 kV switchyard. The failed insulator caused the loss of one of three electrical phases (Phase "C") supplying 345 kV offsite power to the Unit 2 station auxiliary transformers (SATs). Following the insulator failure, the reactor automatically tripped from full power and additional complications resulted from the OPC. NRC Bulletin 2012-01, "Design Vulnerability In Electric Power System" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12074A115) was issued in response to this event and contains additional details. The event demonstrated that electrical power systems of nuclear power plants have and may be adversely impacted from such an OPC design vulnerability.

As a result of this event, industry committed, through a Voluntary Industry Initiative (VII), to address OPCs. This initiative was communicated to the NRC by NEI in a letter dated October 9, 2013 (ADAMS Accession No. ML13333A147) and acknowledged in the NRC letter dated December 19, 2013 (ADAMS Accession No. ML13340329). This NEI letter further indicated that this approved initiative commits each licensee to develop a proactive plan and schedule for addressing the potential design vulnerabilities associated with OPCs. In response to the VII, industry had developed a plan for implementing a system which would automatically actuate and protect against OPC called the Open Phase Isolation System (OPIS). After a period of monitoring the use of this system, industry observed several spurious automatic actuations of OPIS. During a public meeting held on March 20, 2019, NEI indicated that the OPIS circuitry may be sensitive to electric plant transients resulting from circuit breaker switching, thus

potentially resulting in a spurious actuation that could lead to an inadvertent loss of offsite power. Therefore, NEI decided to revise the VII and create a guidance document (NEI 19-02) enabling licensees to use a risk-informed approach to implement the OPIS to provide alarm and indication to the control room operator and rely on operator action to diagnose and respond to the presence of an OPC as opposed to automatic actuation mode. The revised VII was communicated to NRC by NEI in a letter dated June 6, 2019 and NEI 19-02 was provided to the NRC on June 20, 2019. NEI indicated to the NRC on June 28, 2019 that (Ginna, Nine Mile Point) is planning to implement the risk-informed approach discussed above. As a result, the NRC is conducting this audit to verify that the selected plant has appropriately implemented the guidance in NEI 19-02 and to verify that implementation of NEI 19-02 is an appropriate alternate approach to implement the revised VII.

The objectives of this regulatory audit are to:

- Identify how the methodology described in NEI 19-02 was implemented;
- Identify how the PRA model used in the assessment was updated, and that this update meets accepted PRA standards; and
- Identify the training conducted and procedures required to address OPC to help verify the Human Reliability Analysis (HRA) and plant configuration described in the licensees' assessment and PRA model.

2.0 REGULATORY AUDIT BASIS

The Commission directed the staff in SRM-SECY-16-0068 to "verify that licensees have appropriately implemented the voluntary industry initiative." Industry has since revised the VII and created the guidance document NEI 19-02 to enable licensees to use a risk-informed approach to implement the OPIS to provide alarm and indication to the control room operator and rely on operator action to diagnose and respond to the presence of an OPC as opposed to automatic actuation mode. The basis for this audit is to verify that the selected plants have appropriately implemented the guidance in NEI 19-02 and the revised VII, per the Commission's direction.

3.0 REGULATORY AUDIT SCOPE OR METHOD

The team will review the resulting documentation from implementing NEI 19-02 (i.e., the filled in template specified in Appendix A (Analysis File Template) of NEI 19-02). The team will also review the changes to the licensees' PRA model made because of the implementation of NEI 19-02. In addition, the audit team will review the training conducted and procedures required to address OPC, to help verify the HRA and plant configuration described in the licensees' assessment and PRA model.

4.0 INFORMATION AND OTHER MATERIAL NECESSARY FOR THE AUDIT

The NRC audit team will require access to personnel knowledgeable regarding the implementation of NEI 19-02, the resulting PRA model changes made as a result of this implementation, and the training and procedure changes made regarding OPC. The NRC audit team will need access to hardcopies and/or electronic copies of the following documentation:

- The resulting documentation from implementing NEI 19-02 (i.e., the filled in template specified in Appendix A of NEI 19-02);
- Changes to the licensees' PRA model made because of the NEI 19-02 implementation;
- Any procedures related to the operator actions required to address an OPC; and
- Any documentation of the training conducted to address an OPC.

5.0 **TEAM ASSIGNMENTS**

The audit will be conducted by NRC staff from the Office of Nuclear Reactor Regulation Division of Risk Assessment (DRA). NRC staff from other organizations may be assigned to the team as appropriate and others may participate as observers.

The NRC Audit Team Leader will be Alexander Schwab. The audit team leader will conduct daily briefings on the status of the review and coordinate audit activities while on site. The tables below show (1) audit milestones and schedule, and (2) planned audit team composition and their assigned areas for review during the audit.

Audit Milestones and Schedule		
Activity	Time Frame	Comments
Audit Scheduling/Clarification Call	tbd	Teleconference to provide clarification of audit questions.
Onsite Audit Kick-Off Meeting	tbd	NRC will present a brief team introduction and discuss the scope of the audit. The licensee representatives should introduce team members and give logistics for the week.
End of Day Summary Briefing	tbd	Meet with licensee representatives to provide a summary of any significant audit results
Provide Break-out Areas	tbd	Facilitate discussion between licensee representatives and NRC staff.
Onsite Audit Exit Meeting	tbd	NRC staff will hold a brief exit meeting, with licensee staff to conclude audit activities.
Audit Summary	90 days after exit	To document the audit.

	Assigned Area	Lead
1	Review licensee documentation resulting from implementing NEI 19-02	A. Schwab
2	Review changes to the licensees' PRA model made as a result of the implementation of NEI 19-02	A. Schwab
3	Review procedures related to the actions required to address an OPC	A. Schwab
4	Review documentation of the training conducted to address an OPC	A. Schwab

6.0 LOGISTICS

This regulatory audit is planned for the week of **Early Fall, 2019**, and will last approximately **3 days**. A conference call will be scheduled one to two weeks prior to the audit to discuss the details of the audit plan. The dates in the milestone chart are subject to change based on agreement between the licensee and the NRC. An entrance meeting for this audit will be held the first day at **9:00 AM** and an exit meeting will be held the final audit day at **12:00 noon or based on a mutually agreed upon time after receipt of this audit plan**. The NRC audit team leader will provide daily progress to licensee personnel on the second day of the audit.

The audit will take place at a location agreed upon by the licensee and NRC audit leader where (1) the necessary reference material and (2) appropriate analysts will be available to support the review. Visitor access will be requested for the entire audit team. We recommend that security paperwork and processing be handled upon arrival on the first day of the audit week.

7.0 SPECIAL REQUESTS

The regulatory audit team will require the following to support the regulatory audit:

- Visitor access will be needed for all team members participating in the audit.
- Phone line with teleconference capabilities
- Two computers with internet access and printing capability in the NRC room and wired or wireless internet access.
- Private conference room should be made available.

8.0 DELIVERABLES

A regulatory audit summary will be issued within approximately 90 days after the completion of the audit. The summary will use the guidance of NRR Office Instruction LIC-111 for content. The audit summary will be placed ADAMS.

DRAFT