FRANCES PIMENTEL
Senior Project Manager,
Risk and Technical Support

1201 F Street, NW, Suite 1100
Washington, DC 20004
P: 202.739.8132
fap@nei.org
nei.org

NUCLEAR ENERGY INSTITUTE

October 16, 2017

Ms. Anne T. Boland
Director, Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Industry Comments on the Proposed Director's Decision for the Open Phase Condition 2.206 Petition. (ML17156A214)

Project Number: 689

Dear Ms. Boland:

The Nuclear Energy Institute (NEI)[1], on behalf of the industry, appreciates the opportunity to provide industry comments on the Proposed Director's Decision for the open phase condition (OPC) 2.206 petition (ML17156A214).

We understand that in accordance with NRC Management Directive 8.11, "Review Process for 10 CFR 2.206 Petitions," the petitioners and appropriate NRC licensees may provide comments on the Proposed Director's Decision. Following a review of comments received, the NRC will consider them and issue a Final Director's Decision with no further opportunity for comment. The industry agrees with the Director's proposed decision to deny the petition. The comments provided herein are intended to promote better alignment between staff and the industry regarding implementation of the NEI OPC voluntary industry initiative (VII)[2].

The VII was developed by the industry as an aggressive action to ensure that an OPC will not prevent the functioning of important-to-safety structures, systems and components at nuclear power plants. As discussed in the VII, an open phase condition is defined as an open phase, with or without a ground, that is located on the high voltage side of a transformer connecting a General Design Criterion (GDC) 17 off-site power circuit to the transmission system. The industry committed to implement OPC solutions that address the objectives and criteria in the VII by the end of 2018.

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.
[2] Nuclear Energy Institute (NEI) Open Phase Condition Initiative (VII), Revision 1, dated March 16, 2015 (ML15075A455, ML15075A456).

The references to 10CFR50.55a(h)(2) and 10CFR50.55a(h)(3) found in Section C, "Applicable NRC Regulatory Requirements and Guidance," of the Proposed Director's Decision are of particular concern to the industry. This section appears to set expectations that designs to address the OPC vulnerability should meet Institute of Electrical and Electronic Engineers (IEEE) Class 1E requirements, which apply only to safety-related structures, systems, and components. The majority of stations are implementing, or have already implemented, Non-1E (non-safety related) OPC modifications, in accordance with the VII. In our view, it is inappropriate to apply IEEE Standard (Std.) 279, "Criteria for Protections Systems for Nuclear Power Generating Systems," or IEEE Std. 603, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," to an Open Phase Isolation System (OPIS) installed on a Non-Class 1E circuit, because such systems do not scram or trip the reactor, or actuate an engineered safety feature. Furthermore, it is not necessary to apply IEEE Std. 279 or IEEE Std. 603 to OPC detection and actuation systems installed on Non-Class 1E circuits in order to achieve an acceptable level of safety. The approach provided in the VII effectively addresses the vulnerability to OPC events without OPC design compliance to 10 CFR 50.55a(h)(2) and (3). Accordingly, the references to 10CFR50.55a(h)(2) and 10CFR50.55a(h)(3), along with IEEE Std. 279 and IEEE Std. 603 as applied to the OPIS, should be removed from this section.

The attached table contains additional, specific comments and recommendations for your consideration in finalizing the Director's Decision. Below are examples where information in the Proposed Director's Decision appears to be inaccurate or inappropriate and are illustrative of the concerns provided in the attached table:

1. The description of the Oconee event inaccurately describes the interim corrective actions implemented at Oconee, which were successful in discovering the open phase condition and in prompting appropriate responses. The interim corrective actions were put in place to allow adequate time for each station to assess specific vulnerabilities and to address them to the appropriate level. Modifications are not complete; therefore automatic alarms in the main control room should not have been expected.

2. Equating a design basis event to a loss of offsite power in the case of an open phase condition is incorrect due to the fact that disconnection of faulted offsite power circuits *is the protective action*. Generally loss of offsite power is considered loss of the grid, and subsequent reliance on the standby power sources. An open phase is a fault that requires the upstream breaker to be opened to isolate the fault from onsite circuits.

An additional concern is that the Proposed Director's Decision discusses a white paper prepared by the NRC that provides a risk assessment of the impact of a postulated loss of a single phase in a three-phase high voltage offsite power circuit[3]. The risk assessment supported the proposition that the original, as-discovered electrical configuration of nuclear power plants was susceptible to an OPC, and has the potential to be risk significant.

[3] Preliminary Risk Estimate on the Impact of Open Phase Condition (OPC), dated May 16, 2017 (ML17234A631).

An industry evaluation of the NRC's white paper risk assessment providing the basis for the potential risk characterization identified there are areas of conservatism in the model that could be refined to improve realism in the NRC assessment. For example, the potential increase in risk is overestimated by a factor of 16 to 1,600 depending on the specific plant configuration. Accounting for recent unrelated plant modifications at some plants, the overall core damage frequency and associated potential impact of an OPC on risk have been significantly reduced. Also, the benefit associated with the installation of OPIS is overstated for some facilities. Most plants have two different transformer/voltage regulator paths to the safety related buses. For these plants, an OPC would only impact a single train. Plants with redundant, non-safety related power paths would require a common mode OPC event. This would further lower the risk for those plants. In addition, operator training and awareness of the potential for an OPC contributes to the reduction in risk with or without installation of an OPIS. In summary, the conclusion that the OPIS greatly reduces the vulnerability to an OPC should be tempered given the above observations.

We appreciate the opportunity to comment on the Proposed Director's Decision for the OPC 2.206 petition. If you have any questions concerning the contents of this letter and the attached table, please contact Steve Geier (202-739-8111; seg@nei.org) or me (202-739-8132; fap@nei.org).

Sincerely,

Frances Pimentel

Attachment

c: John Lubinski, NRR/DE
Jessie Quichocho, NRR/DE/EEOB

NEI/Industry Comments on NRC Proposed Director's Decision for the Open Phase Condition 2.206 Petition

Item	Page / Section	Proposed Director's Decision Wording	Comment	Suggested Resolution
1	Pg. 6 / Sect. II.B	"The NRC also communicated functional criteria for demonstrating compliance with existing regulatory requirements."	The NRC provided a letter to NEI containing the four functional requirements for demonstrating compliance with existing regulatory requirements.	Re-word to, 'The NRC communicated four functional criteria for demonstrating compliance with existing regulatory requirements in a letter to NEI"
2	Pg. 9 / Sect. II.C	"Applicable NRC Regulatory Requirements and Guidance." Continued reference to 10CFR50.55a(h)(2) and (3)	10CFR50.55a(h)(2) and (3) is listed under the header of "Applicable NRC Regulatory Requirements and Guidance." This section appears to set expectations that designs to address the OPC vulnerability should meet IEEE Class 1E requirements, which apply only to safety-related structures, systems, and components. The majority of stations are implementing Non-1E (non-safety related) OPC modifications, in accordance with the VII. In our view, it is inappropriate to apply IEEE Standard Std. 279, or IEEE Std. 603, to an Open Phase Isolation System (OPIS) installed on a Non-Class 1E circuit, because such systems do not scram or trip the reactor, or actuate an engineered safety feature	References to 10CFR50.55a(h)(2) and 10CFR50.55a(h)(3), along with IEEE Std. 279 and IEEE Std. 603 should be removed from this section
3	Pg. 9 / Sect. II.C	"Applicable NRC Regulatory Requirements and Guidance."	Open phase events and design basis events are independent and should not be considered simultaneously. This type of review has already been documented in	Clarify independence of events in the document.

Item	Page / Section	Proposed Director's Decision Wording	Comment	Suggested Resolution
			GSI-171 and clarification of independence of events should be clearly stated.	
4	Pg. 11 / Sect. II.D	Description of the Oconee event.	Bulletin response stated open phase was not part of their original design and licensing basis. Modifications are not complete at this time; therefore automatic alarms in the MCR should not have been expected.	Add to the Oconee event description that open phase was not part of Oconee's original design and licensing basis; therefore, automatic alarms in the MCR should not have been expected.
5	Pg. 11, Last Paragraph (in regards to Oconee event) / Sect. II.D	"The NRC inspectors determined that interim compensatory measures were in place at the facility at the time of the event and that the open phase condition was identified during a routine walk-down surveillance, not from automatic alarms in the control room as expected by the licensee." "The inspectors noted in the inspection report that when the startup transformer is not supplying the plant buses, there is not enough current flow for the installed relays to detect an open phase condition. The fact that operators failed to receive alarms in the control room intended to alert them of an open phase condition during the December 7, 2015, event at Oconee	The Oconee Bulletin 2012-01 Response (ML12300A426) provided the following information for Question 1: "In both voltage monitoring schemes, 230kV and 4160V, there are control room indications provided for a single phase condition (open circuit). The control room would receive annunciators and computer points of an under voltage condition on that phase, but no automatic trip would be initiated. The control room operators would respond per the appropriate Alarm Response Guide. See Attachment 3 Table 6 for associated alarms. However, in certain cases it is not known if the loss of phase would be detected by the current relaying protection schemes to give control room indication. In general, there will be no plant	It should be noted that the interim corrective actions implemented at Oconee were successful in discovering the open phase which prompted appropriate responses. The interim corrective actions were put in place to allow adequate time for each station to assess specific vulnerabilities and to address them to the level appropriate. The results of these assessments will determine to what degree additional modifications are required. ".....The fact that operators failed to receive alarms in the control room intended to alert them of an open phase condition during the December 7, 2015, event at Oconee highlights the need to assess potential vulnerabilities in order to respond and/or implement modifications

Item	Page / Section	Proposed Director's Decision Wording	Comment	Suggested Resolution
		highlights the importance of implementing permanent design changes at all affected facilities."	response for an unloaded (e.g., ESF buses normally aligned to unit auxiliary transformer) power source in the event of a single-phase open circuit on a credited off-site power circuit because there is insufficient current to detect a single-phase open circuit for this configuration." The Oconee Bulletin 2012-01 RAI Response (ML14035A453) provided the following information for Response 1: "2. ONS Operations personnel perform daily rounds of the switchyards. This is a general observation performed on the equipment to note any out of normal conditions and take appropriate actions. The daily switchyard rounds procedure was revised to incorporate specific points to look for areas of degraded off site power vulnerabilities." As predicted in the Bulletin Response, control room alarms were not received due to the lack of current available due to the source being unloaded at the time of the event. In addition, The RAI response provided an interim corrective action for Operations staff to perform daily	accordingly per the NEI Initiative."

Item	Page / Section	Proposed Director's Decision Wording	Comment	Suggested Resolution
			switchyard rounds which proved to be the method of discovery. The interim corrective actions in their entirety were put in place to allow adequate time for each station to assess specific vulnerabilities and to address them to the level appropriate. The results of these assessments will determine to what degree additional modifications are required.	
6	Pg. 12 / Sect. II.D	"The events that occurred at Byron Station, Unit 2, and Oconee Nuclear Station are considered by the NRC to be safety significant because the occurrence of the open phase condition either resulted or could have resulted in a design basis event (i.e., loss of offsite power),…."	Equating a design basis event to a loss of offsite power in the case of an OPC is incorrect due to the fact that disconnection of faulted offsite power circuits *is the protective action*. Generally loss of offsite power is considered loss of the grid, and subsequent reliance on the standby power sources. An open phase is a fault that requires the upstream breaker to be opened to isolate the fault from onsite circuits.	Detail actual safety significance basis rather than the protective action.

Item	Page / Section	Proposed Director's Decision Wording	Comment	Suggested Resolution
7	Pg. 12 / Sect. II.D	Paragraph starting with, "The importance of implementing permanent design changes at all affected facilities is further supported by information in a white paper….," and the remaining discussion about the white papers insights.	Excessive conservatisms were included in the risk analysis. Actual risk has already been presented and discussed in public meetings. NRC representatives indicated that this overly conservative analysis was only to be used for the methodology to determine real plant risks.	Remove specific risk values in the letter.
8	Pg. 13 / Sect. II.D	"Based on risk insights derived from the assessment, the NRC staff concluded that the use of visual inspection rounds in switchyard areas alone will have minimal benefit for decreasing the impact of open phases. However, the use of a detection system and/or automatic actuation system (i.e., OPIS) would greatly reduce this vulnerability."	Use of visual inspection in conjunction with maintenance intervals is the standard method for ensuring many of the components in the PPS has the capability to allow current to flow to the safety related components.	Remove the inconsistent reference to automatic detection of the event.