

## Vogle PEmails

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**From:** Hoellman, Jordan  
**Sent:** Monday, February 4, 2019 1:44 PM  
**To:** Vogle PEmails  
**Subject:** FW: RE: Questions on Open Phase Commitment Extension  
**Attachments:** SNC response to NRC Questions on Open Phase Commitment Change.pdf

Attached are SNC written responses to NRC questions on the open phase commitment change, to be discussed at a future public meeting.

Jordan Hoellman

*Project Manager*

*NRO / DLSE / LB2*

*U.S. Nuclear Regulatory Commission*

*office: OWFN 08-C18*

*phone: (301) 415-5481*

*email: [Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)*

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**From:** Leighty, Steven [mailto:[sleighty@southernco.COM](mailto:sleighty@southernco.COM)]  
**Sent:** Monday, February 04, 2019 10:51 AM  
**To:** Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>  
**Cc:** Roberts, Kelli Anne <[KROBERTS@southernco.com](mailto:KROBERTS@southernco.com)>; Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>  
**Subject:** [External\_Sender] RE: Questions on Open Phase Commitment Extension

Jordan,

Attached are SNC written responses to the questions provided on the open phase commitment change. We are prepared to discuss the responses on the public call this week, 2/7 if the staff is available.

Thanks,

*Steve Leighty*

Licensing Supervisor (Acting), Vogtle 3&4

Southern Nuclear

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Waynesboro, GA 30830

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----- Original Message -----

Subject: FW: Questions on Open Phase Commitment Extension

From: "Hoellman, Jordan" <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>

Date: Dec 3, 2018, 7:25 AM

To: "Roberts, Kelli Anne" <[KROBERTS@southernco.com](mailto:KROBERTS@southernco.com)>

Hi Kelli,

Please see our comments below for the open phase discussion.

Let us know when you can support a discussion at a public meeting.

Thanks,

Jordan

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**From:** Ray, Sheila

**Sent:** Friday, November 30, 2018 3:20 PM

**To:** Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>; Martinez Navedo, Tania <[Tania.MartinezNavedo@nrc.gov](mailto:Tania.MartinezNavedo@nrc.gov)>

**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>

**Subject:** RE: Questions on Open Phase Commitment Extension

Jordan,

Please see below for EENB comments for the open phase discussion that can be passed on to the licensee.

Please discuss the technical rationale for moving the implementation of the OPC commitment to before the end of the second refueling outage. Staff understands that Vogtle 1&2 will implement open phase detection and alarm by the end of 2018. In addition, staff understands that Vogtle 3 shares a 230/500 kV switchyard with Vogtle 1&2, and Vogtle 4 is connected to a 500kV switchyard. Given the above, staff is unclear what information is needed before implementing the open phase detection and alarm. Please discuss if there is data being gathered during operation before implementing the open phase detection and alarm.

We can support a public meeting in first quarter of 2019 or earlier.

If there are any questions, please let me know.

Thanks.

Sheila

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**From:** Hoellman, Jordan

**Sent:** Wednesday, November 14, 2018 7:07 AM

**To:** Martinez Navedo, Tania <[Tania.MartinezNavedo@nrc.gov](mailto:Tania.MartinezNavedo@nrc.gov)>

**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>; Ray, Sheila <[Sheila.Ray@nrc.gov](mailto:Sheila.Ray@nrc.gov)>

**Subject:** RE: Questions on Open Phase Commitment Extension

Thanks, Tania! FYI, SNC informed me that they'd like to target this discussion at a public meeting in the first quarter of 2019.

Thanks again,

Jordan

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**From:** Martinez Navedo, Tania

**Sent:** Tuesday, November 13, 2018 4:59 PM

**To:** Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>  
**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>; Ray, Sheila <[Sheila.Ray@nrc.gov](mailto:Sheila.Ray@nrc.gov)>  
**Subject:** RE: Questions on Open Phase Commitment Extension

Jordan,

Yes, EENB is the lead branch for this. I will have my staff draft a list of questions and we will coordinate with you.

Thanks,  
Tania

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**From:** Hoellman, Jordan  
**Sent:** Tuesday, November 13, 2018 4:29 PM  
**To:** Martinez Navedo, Tania <[Tania.MartinezNavedo@nrc.gov](mailto:Tania.MartinezNavedo@nrc.gov)>  
**Cc:** Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>  
**Subject:** FW: Questions on Open Phase Commitment Extension

Hi Tania,

Is your branch working on this? I'm not that familiar, but it looks like SNC would like a list of comments/questions that they could prepare to discuss in a future public meeting.

Please let us know if you have any questions.

Thanks,  
Jordan

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**From:** Roberts, Kelli Anne <[KROBERTS@southernco.com](mailto:KROBERTS@southernco.com)>  
**Sent:** Tuesday, November 13, 2018 3:24 PM  
**To:** Hoellman, Jordan <[Jordan.Hoellman2@nrc.gov](mailto:Jordan.Hoellman2@nrc.gov)>; Patel, Chandu <[Chandu.Patel@nrc.gov](mailto:Chandu.Patel@nrc.gov)>  
**Subject:** [External\_Sender] Questions on Open Phase Commitment Extension

Jordan/Chandu,

During the 4Q18 LARM, Rob indicated that the electrical branch staff have questions related to our recent extension of open phase regulatory commitments (reference ML18242A012). We took the action to setup a public call to discuss these.

Can you please identify what questions staff have so that we can prepare for this public meeting? Once we get those questions, we'll identify right participants and let you know what their availability is to support a discussion during one of the Thursday public calls.

Thanks!

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**Kelli Roberts | Southern Nuclear Operating Company**  
Vogtle 3&4 Licensing Supervisor

**Hearing Identifier:** Vogtle\_COL\_Docs\_Public  
**Email Number:** 414

**Mail Envelope Properties** (SN6PR0901MB2366AD2415CEB6E3F09D1F82D56D0)

**Subject:** FW: RE: Questions on Open Phase Commitment Extension  
**Sent Date:** 2/4/2019 1:44:18 PM  
**Received Date:** 2/4/2019 1:44:27 PM  
**From:** Hoellman, Jordan

**Created By:** Jordan.Hoellman2@nrc.gov

**Recipients:**  
"Vogtle PEmails" <Vogtle.PEmails@nrc.gov>  
Tracking Status: None

**Post Office:** SN6PR0901MB2366.namprd09.prod.outlook.com

Files	Size	Date & Time	
MESSAGE	5616	2/4/2019 1:44:27 PM	
image001.gif	2074		
SNC response to NRC Questions on Open Phase Commitment Change.pdf			243027

**Options**  
**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**



## Response to NRC Questions Regarding SNC's Supplemental Response to Bulletin 2012-01, Design Vulnerability in Electric Power System

### Background

On August 29, 2018, Southern Nuclear Operating Company (SNC) submitted a Supplemental Response to NRC Bulletin 2012-01, Design Vulnerability in Electric Power System (ADAMS Accession No. ML18242A012). The purpose of the supplement was to notify the NRC that SNC was revising the commitment dates for completion of *Open Phase Condition* analysis and modifications to detect an open phase condition at Vogtle Units 3 and 4 (V3&4).

SNC evaluated the commitment changes in accordance with the Nuclear Energy Institute guidance document NEI 99-04, "Guidelines for Managing NRC Commitment Changes" and determined that the (approximate) 36-month delay in implementing the actions to address the open phase condition was not significant to safety.

On December 3, 2018, the NRC provided SNC with questions<sup>1</sup> regarding the extension of due dates for OPC commitments. This document provides SNC's response to those questions and is being provided in advance to facilitate understanding prior to meeting with the staff.

### NRC Questions

*"Please discuss the technical rationale for moving the implementation of the OPC [Open Phase Condition] commitment to before the end of the second refueling outage. Staff understands that Vogtle 1&2 will implement open phase detection and alarm by the end of 2018. In addition, staff understands that Vogtle 3 shares a 230/500 kV switchyard with Vogtle 1&2, and Vogtle 4 is connected to a 500kV switchyard. Given the above, staff is unclear what information is needed before implementing the open phase detection and alarm. Please discuss if there is data being gathered during operation before implementing the open phase detection and alarm."*

### SNC Responses

*Q1. Discuss the technical rationale for moving the implementation of the OPC commitment to before the end of the second refueling outage.*

SNC originally committed to complete the analysis and modifications to detect an OPC at **V3&4** by the end of each Unit's second maintenance/refueling outage (ADAMS Accession No. ML15030A357). In that response, SNC clarified how the Open Phase event is not a safety concern for the **AP1000** design. However, SNC recognized that the open phase conditions were significant industry events, and as such, SNC would perform the necessary analysis and implement any subsequent modifications to ensure that operations personnel can adequately detect an open phase condition and that the detection should alarm in the main control room.

SNC responsive submittals dated August 10, 2012 (ML12226A399), October 25, 2012 (ML12305A039), February 14, 2014 (ML14045A305), January 29, 2015 (ML15030A357) and July 22, 2015 (ML15226A058) provided detailed analyses of the OPC as it relates to the **AP1000** design.

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<sup>1</sup> Email from Jordan Hoellman to Kelli Roberts, Dec 3, 2018, Subject: FW: Questions on Open Phase Commitment Extension.

## Response to NRC Questions Regarding SNC's Supplemental Response to Bulletin 2012-01, Design Vulnerability in Electric Power System

In summary, the responses describe how:

- offsite power has no safety-related function due to the passive design of the **AP1000**.
- the **AP1000** design has a partial exemption from GDC 17 for AC Offsite Power sources due to passive safety features of the **AP1000** design that do not rely on power from the offsite system to accomplish safety-related functions.
- all onsite ac power distribution connected directly to the grid, including the standby diesel backed buses ES1 and ES2, is classified as non-1 E, nonsafety-related on the **AP1000** design (i.e., no safety-related ac from the grid).
- the **AP1000** design does not transfer house loads to the standby Diesel Generators. The onsite standby power system only powers certain designated defense-in-depth nonsafety-related loads.

In addition to the previously described design features, specific **V3&4** features also reduce susceptibility to OPC occurrences. The transmission system connections to the main step up (MSU) transformers are new, which minimizes the likelihood of fatigue related failure during the period of time from startup to the second refueling outage. Similarly, transmission lines have been constructed to modern standards using the latest products and materials, tools and construction techniques. These connections are more robust than transmission system designs from the previous generations of plants (circa 1975). For example:

- Individual phase 5-inch, Schedule 80 Aluminum tubular bus work is routed atop 40-foot stanchions from the transmission line dead-end structure to each phase of the MSU Transformers.
- Short jumpers connect the transmission line and each MSU phase bushing to the tubular conductors routed between. Due to short length, jumper connections are not subject to appreciable strain.
- The solid tubular bus work between the dead-end structure and MSU phases are not credibly subject to open phase by a broken connection.
- Twin conductor bundled transmission lines connect to strain/suspension insulators on the dead-end structure.

Regarding transmission system reliability, Georgia Power Transmission personnel conduct thermographic inspections of all switchyard connections every six months. Hotspots indicative of loose connections are repaired and monitored at a more frequent periodicity to confirm repairs were effective.

Primary and backup multifunction microprocessor-based relays provide protection for the MSU Transformers. Current transformers (CT) on the high side of each MSU phase detect current imbalance from high or low impedance faults that would occur with postulated open phase conditions. The relays would respond to such CT imbalance and isolate the MSUs under all but lightly loaded conditions. The MSUs will only be lightly loaded during outage conditions when supplying non-safety related plant AC distribution via back-feed from the transmission switchyard.

**Response to NRC Questions Regarding SNC's Supplemental Response to  
Bulletin 2012-01, Design Vulnerability in Electric Power System**

Supply feeds to 6.9kV medium voltage buses have three phase voltage sensing and protection. In the event of an OPC under lightly loaded condition, the loss of phase voltage will actuate alarms and protective action will isolate the 6.9kV buses from the preferred offsite MSU source.

Medium voltage breakers to non-safety, defense in depth motor loads (e.g., service water, component cooling water, central chilled water systems) are provided with negative sequence current protection. Therefore, alarms will be generated for large motors in operation under light load and a postulated OPC. The motors will trip if negative sequence conditions persist before damage is expected.

In addition to negative sequence protection for large motors, unbalanced voltage from OPC will result in automatic isolation of chargers supplying Class 1E batteries. Such occurrences will alarm in the MCR.

Training and alarm procedure guidance will provide Operations Personnel with the means to recognize an OPC from the above symptoms and take appropriate action.

*Q2. Since Vogtle 1&2 will implement open phase detection and alarm by the end of 2018 and Vogtle 3 shares a 230/500 kV switchyard with Vogtle 1&2, and Vogtle 4 is connected to a 500kV switchyard, what information is needed before implementing the open phase detection and alarm. Is data being gathered during operation before implementing the open phase detection and alarm*

With regard to shared features of the Vogtle switchyard, the existing Vogtle 1 and 2 switchyard consists of a 230kV section and 500kV section. The sections are connected by 230/500kV autotransformers. Unit 1 output is connected to the 230kV section and Unit 2 output is connected to the 500kV section. Both Unit 1 and 2 GDC 17 offsite power sources are supplied from the 230kV section.

Unit 3 output will be connected to the 230kV section of the existing switchyard. Unit 4 output will be connected to a new 500kV switchyard. The new 500kV switchyard is connected to the 500kV section of the existing switchyard by overhead tie lines. The tie line connections effectively make the new switchyard an extension of the 500kV section of the existing switchyard. Refer to Vogtle 3 and 4 UFSAR Figure 8.2-201 (below).

The request to revert the commitment completion date back to the end of each Unit's second maintenance/refueling outage was not solely based on a need to collect information. Vogtle Units 3 and 4 are still under construction, and as such, there is no switchyard data to collect. SNC concluded that it would be prudent to observe industry initiatives and lessons learned and to have some period of operation wherein station performance could be assessed, prior to performing detailed analyses of the effects of an OPC on the **AP1000** design.



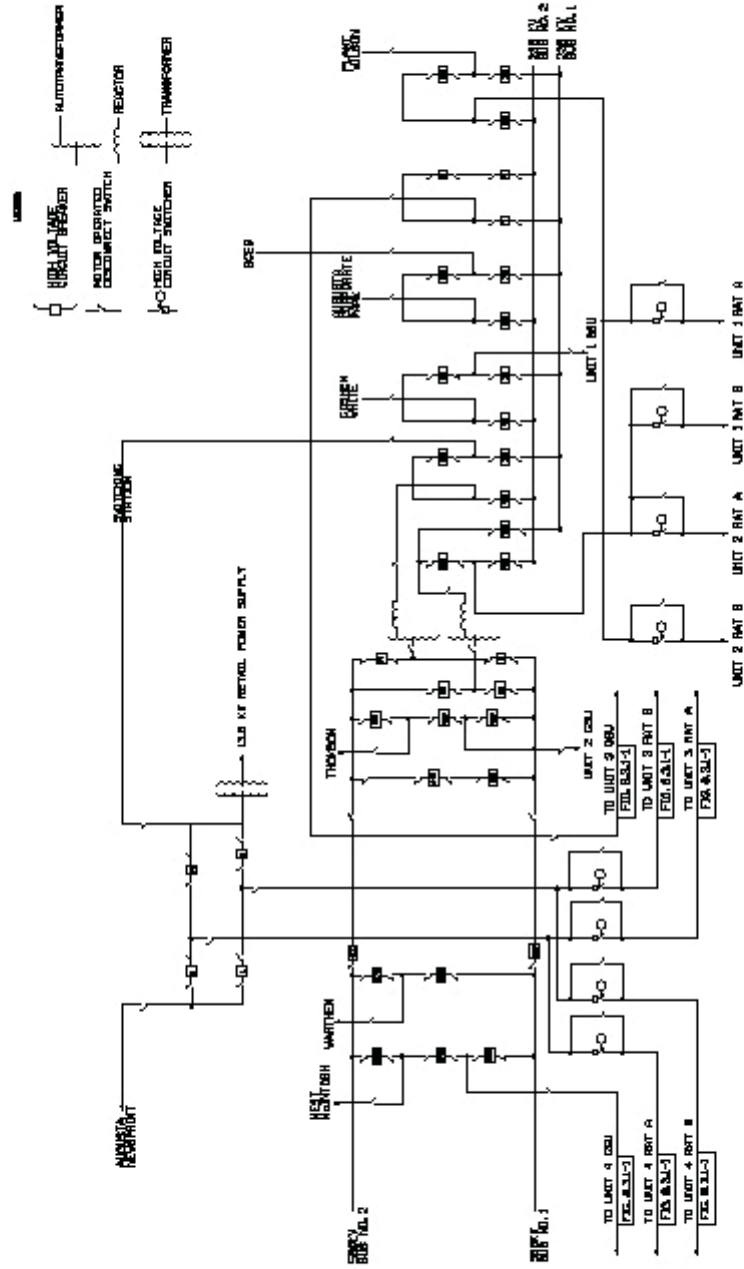


Figure 8.2-201  
Offsite Power System One-Line Diagram