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U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant
Edwin I. Hatch Nuclear Plant
Vogtle Electric Generating Plant
NRC Bulletin 2012-01 – Design Vulnerability in Electric Power System
Response to NRC Request for Additional Information

Ladies and Gentlemen:

On July 27, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Bulletin 2012-01, "Design Vulnerability in Electric Power System" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12074A115), to all holders of operating licenses for nuclear power reactors. Bulletin 2012-01 requested information about each facility's electric power system design and the ability to identify and respond to the loss of one of three phases of the offsite power circuit.

NRC letter dated December 20, 2013 (ADAMS Accession No. ML13351A314), requested Southern Nuclear Operating Company (SNC) to provide additional information necessary to allow NRC staff to complete its review of its response to the bulletin. Accordingly, the additional information requested by the NRC is provided in Enclosures 1, 2, and 3 for the Edwin I. Hatch Nuclear Plant (Hatch), Joseph M. Farley Nuclear Plant (Farley), and the Vogtle Electric Generating Plant (Vogtle), respectively.

During preparation of the RAI response, SNC identified an error in its October 25, 2012, response to Bulletin 2012-01 related to Farley (SNC Letter NL-12-2037). In response to Issue 2, System Protection, Item d., SNC mistakenly stated that ESF bus voltages on all three phases were taken twice per shift at Farley when in fact, the bus voltages are read twice per day. SNC regrets this error and has entered it into its corrective action program to preclude recurrence.

This letter contains no NRC commitments.

Mr. D. R. Madison states he is Fleet Operations Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

Mr. D. R. Madison
Fleet Operations Vice President

Sworn to and subscribed before me this 3rd *day of* February, *2014.*

Nancy Louise Henderson
Notary Public

My commission expires: March 23, 2014

DRM/TWS/lac

Enclosures:
1. Edwin I. Hatch Nuclear Plant – Response to NRC Request for Additional Information
2. Joseph M. Farley Nuclear Plant – Response to NRC Request for Additional Information
3. Vogtle Electric Generating Plant – Response to NRC Request for Additional Information

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Ms. C. A. Gayheart, Vice President – Farley
Mr. D. R. Vineyard, Vice President – Hatch
Mr. T. E. Tynan, Vice President – Vogtle 1 & 2
Mr. B. L. Ivey, Vice President – Regulatory Affairs
Mr. C. R. Pierce, Director – Regulatory Affairs
RType: CFA04.054; CHA02.004; CVC7000

U. S. Nuclear Regulatory Commission
Mr. V. M. McCree, Regional Administrator
Mr. R. E. Martin, NRR Project Manager – Hatch; Vogtle
Mr. E. D. Morris, Senior Resident Inspector – Hatch
Mr. L. M. Cain, Senior Resident Inspector – Vogtle
Mr. P. K. Niebaum, Senior Resident Inspector – Farley
Mr. G. E. Miller, NRR Project Manager - Farley

Alabama Department of Public Health
Dr. D. E. Williamson, State Health Officer

State of Georgia
Mr. J. H. Turner, Environmental Director Protection Division

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Enclosure 1

Edwin I. Hatch Nuclear Plant
Response to NRC Request for Additional Information

ENCLOSURE 1

Edwin I. Hatch Nuclear Plant Response to NRC Request for Additional Information

By letter dated December 20, 2013, the NRC requested Southern Nuclear Operating Company (SNC) to provide additional information necessary to allow NRC staff to complete its review of SNC's response to the bulletin. The following restates the NRC requested information, as provided to SNC, followed by the Hatch response to each.

NRC Request 1:

Provide a summary of all interim corrective actions that have been taken since the January 30, 2012, event at Byron Station, Unit 2, to ensure that plant operators can promptly diagnose and respond to open phase conditions on the offsite power circuits for Class-1E vital buses until permanent corrective actions are completed.

Hatch Response:

Lessons learned from the events at the Byron station were reviewed and various interim corrective actions evaluated for safety and efficiency. Based on the plant's offsite power configuration, electrical design details, and lessons learned, the following actions were taken to ensure plant operators can promptly diagnose and respond to an open phase condition (OPC) until permanent corrective actions are completed.

A. SNC provided the following technical guidance to Hatch for incorporation into operating procedures as indications of a potential open phase event and to aid plant operators in promptly diagnosing and responding to an open phase event:

- running loads tripping for no apparent reason;
- inability to start motors;
- increase in current (e.g., 170% of normal) in two phases with decreased or loss of current in one phase;
- fluctuating voltages; and
- degraded grid alarm with normal 230kV system voltage.

B. SNC performed a switchyard inspection to assess the condition of the switchyard feeds to the plant's Class 1E buses and to identify switchyard bus supports and connections vulnerable to an open phase condition. These inspections focused primarily on identification of insulators subjected to lateral loads that could lead to a greater risk of failure. These inspections did not identify any insulators subjected to lateral loads.

C. Equipment records for Hatch were reviewed to determine if Ohio Brass insulators are currently installed in the switchyard. The review determined that there are no Ohio Brass insulators at Hatch.

D. Georgia Power Company (GPC) personnel and Hatch site personnel perform weekly switchyard bus and connection inspections for evidence of deterioration. Operations personnel also look for abnormal conditions three times per week as part of normal operator rounds.

E. Maintenance and testing are routinely performed on switchyard components. Thermography of the high voltage switchyards is routinely performed and repeated following major switching operations (e.g., outages). This practice monitors the health of bushings, insulators, and connections. Additionally, insulators are also closely inspected every three years during the Comprehensive Substation Inspection, last performed in December 2011, to identify any chipping, cracks, or contamination.

F. The GPC Transmission Support group reviews Southern Company Operating Experience (OE) and manufacturer/vendor quality issues to formulate replacement plans as needed.

G. Planned switching to align a transformer to a single feed requires visual verification that an open phase condition is not present prior to switching.

H. The Byron Open Phase event is discussed in Operations continuing training classes.

NRC Request 2:

Provide a status and schedule for completion of plant design changes and modifications to resolve issues with an open phase of electric power.

Hatch Response

SNC is considering options being developed by several vendors (e.g., PSC2000, EPRI, Schweitzer) to detect OPC faults. There are currently no off-the-shelf solutions proven to reliably detect open phase fault conditions for the various plant and transformer designs that exist in the industry.

As previously stated in response to Bulletin 2012-01, preliminary vulnerability studies of the OPC faults have been performed for Hatch. Additionally, SNC is engaged in development of the NEI OPC Guidance Document and development of software enhancements used to analyze OPC faults.

SNC considers the transformer Neutral Current Injection (NCI) technology being developed by EPRI to represent the most appropriate solution for Hatch based on the information available at this time. This technology has successfully completed proof-of-concept testing in November 2013, and full-scale prototype testing is scheduled for the first quarter of 2014. Upon finalization of the NCI design, SNC will evaluate its ability to perform the

intended function, evaluate the potential impact on nuclear safety, and determine the need for prior NRC review and approval in accordance with the provisions of 10 CFR 50.59 prior to installation.

SNC is committed to meeting the intent of the generic schedule for operating plants provided in the NEI OPC initiative which can be generally described as follows:

- December 31, 2014 – Identify actions required to provide protection;
- December 31, 2016 – Install protective scheme in monitoring mode; and
- December 31, 2017 – Activate trip mode of protective scheme.

Due to the potential for delays associated with development of the technology, development of site-specific design, procurement and delivery of equipment, the need to schedule installation during a scheduled refueling outage, and the potential need for prior NRC review and approval, there is a potential for delays outside SNC's control that could impact the ability for Hatch to meet the above milestones for activating the trip mode of the protective scheme. For example, Hatch currently anticipates the existing refueling outage schedule for Unit 2 will prohibit installation of the protective scheme in monitoring mode until Spring 2017. However, based on successful testing of equipment during the monitoring phase on Unit 1, SNC currently expects to place the Hatch Unit 2 protection scheme in trip mode by the December 31, 2017 milestone described in the NEI OPC initiative.

Deviations from the Industry OPC Initiative schedule will be documented through the deviation/exemption process described in the NEI OPC Guidance Document.

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ENCLOSURE 2

Joseph M. Farley Nuclear Plant
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ENCLOSURE 2

Joseph M. Farley Nuclear Plant
Response to NRC Request for Additional Information

By letter dated December 20, 2013, the NRC requested Southern Nuclear Operating Company (SNC) to provide additional information necessary to allow NRC staff to complete its review of SNC's response to the bulletin. The following restates the NRC requested information, as provided to SNC, followed by the Farley response to each.

NRC Request 1:

Provide a summary of all interim corrective actions that have been taken since the January 30, 2012, event at Byron Station, Unit 2, to ensure that plant operators can promptly diagnose and respond to open phase conditions on the offsite power circuits for Class-1E vital buses until permanent corrective actions are completed.

Farley Response:

Lessons learned from the events at the Byron station were reviewed and various interim corrective actions evaluated for safety and efficiency. Based on the plant's offsite power configuration, electrical design details, and lessons learned, the following actions were taken to ensure plant operators can promptly diagnose and respond to an open phase condition (OPC) until permanent corrective actions are completed.

A. SNC provided the following technical guidance to Farley for incorporation into operating procedures as indications of a potential open phase event; and to aid plant operators in promptly diagnosing and responding to an open phase event:

   - running loads tripping for no apparent reason;
   - inability to start motors;
   - increase in current (e.g., 170% of normal) in two phases with decreased or loss of current in one phase;
   - fluctuating voltages; and
   - degraded grid alarm with normal 230kV system voltage.

B. SNC performed a switchyard inspection to assess the condition of the switchyard feeds to the plant's Class 1E buses and to identify switchyard bus supports and connections vulnerable to an open phase condition. These inspections focused primarily on identification of insulators subjected to lateral loads that could lead to a greater risk of failure. These inspections did not identify any insulators subjected to lateral loads.

C. Equipment records for Farley were reviewed to determine if Ohio Brass insulators are installed in the switchyard. This review determined that Ohio Brass insulators are installed at Farley.

D. Alabama Power Company (APC) personnel perform switchyard bus and connection inspections for evidence of deterioration twice per week.

E. Maintenance and testing are routinely performed on switchyard components. Thermography of the high voltage switchyards is routinely performed and repeated following major switching operations (e.g., outages). This practice monitors the health of bushings, insulators, and connections. Additionally, insulators are closely inspected every three years during the Comprehensive Substation Inspection, last performed in May 2013, to identify any chipping, cracks, or contamination.

F. The APC Transmission Support group reviews Southern Company operating experience and manufacturer/vendor quality issues to formulate proactive replacement plans as appropriate.

G. Planned switching to align a transformer to a single feed requires visual verification that an open phase condition is not present prior to switching.

H. The Byron Open Phase event is discussed in Operations continuing training classes.

NRC Request 2:

Provide a status and schedule for completion of plant design changes and modifications to resolve issues with an open phase of electric power.

Farley Response

SNC is considering options being developed by several vendors (e.g., PSC2000, EPRI, Schweitzer) to detect OPC faults. There are currently no off-the-shelf solutions proven to reliably detect open phase fault conditions for the various plant and transformer designs that exist in the industry.

As previously stated in response to Bulletin 2012-01, preliminary vulnerability studies of the OPC faults have been performed for Farley. Additionally, SNC is engaged in development of the NEI OPC Guidance Document and development of software enhancements used to analyze OPC faults.

SNC considers the transformer Neutral Current Injection (NCI) technology being developed by EPRI to represent the most appropriate solution for Farley based on the information available at this time. This technology has successfully completed proof-of-concept testing in November 2013, and full-scale prototype testing is scheduled for the first quarter of 2014. Upon finalization of the NCI design, SNC will evaluate its ability to perform the intended function, evaluate the potential impact on nuclear safety, and determine the need for prior NRC review and approval in accordance with the provisions of 10 CFR 50.59 prior to installation.

SNC is committed to Farley meeting the generic schedule for operating plants provided in the NEI OPC initiative which can be generally described as follows:

- December 31, 2014 – Identify actions required to provide protection;
- December 31, 2016 – Install protective scheme in monitoring mode; and
- December 31, 2017 – Activate trip mode of protective scheme.

Due to the potential for delays associated with development of the technology, development of site-specific design, procurement and delivery of equipment, the need to schedule installation of equipment during scheduled refueling outages, and the potential need for prior NRC review and approval, there is a potential for delays outside the control of SNC that could impact the ability for Farley to meet the above milestones for activating the trip mode of the protective scheme. Accordingly, deviations from the Industry OPC Initiative schedule will be documented through the deviation/exemption process described in the NEI OPC Guidance Document.

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Enclosure 3

Vogtle Electric Generating Plant
Response to NRC Request for Additional Information

ENCLOSURE 3

Vogtle Electric Generating Plant
Response to NRC Request for Additional Information

By letter dated December 20, 2013, the NRC requested Southern Nuclear Operating Company (SNC) to provide additional information necessary to allow NRC staff to complete its review of SNC's response to the bulletin. The following restates the NRC requested information, as provided to SNC, followed by the Vogtle response to each.

NRC Request 1:

Provide a summary of all interim corrective actions that have been taken since the January 30, 2012, event at Byron Station, Unit 2, to ensure that plant operators can promptly diagnose and respond to open phase conditions on the offsite power circuits for Class-1E vital buses until permanent corrective actions are completed.

Vogtle Response:

Lessons learned from the events at the Byron station were reviewed and various interim corrective actions evaluated for safety and efficiency. Based on the plant's offsite power configuration, electrical design details, and lessons learned, the following actions were taken to ensure plant operators can promptly diagnose and respond to an open phase condition (OPC) until permanent corrective actions are completed.

A. SNC provided the following technical guidance to Vogtle for incorporation into operating procedures as indications of a potential open phase event; and to aid plant operators in promptly diagnosing and responding to an open phase event:

- running loads tripping for no apparent reason;
- inability to start motors;
- increase in current (e.g., 170% of normal) in two phases with decreased or loss of current in one phase;
- fluctuating voltages;
- negative sequence alarm; and
- degraded grid alarm with normal 230kV system voltage.

B. SNC performed a switchyard inspection to assess the condition of the switchyard feeds to the plant's Class 1E buses and to identify switchyard bus supports and connections vulnerable to an open phase condition. These inspections focused primarily on identification of insulators subjected to lateral load that could lead to a greater risk of failure. These inspections did not identify any insulators subjected to lateral loads.

C. Equipment records for Vogtle were reviewed to determine if Ohio Brass insulators are currently installed in the switchyard. The review determined that Ohio Brass insulators are installed at Vogtle.

D. Georgia Power Company (GPC) personnel and Vogtle site personnel perform weekly switchyard bus and connection inspections for evidence of deterioration.

E. Maintenance and testing are routinely performed on switchyard components. Thermography of the high voltage switchyards is routinely performed and repeated following major switching operations (e.g., outages). This practice monitors the health of bushings, insulators, and connections. Additionally, insulators are also closely inspected every three years during the Comprehensive Substation Inspection, last performed in March 2012, to identify any chipping, cracks, or contamination.

F. The GPC Transmission Support group reviews Southern Company Operating Experience (OE) and manufacturer/vendor quality issues to formulate proactive replacement plans as needed.

G. Planned switching to align a transformer to a single feed requires a visual verification that an open phase condition is not present prior to switching.

H. The Byron Open Phase event is discussed in Operations continuing training classes.

NRC Request 2:

Provide a status and schedule for completion of plant design changes and modifications to resolve issues with an open phase of electric power.

Vogtle Response

SNC is considering options being developed by several vendors (e.g., PSC2000, EPRI, Schweitzer) to detect OPC faults. There are currently no off-the-shelf solutions proven to reliably detect open phase fault conditions for the various plant and transformer designs that exist in the industry.

As previously stated in response to Bulletin 2012-01, preliminary vulnerability studies of the OPC faults have been performed for Vogtle. Additionally, SNC is engaged in development of the NEI OPC Guidance Document and development of software enhancements used to analyze OPC faults.

SNC considers the transformer Neutral Current Injection (NCI) technology being developed by EPRI to represent the most appropriate solution for Vogtle based on the information available at this time. This technology has successfully completed proof-of-concept testing in November 2013, and full-scale prototype testing scheduled for the first quarter 2014. Upon finalization of the NCI design, SNC will evaluate its ability to perform the intended function, evaluate the potential impact on nuclear safety, and determine the

need for prior NRC review and approval in accordance with the provisions of 10 CFR 50.59 prior to installation.

SNC is committed to meeting the intent of the generic schedule for operating plants provided in the NEI OPC initiative for Vogtle which can be generally described as follows:

- December 31, 2014 – Identify actions required to provide protection;
- December 31, 2016 – Install protective scheme in monitoring mode; and
- December 31, 2017 – Activate trip mode of protective scheme.

Due to the potential for delays associated with development of the technology, development of site-specific design, procurement and delivery of equipment, the need to schedule installation during a scheduled refueling outage, and the potential need for prior NRC review and approval, there is a potential for delays outside SNC's control that could impact the ability for Vogtle to meet the above milestones for activating the trip mode of the protective scheme. For example, Vogtle currently anticipates the existing refueling outage schedule for Unit 1 will prohibit installation of the protective scheme in monitoring mode until Spring 2017. However, based on successful testing of equipment during the monitoring phase on Unit 2, SNC currently expects to place the Vogtle Unit 1 protection scheme in trip mode by the December 31, 2017, milestone described in the NEI OPC initiative.

Deviations from the Industry OPC Initiative schedule will be documented through the deviation/exemption process described in the NEI OPC Guidance Document.