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SOUTHERN COMPANY
Energy to Serve Your World℠

January 30, 2007

Docket Nos.: 50-321 50-348 50-424
50-366 50-364 50-425

NL-07-0060

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Edwin I. Hatch Nuclear Plant
Joseph M. Farley Nuclear Plant
Vogtle Electric Generating Plant
Response to Request for Additional Information
Regarding Resolution of Generic Letter 2006-02
<u>Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power</u>

Ladies and Gentlemen:

On December 5, 2006, the Nuclear Regulatory Commission (NRC) issued a Request for Additional Information (RAI) Regarding Resolution of Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power. The NRC requested that written responses be submitted no later than January 31, 2007.

In accordance with the RAI regarding resolution of Generic Letter 2006-02, Hatch Nuclear Plant (HNP) responded to questions 3 and 4, Farley Nuclear Plant (FNP) responded to questions 1, 3 and 4, and Vogtle Electric Generating Plant (VEGP) responded to questions 1 and 4. Enclosed are the responses for each of the three Southern Nuclear Operating Company (SNC) plants.

As noted in SNC's response to GL 2006-02, dated March 31, 2006, SNC does not have first hand knowledge of the operation of the Southern Company transmission grid and has relied on Southern Company Transmission for the information contained in the attached enclosures regarding analyses, procedures, and activities concerning grid operations.

(Affirmation and signature are on the following page.)

Mr. J. T. Gasser states he is Executive Vice President and Chief Nuclear Officer 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,

SOUTHERN NUCLEAR OPERATING COMPANY

Jeffrey T Gasser

Jeffrey T. Gasser

Sworn to and subscribed before me this 30th *day of* January*, 2007.*

Notary Public

My commission expires: 9/14/10

JTG/PAH/daj

Enclosures:
1. Edwin I. Hatch Nuclear Plant Response – Questions 3 and 4
2. Joseph M. Farley Nuclear Plant Response – Questions 1, 3 and 4
3. Vogtle Electric Generating Plant Response – Questions 1 and 4

cc: Southern Nuclear Operating Company
Mr. J. R. Johnson, Vice President – Farley
Mr. T. E. Tynan Vice President – Vogtle
Mr. D. R. Madison, Vice President – Hatch
RType: CFA04.054; CHA02.004; CVC7000; LC# 14526

U. S. Nuclear Regulatory Commission
Dr. W. D. Travers, Regional Administrator
Mr. K. R. Cotton, NRR Project Manager – Farley
Mr. R. E. Martin, NRR Project Manager – Hatch
Mr. B. K. Singal, NRR Project Manager – Vogtle
Mr. C. A. Patterson, Senior Resident Inspector – Farley
Mr. D. S. Simpkins, Senior Resident Inspector – Hatch
Mr. G. J. McCoy, Senior Resident Inspector – Vogtle

Enclosure 1

Edwin I. Hatch Nuclear Plant
Response to Request for Additional Information
Regarding Resolution of Generic Letter 2006-02
Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

Questions 3 and 4

Enclosure 1
Edwin I. Hatch Nuclear Plant
Response to Request for Additional Information
Regarding Resolution of Generic Letter 2006-02
Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

NRC Question

3. Verification of RTCA Predicted Post-Trip Voltage

Your response to question 2(g) indicates that you have not verified by procedure the voltages predicted by the online grid analysis tool (software program) with actual real plant trip voltage values. It is important that the programs used for predicting post-trip voltage be verified to be reasonably accurate and conservative. What is the range of accuracy for your GO's contingency analysis program? Why are you confident that the post-trip voltages calculated by the GO's contingency analysis program (that you are using to determine operability of the offsite power system) are reasonably accurate and conservative? What is your standard of acceptance?

Plant Hatch Response

Southern Company Transmission, the Grid Operator (GO), also called the Transmission System Operator (TSO), for Southern Company maintains a set of commercially proven power system analysis tools that are currently in successful large scale use throughout the industry. These tools are configured and optimized to meet the specific requirements of the Southern Company and the Southern Sub-regional Security Coordinator and are operated by certified and experienced personnel. The transmission operators, reliability coordinators, and security engineers who operate these tools and the Energy Management System (EMS) engineers and technicians who maintain them monitor the results produced by these tools against real time conditions on the grid. While there are no ongoing formal procedures to verify the accuracy of these tools, any deviation from an expected value (based upon the experience of senior system operators) or observed real time Supervisory Control and Data Acquisition (SCADA) information "after the fact" (i.e., after a contingency has occurred) is scrutinized to determine if errors have occurred in the models or if the accuracy of the instrumentation providing real time input to the process has been degraded.

There is no specific "range of accuracy" or known industry standard for the contingency analysis tool or the security analysis process as a whole. Contingency analysis is a forecasting tool which utilizes real-time snapshots of the TSO's entire system to assess the potential future impacts of contingency events. The real-time snapshots are derived from many thousands of redundant measurements which are filtered through the common industry procedure known as state estimation. This filtering process eliminates anomalous measurements from the input data set and makes slight adjustments to the remaining measurements to minimize inaccuracies and ensure the complete set of interrelated measurement values conform to the fundamental principles of bulk power flow theory. Thus, the TSO contingency analysis tool depends not only upon a solid technical basis proven throughout the industry but also on a skilled set of senior operators, engineers and technicians to interface with these tools and provide oversight. Such systems are the most accurate and robust tools available.

As noted above, the power system analysis tools utilized by the Southern Company TSO are well proven through extensive field application in large power systems similar to Southern Company's. Southern Company TSO Operators, engineers, and technicians continuously monitor the output of the power system analysis tools in a redundant fashion that provides overlapping areas of responsibility. Any deviation in the results produced by these tools against real time observations of the grid or any deviation from an expected value (based upon the experience of senior system operators) is scrutinized to determine if errors have occurred in the models or if the accuracy of the instrumentation providing real time input to the process has been degraded. There is no formal standard of acceptance.

NRC Question

4. Identification of Applicable Single Contingencies

In response to question 3(a) you did not identify the loss of other critical transmission elements that may cause the offsite power system (OSP) to degrade, other than the loss of the nuclear unit. If it is possible for specific critical transmission elements (such as other generators, critical transmission line, transformers, capacitor banks, voltage regulators, etc.) to degrade the OSP such that inadequate post-trip voltage could result, have these elements, been included in your N-1 contingency analysis? When these elements are included in your GO's contingency analysis model and failure of one of these transmission elements could result in actuation of your degraded voltage grid relay, is the offsite power declared inoperable? If not, what is your basis for not declaring the offsite power inoperable?

Plant Hatch Response

As described in the responses to GL 2006-02 for questions 2a and 2e, the contingency analysis that is performed by the TSO for the Southern Company transmission system includes the loss of numerous transmission elements, including specific multiple contingencies, selected based on operational experience and transmission system planning analyses as the most critical transmission contingencies affecting Plant Hatch. In addition, the normal N-1 contingency analysis includes the loss of all transmission elements one at a time. This includes the loss of all transmission lines, all autobank transformers, and each of the individual generating units sequentially, one at a time. TSO personnel can also add loss of capacitor banks, loss of voltage regulators, and other grid conditions into the model, if necessary.

These contingencies are evaluated by system security tools. The system is operated, and compensatory measures are used, so that a single contingency will not result in inadequate voltage.

The contingency analyses run by the TSO do not calculate voltages at the in-plant essential 4kv switchgear, where the degraded voltage relays are located, but at the 230kv yard busses where the transmission lines into the plant originate. The voltage limits given to the TSO to evaluate in the contingency analysis program are above a voltage that would actually cause the degraded or loss of offsite power (LOSP) voltage relays to actuate. If the contingency analysis program indicates that a condition may exist where additional system failures could result in voltages lower than the limits, the licensing basis for Hatch, as described below, requires actions more restrictive than would be required by declaring offsite sources inoperable.

If a first contingency occurs and it results in an unacceptable condition for the next contingency, the TSO will take immediate action to eliminate the unacceptable contingency situation.

If immediate actions (within a few minutes) do not resolve the unacceptable contingency situation due to system conditions, the TSO will notify the nuclear power plant (NPP) that abnormal system conditions (i.e. a potential degraded grid following the next contingency) exist.

If Plant Hatch is notified of a contingency analysis predicting that voltages lower than the limits provided to the TSO may occur, or if the analysis program is unavailable for certain durations, Plant Hatch has to perform a number of actions more restrictive than those required by declaring the offsite power sources inoperable per Technical Specifications. These restrictions were imposed by a 1995 NRC Safety Evaluation Report (SER) and are contained in several plant operating procedures. If actual low voltages occur but not enough to actuate the degraded grid relays, the SER still requires operator actions more restrictive than declaring offsite power inoperable.

Units 1 and 2 LCO 3.8.1.a requires: "two qualified circuits between the offsite transmission network and the Unit 1 onsite Class 1E AC Electrical Power Distribution System." At Plant Hatch, Surveillance Requirement 3.8.1.1 serves to verify that this LCO is met. It states: "Verify correct breaker alignment <u>and indicated power availability</u> for each required circuit."

“Qualified” circuits are not defined in the TS Bases. Because the Update Final Safety Analysis Report (UFSAR) description of the offsite power system includes allowable voltage levels, the actual voltage has to be above the UFSAR levels in order to meet the surveillance procedure, however these voltages are not directly specified in the TS offsite power requirements (they are listed in the TS section for routine calibration and functional testing of the degraded voltage relays themselves). If actual voltage drops below the UFSAR values, then the surveillance procedure would not be met and one or both offsite sources would be declared inoperable. Note that this is based on actual voltages however and not predicted conditions.

Enclosure 2

Joseph M. Farley Nuclear Plant
Response to Request for Additional Information
Regarding Resolution of Generic Letter 2006-02
Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

Questions 1, 3 and 4

NRC Question

1. Switchyard Minimum Voltage

In response to question 1(g) you did not identify specific minimum switchyard voltage limits that you supplied to the local transmission entity. Please, provide the following information:

What is the specific minimum acceptable switchyard voltage included in your protocol agreement with your grid operator (GO) and what was the basis for this value? How is this value related to your technical specification degraded voltage relay setpoints?

FNP Response

The agreement with the GO or transmission system operator (TSO) concerning minimum acceptable switchyard voltages is documented in the plant's Power Quality Guide. It includes both planning (i.e., design) and operational criteria. For Farley Nuclear Plant (FNP), there are two values included.

A value of 101.6% of 230kV is the minimum acceptable voltage when either of the FNP generators is on-line. This value was chosen to ensure proper operation of the generating units. It provides for acceptable voltages at all station service loads (both non-safety related and safety-related). The safety-related 4kV bus voltages corresponding to 101.6% of 230kV range between approximately 3920V and 3940V during normal, non-loss of coolant accident (non-LOCA) operation.

A value of 100% of 230kV is the minimum acceptable voltage for worst case conditions when both FNP generators are not on-line. This switchyard voltage value correlates with the nominal degraded grid alarm setpoint (3850V). The calculated safety-related 4kV bus voltages corresponding to 100% of 230kV range between approximately 3860V and 3880V during normal (non-LOCA) conditions. For LOCA conditions, the voltages are slightly lower due to increased loading. The calculated safety-related 4kV bus voltages corresponding to 100% of 230kV range between approximately 3835V and 3860V during LOCA conditions.

Per the protocol agreement, the TSO is required to maintain the 230kV bus switchyard voltage at or above these minimum acceptable voltage values (101.6% or 100%) for the next single contingency condition. The single contingency analysis postulates a LOCA for a FNP generating unit, a loss of another generating unit, loss of an autobank transformer, or loss of a transmission line. This includes conditions when one FNP unit is in a tripped condition. The 100% of 230kV value is chosen to provide margin above the voltages required for safety-related loads to perform their safety-related functions. It also minimizes the potential for a loss of offsite power (LOSP) by providing for identification and correction of contingency conditions that could result in inadequate voltages at safety-related loads or a trip of degraded grid relays.

At FNP, the degraded grid relay nominal setpoint is 3675V. The corresponding switchyard voltages vary by 4kV bus and plant conditions. For normal (non-LOCA) conditions, the corresponding switchyard voltages range from approximately 94% to 94.5% of 230kV. For LOCA conditions, the corresponding switchyard voltages range from approximately 95.7% to 96.3% of 230kV.

NRC Question

3. Verification of RTCA Predicted Post-Trip Voltage

Your response to question 2(g) indicates that you have not verified by procedure the voltages predicted by the online grid analysis tool (software program) with actual real plant trip voltage values. It is important that the programs used for predicting post-trip voltage be verified to be reasonably accurate and conservative. What is the range of accuracy for your GO's contingency analysis program? Why are you confident that the post-trip voltages calculated by the GO's contingency analysis program (that you are using to determine operability of the offsite power system) are reasonably accurate and conservative? What is your standard of acceptance?

FNP Response

Southern Company Transmission, the Grid Operator (GO), also called the Transmission System Operator (TSO), for Southern Company maintains a set of commercially proven power system analysis tools that are currently in successful large scale use throughout the industry. These tools are configured and optimized to meet the specific requirements of the Southern Company and the Southern Sub-regional Security Coordinator and are operated by certified and experienced personnel. The transmission operators, reliability coordinators, and security engineers who operate these tools and the Energy Management System (EMS) engineers and technicians who maintain them monitor the results produced by these tools against real time conditions on the grid. While there are no ongoing formal procedures to verify the accuracy of these tools, any deviation from an expected value (based upon the experience of senior system operators) or observed real time Supervisory Control and Data Acquisition (SCADA) information "after the fact" (i.e., after a contingency has occurred) is scrutinized to determine if errors have occurred in the models or if the accuracy of the instrumentation providing real time input to the process has been degraded.

There is no specific "range of accuracy" or known industry standard for the contingency analysis tool or the security analysis process as a whole. Contingency analysis is a forecasting tool which utilizes real-time snapshots of the TSO's entire system to assess the potential future impacts of contingency events. The real-time snapshots are derived from many thousands of redundant measurements which are filtered through the common industry procedure known as state estimation. This filtering process eliminates anomalous measurements from the input data set and makes slight adjustments to the remaining measurements to minimize inaccuracies and ensure the complete set of interrelated measurement values conform to the fundamental principles of bulk power flow theory. Thus, the TSO contingency analysis tool depends not only upon a solid technical basis proven throughout the industry but also on a skilled set of senior operators, engineers and technicians to interface with these tools and provide oversight. Such systems are the most accurate and robust tools available.

As noted above, the power system analysis tools utilized by the Southern Company TSO are well proven through extensive field application in large power systems similar to Southern Company's. Southern Company TSO Operators, engineers, and technicians continuously monitor the output of the power system analysis tools in a redundant fashion that provides overlapping areas of responsibility. Any deviation in the results produced by these tools against real time observations of the grid or any deviation from an expected value (based upon the experience of senior system operators) is scrutinized to determine if errors have occurred in the models or if the accuracy of the instrumentation providing real time input to the process has been degraded. There is no formal standard of acceptance.

NRC Question

4. Identification of Applicable Single Contingencies

In response to question 3(a) you did identify the loss of other critical transmission elements that may cause the offsite power system (OSP) to degrade, other than the loss of the nuclear unit. If it is possible for specific critical transmission elements (such as other generators, critical transmission line, transformers, capacitor banks, voltage regulators, etc.) to degrade the OSP such that inadequate post-trip voltage could result, have these elements been included in your N-1 contingency analysis? When these elements are included in your GO's contingency analysis model and failure of one of these transmission elements could result in actuation of your degraded voltage grid relay, is the offsite power declared inoperable? If not, what is your basis for not declaring the offsite power inoperable?

FNP Response

The statuses of critical transmission elements (such as other generators, transmission lines, transformers, capacitor banks, voltage regulators, etc.) are included in the TSO's real-time contingency analysis (RTCA) tools. The single contingency analysis postulates a LOCA for a FNP generating unit, loss of another generating unit, loss of an autobank transformer, or loss of a transmission line. In addition, the outage of other elements, including specific multiple contingencies, selected based on operational experience and transmission planning analyses as the most critical transmission contingencies affecting FNP, are run on a periodic basis. Other than the postulated contingency, the latest operational state of all transmission elements (generators, transmission lines, transformers, capacitor banks, voltage regulators, etc.) is used in the RTCA.

These contingencies are evaluated by system security tools. The system is operated, and compensatory measures are used, so that a single contingency will not result in voltages below the minimum acceptable limits (100% or 101.6% of 230kV).

If a first contingency occurs and it results in an unacceptable condition for the next contingency, the TSO will take immediate action to eliminate the unacceptable contingency situation.

If immediate actions (within a few minutes) do not resolve the unacceptable contingency situation due to system conditions, notification of abnormal system conditions (i.e. a potential degraded grid following the next contingency) by the TSO is required. If FNP is notified by the TSO that a contingency prediction has resulted in a possible switchyard voltage below the minimum acceptable limits, the degraded grid procedure actions are implemented, including more frequent monitoring of actual in-plant emergency bus voltages. These procedures provide guidance for monitoring the abnormal condition and for taking proper actions, including plant shutdown if necessary.

According to Regulatory Information Summary (RIS) 2005-20, [Revision to Guidance Formerly Contained in Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability"], the term 'Operable/Operability' is defined in the Technical Specifications and applied only to TS structures, systems and components (SSCs). Thus, the FNP offsite power system cannot be referred to as 'Operable' or 'Inoperable', because the grid is not a TS SSC. Everything that is non-TS is referred to as Functional or non-Functional.

There is no FNP Technical Specification requirement to declare the grid inoperable. Regardless, prediction of a postulated detrimental event is not adequate to declare a system non-functional. RTCA tools are used by the TSO to take prudent compensatory measures and help prevent such detrimental events.

Enclosure 3

Vogtle Electric Generating Plant
Response to Request for Additional Information
Regarding Resolution of Generic Letter 2006-02
Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

Questions 1 and 4

Enclosure 3
Vogtle Electric Generating Plant
Response to Request for Additional Information
Regarding Resolution of Generic Letter 2006-02
Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

NRC Question

1. Switchyard Minimum Voltage

In response to question 1(g) you did not identify specific minimum switchyard voltage limits that you supplied to the local transmission entity. Please, provide the following information:

What is the specific minimum acceptable switchyard voltage included in your protocol agreement with your grid operator (GO) and what was the basis for this value? How is this value related to your technical specification degraded voltage relay setpoints?

VEGP Response

The agreement with the GO or the transmission system operator (TSO) concerning minimum acceptable switchyard voltages is documented in Vogtle Electric Generating Plant's (VEGP's) Power Quality Guide. It includes both planning (i.e., design) and operational criteria.

A value of 100% of 230 kV is the minimum acceptable voltage for the worst case conditions, assuming one unit tripped and the other unit is in a loss of coolant accident (LOCA) condition. For this value of 100% of 230 kV bus voltage:

1. Transmission planning studies criteria are met.

2. The available voltage at the equipment terminals in the station auxiliary (1E and non-1E) system would be within the operable range of equipment.

3. The Class 1E buses will remain connected to the offsite source. (The degraded grid alarm setpoint value on the class 1E 4160 V bus is 3873 V. The corresponding 230 kV bus voltage is < 100 %.).

Per the protocol agreement, the TSO is required to maintain the 230 kV bus switchyard voltage at or above the minimum acceptable voltage value of 100% for the next single contingency condition. The single contingency analysis postulates a LOCA for a VEGP generating unit, a loss of another generating unit, loss of an autobank transformer, or loss of a transmission line. The types of contingencies evaluated include a transmission line trip, a non-VEGP unit trip, or one VEGP unit in a LOCA. This includes conditions when one VEGP unit is in a tripped condition. The 100% of 230 kV value is chosen to provide margin above the voltages required for safety-related loads to perform their safety-related functions. It also minimizes the potential for a loss of offsite power by providing for identification and correction of contingency conditions that could result in inadequate voltages at safety-related loads or a trip of degraded grid relays.

The degraded grid relay setpoints at each 4160 V 1E bus are as follows:

Level	Setting	Tolerance	Time Delay	Function
1	2975 V	+/- 63.4 V	0.8 sec	Disconnect Offsite source
2	3746 V	+/- 63.4 V	20 sec	Disconnect Offsite source
3	3873 V	+/- 63.4 V	10 sec	Alarm

For 2975 V on the 4160 V bus, the corresponding 230 kV bus voltage is approximately 77% for the worst case loading conditions on the 4160 V 1E bus.

For 3746 V on the 4160 V bus, the corresponding 230 kV bus voltage is approximately 97% for the worst case loading conditions on the 4160 V 1E bus.

For 3873 V on the 4160 V bus, the corresponding 230 kV bus voltage is approximately 100% for the worst loading conditions on the 4160 V 1E bus.

In the technical specifications, level 1 and 2 degraded grid relay setpoints are documented.

NRC Question

4. Identification of Applicable Single Contingencies

In response to question 3(a) you did identify the loss of other critical transmission elements that may cause the offsite power system (OSP) to degrade, other than the loss of the nuclear unit. If it is possible for specific critical transmission elements (such as other generators, critical transmission line, transformers, capacitor banks, voltage regulators, etc.) to degrade the OSP such that inadequate post-trip voltage could result, have these elements been included in your N-1 contingency analysis? When these elements are included in your GO's contingency analysis model and failure of one of these transmission elements could result in actuation of your degraded voltage grid relay, is the offsite power declared inoperable? If not, what is your basis for not declaring the offsite power inoperable?

VEGP Response

The statuses of critical transmission elements (such as other generators, transmission lines, transformers, capacitor banks, voltage regulators, etc.) are included in the TSO's real-time contingency analysis (RTCA) tools. The single contingency analysis postulates a LOCA for a VEGP generating unit, a loss of another generating unit, loss of an autobank transformer, or loss of a transmission line. In addition, the outage of other elements, including specific multiple contingencies, selected based on operational experience and transmission system planning analyses as the most critical transmission contingencies affecting VEGP, are run on a periodic basis. Other than the postulated contingency, the latest operational state of all transmission elements (generators, transmission lines, transformers, capacitor banks, voltage regulators, etc.) is used in the RTCA.

These contingencies are evaluated by system security tools. The system is operated, and compensatory measures are used, so that a single contingency will not result in voltages below the minimum acceptable limit (100% of 230kV).

If a first contingency occurs and it results in an unacceptable condition for the next contingency, the TSO will take immediate action to eliminate the unacceptable contingency situation.

If immediate actions (within a few minutes) do not resolve the unacceptable contingency situation due to system conditions, notification of abnormal system conditions (i.e. a potential degraded grid) by the TSO is required. If VEGP is notified by the TSO that a contingency prediction has resulted in a possible switchyard voltage below the minimum acceptable limit (100% of 230kV), the degraded grid procedure actions are implemented, including more frequent monitoring of actual in-plant emergency bus voltages. These procedures provide guidance for monitoring the abnormal condition and for taking proper actions, including plant shutdown if necessary.

According to Regulatory Information Summary (RIS) 2005-20, [Revision to Guidance Formerly Contained in Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability"], the term 'Operable/Operability' is defined in the Technical Specifications and applied only to TS structures, systems and components (SSCs). Thus, the VEGP offsite power system cannot be referred to as 'Operable' or 'Inoperable,' because the grid is not a TS SSC. Everything that is non-TS is referred to as Functional or non-Functional.

There is no VEGP Technical Specification requirement to declare the grid inoperable. Regardless, prediction of a postulated detrimental event is not adequate to declare a system non-functional. RTCA tools are used by the TSO to take prudent compensatory measures and help prevent such detrimental events.