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SCE&G®
A SCANA COMPANY

April 3, 2006

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

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
60-DAY RESPONSE TO NRC GENERIC LETTER 2006-02:
GRID RELIABILITY AND THE IMPACT ON PLANT RISK
AND THE OPERABILITY OF OFFSITE POWER

This letter provides South Carolina Electric & Gas Company's (SCE&G) 60-day response to the subject generic letter for V. C. Summer Nuclear Station (VCSNS). The responses to the information request are contained in the attachment to this letter and considered the NEI template for the Generic Letter response.

Some of the questions in GL 2006-02 seek information about analyses, procedures, and activities concerning grid reliability which VCSNS does not have first-hand knowledge and which are beyond the control of VCSNS, although there is no reason to doubt the accuracy. In providing information responsive to such questions, VCSNS makes no representation as to its accuracy or completeness.

Should you have questions, please call Mr. Robert G. Sweet at (803) 345-4080.

I certify under penalty of perjury that the foregoing is true and correct.

4/3/06
Executed on

Jeffrey B. Archie
Vice President, Nuclear Operations

PAR/JBA/mb
Attachment

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NRC Resident Inspector
NSRC
CER (C-06-0465)
File (815.14)
DMS (RC-06-0066)

A123

NRC Generic Letter 2006-02

Requested Information

1. *Use of protocols between the NPP licensee and the TSO, ISO, or RC/RA to assist the NPP licensee in monitoring grid conditions to determine the operability of offsite power systems under plant TS.*

   (a) *Do you have a formal agreement or protocol with your TSO?*

   Yes. V. C. Summer Nuclear Station (VCSNS) does have a formal agreement with the Transmission System Operator (TSO). The agreement is contained in a document signed by the Vice President of Operation - Transmission Systems and the Vice President of Nuclear Operations. Compliance with General Design Criteria (GDC)-17, as documented in the VCSNS license basis and plant Technical Specifications, is not predicated on such an agreement.

   (b) *Describe any grid conditions that would trigger a notification from the TSO to the NPP licensee and if there is a time period required for the notification.*

   The TSO is required to notify VCSNS whenever an impaired or potentially degraded grid condition is recognized by the TSO. Specific examples of known potentially degrading conditions identified in the agreement fall into 2 basic categories:

   1. Normal day to day operational communications associated with topics such as:
      - Work coordination
      - Switching
      - Generation dispatch
      - Planning

   2. Infrequent or off-normal communications associated with topics such as:
      - Emergent Line outages
      - Severe weather
      - Plant impacting equipment malfunctions
      - Very low system load
      - Very high system load
      - VCSNS voltage support problems
      - Significant grid frequency problems
      - Sabotage
      - Terrorism

The occurrence of a grid contingency that impacts VCSNS requires immediate VCSNS notification. "Immediate" is defined in the protocols. If the TSO's real-time contingency analysis shows that the off-site power to VCSNS will be impaired or degraded upon the occurrence of a credible contingency, the TSO is expected to notify VCSNS within 30 minutes (under normal circumstances) after verification of the analysis.

(c) *Describe any grid conditions that would cause the NPP licensee to contact the TSO. Describe the procedures associated with such a communication. If you do not have procedures, describe how you assess grid conditions that may cause the NPP licensee to contact the TSO.*

VCSNS will inform the TSO if any of the following occur:

VCSNS will notify the TSO of any voltage alarms, MVAR alarms, frequency alarms, or grid transients noted by the staff, or of determining that a device needed for coping with a Loss of Off-Site Power (LOOP) has become unavailable.

Grid conditions and status are the primary responsibility of the TSO. At VCSNS, the observable parameters include voltage and frequency, generator reactive output, breaker status, and certain switchyard alarm points.

Relative to this question, if "grid conditions" is assumed to be VCSNS changes that impact the Transmission System's analysis of the grid interface, then VCSNS also notifies the TSO for changes in the following grid conditions:

- VCSNS power uprate.
- Changes to switchyard voltage requirements.
- Changes to generator VAR loading requirements.
- Modifications resulting in changes to generator electrical characteristics.
- Changes in VCSNS post trip offsite power minimum required switchyard voltage or loading.
- Change in status of VCSNS offsite power voltage regulating devices (such as load tap changers (LTC's) in or out of service).
- High voltage equipment problems that could impact VCSNS output, stability, or availability (i.e.: large power transformer problems, main generator problems, isophase bus problems, etc.).
- Main Generator automatic voltage regulator (AVR) in manual.
- Main Generator power system stabilizer (PSS) not enabled.

Procedures associated with these communications are in System Operating Procedure (SOP)-304 - 115KV/7.2KV Operations, Annunciator Response Procedure (ARP)-1 - General Information For Annunciator Response Procedures, Operations Administrative Procedure (OAP)-100.4 - Communication.

Engineering Guidelines EE-01, Design Interface With Transmission Planning, Power Delivery, and Relay Applications will be revised to formally document Engineering communications with the TSO. Most changes that Engineering would be involved with that could require notification of the TSO will be design change related. The TSO will be provided the opportunity to review and comment on the design change prior to implementation.

(d) *Describe how NPP operators are trained and tested on the use of the procedures or assessing grid conditions in question 1(c).*

VCSNS operators are trained on procedures that describe the communications between VCSNS and the TSO, and on procedures that are used to assess grid conditions. Operators are trained on the following procedures in Licensed Operator Requalification:

- Classroom training on OAP-100.4 Communication; which describes the communications between VCSNS and the TSO.
- Classroom and simulator training on Emergency Operations Procedure (EOP) -6.0, Loss of All ESF AC Power. This procedure has operators contact the TSO to restore power to the VCSNS using their procedure for system restoration.
- Classroom training on System Operating Procedure (SOP) -304, Enclosure A, which identifies the off-site bus voltage requirements for determining operability.
- Classroom and the simulator training on the draft procedure AOP-301.1, Response to Grid Issues, is in progress and will be completed by 4/6/2006 for all operating crews. This training covers communication with the TSO, the voltage operability tables in SOP-304, Enclosure A, and risk management issues in OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment. Additionally, this training covers the essential elements of the Nuclear-Transmission Services Interface Agreement (NTSIA), notification from the TSO of changing grid conditions (real-time and real time contingency analysis (RTCA)), off site power supply operability determination and compensatory actions, control of VARS in major grid events with large grid voltage changes, operation of the Power System Stabilizer, and degraded grid conditions.

EOP-6.0, Loss of All ESF AC Power and OAP-100.4, Communication are in the base curriculum for Reactor Operator (RO) and Senior Reactor Operator (SRO) initial programs. AOP-301.1 Response to Grid Issues will be added to the base curriculum for RO and SRO initial programs, when it is approved.

Operators are tested on the contents of OAP-100.4 and EOP-6.0; however they have not been specifically tested on communications with the TSO. When AOP-301.1 is approved, test items will be developed to examine operators on degraded grid conditions and appropriate follow-up actions.

(e) *If you do not have a formal agreement or protocol with your TSO, describe why you believe you continue to comply with the provisions of GDC 17 as stated above, or describe what actions you intend to take to assure compliance with GDC 17.*

VCSNS does have a formal agreement with the TSO; thus, this question is not applicable. The agreement is contained in a document signed by the Vice President of Nuclear Operations and the Vice President of Operations - Transmission Services.

Compliance with GDC-17, as documented in the VCSNS license basis and plant Technical Specifications, is not predicated on such an agreement. GDC-17 was established prior to the existence of the agreement.

Compliance with GDC-17, as supported by NUREG 0800, is solely based on "each [offsite power] circuit has been sized with sufficient capacity to supply all connected loads" and "results of the ...grid stability analysis indicated that the loss of the largest generating capacity being supplied to the grid, loss of the largest load from the grid, loss of the most critical transmission line, or loss of the unit itself will not cause grid instability." As confirmed in the Generic Letter definitions, for a given disturbance stability equates to maintaining a state of equilibrium, and not a specific voltage.

The TSO performs periodic studies to ensure compliance with North American Electric Reliability Council (NERC) reliability standards. These standards include transmission system performance criteria for defined grid disturbances. This provides additional VCSNS offsite power assurance beyond that required by GDC-17.

VCSNS does not intend to modify the existing formal agreement(s) with the TSO at this time for the purpose of compliance with GDC-17.

(f) *If you have an existing formal interconnection agreement or protocol that ensures adequate communication and coordination between the NPP licensee and the TSO, describe whether this agreement or protocol requires that you be promptly notified when the conditions of the surrounding grid could result in degraded voltage (i.e., below TS nominal trip setpoint value requirements; including NPP licensees using allowable value in its TSs) or LOOP after a trip of the reactor unit(s).*

As previously stated, VCSNS does have a formal TSO agreement. Prompt notification regarding pre-trip analysis of predicted post-trip voltage that results in below acceptance limits is included. "Prompt" is defined in the protocols.

(g) *Describe the low switchyard voltage conditions that would initiate operation of plant degraded voltage protection.*

- Loss of Voltage relay settings are at 81% for 0.25 seconds as measured on the 7.2kV vital buses.
- Degraded Voltage relay settings are at 91.34% for 3 seconds as measured on the 7.2kV vital buses.

2. *Use of criteria and methodologies to assess whether the offsite power system will become inoperable as a result of a trip of your NPP.*

(a) *Does your NPP's TSO use any analysis tools, an online analytical transmission system studies program, or other equivalent predictive methods to determine the grid conditions that would make the NPP offsite power system inoperable during various contingencies? If available to you, please provide a brief description of the analysis tool that is used by the TSO.*

Yes. The TSO makes use of analysis tools to predict grid conditions, some of which would make the VCSNS offsite power system inoperable, and many other conditions that would denote an increased risk situation. The tools presently used by the TSO to manage the grid, control the transmission related activities, and monitor grid actions are outside the control of VCSNS and include the following:

- A real-time contingency analysis (RTCA) program.
- A grid state estimator and Supervisory Control and Data Acquisition System (SCADA) system in conjunction with periodic static power flow and transient stability studies of a reasonable number of contingencies.
- Voltage limits determined by bounding analyses.

The TSO also uses procedures based on bounding Transmission Planning studies to operate the grid. As long as the grid configuration is within that allowed by the procedure under various system conditions, adequate post VCSNS trip voltage support is assured. Specific case studies are also used from time to time to support planned grid configurations when not clearly bounded by existing studies.

In addition to the transmission system analysis based procedures, the TSO also uses monitoring / predictive analysis computer programs that can predict VCSNS switchyard voltages expected to occur upon realization of any one of a number of possible losses to the grid, such as

- A trip of the VCSNS generator.
- A trip of another large generator.
- The loss of an important transmission line.

Monitoring / predictive analysis computer program tools operate based on raw data from transducers across the system that is processed through a state estimator to generate a current snapshot of the system. This output is then processed through a contingency analysis program that generates a set of new results with various single elements of the system out of service. These results are then screened against a predetermined set of acceptance limits. Postulated scenarios which then do not meet the acceptance limits are listed for review by the TSO.

(b) *Does your NPP's TSO use an analysis tool as the basis for notifying the NPP licensee when such a condition is identified? If not, how does the TSO determine if conditions on the grid warrant NPP licensee notification?*

Yes. The TSO uses the above analysis tools, in conjunction with procedures, as the basis for determining when conditions warrant VCSNS notification. VCSNS operators, after discussion with the TSO, will make operability, risk assignment, and risk management determinations.

The TSO is also asked to use his judgment, experience, and input from other grid entities (such as Reliability Coordinators and other TSOs) and can make notification to VCSNS even when the analysis tools do not predict any issues.

Notifications are made based on grid configurations being outside predefined procedure requirements or based on unsatisfactory monitoring / predictive analysis computer program tool results.

Refer to the response to question 1(b).

(c) *If your TSO uses an analysis tool, would the analysis tool identify a condition in which a trip of the NPP would result in switchyard voltages (immediate and/or long-term) falling below TS nominal trip setpoint value requirements (including NPP licensees using allowable value in its TSs) and consequent actuation of plant degraded voltage protection? If not, discuss how such a condition would be identified on the grid.*

Yes. Procedures and monitoring / predictive analysis tools are in place for this purpose. The TSO analysis tools, in conjunction with VCSNS plant analyses, identify conditions which would result in switchyard voltage falling below loss of voltage relay trip setpoints; however, a trip of VCSNS does not result in an actuation of plant degraded voltage protection.

The use of state estimators and RTCA projects final states; there is no assurance that during a transient that results from a trip of VCSNS the grid will not reach the under-voltage relay setting or the degraded voltage relay setting. It is probable that the grid will not actuate the degraded voltage protection scheme. The minimum allowable voltage limit is presently set well above the degraded voltage

relay setpoint to preclude actuation of the degraded voltage protection scheme. The limit used as an allowable start/end state is determined from grid stability studies that can predict the lowest voltage and time during a transient.

(d) *If your TSO uses an analysis tool, how frequently does the analysis tool program update?*

The TSO State estimator runs at 15 minute interval, with the TSO RTCA program updating the contingency analysis (including VCSNS trip contingency) on alternate runs. Changes in network topography and/or manual input will also immediately trigger these tools to execute.

The TSO SCADA information updates on a 6 second interval for analog data (megawatts, voltage etc) and every 2 seconds for digital data (breaker status, relay status).

The TSO periodic analysis is performed every 36 months and updated as necessary. The VCSNS / TSO NTSIA requires the TSO to notify VCSNS prior to planned changes to the VCSNS local grid. VCSNS can also request updates at any time.

(e) *Provide details of analysis tool-identified contingency conditions that would trigger an NPP licensee notification from the TSO.*

Predefined contingencies are built into the primary contingency routine of the RTCA. This includes voltage violations found in the N-1 analysis or conditions which would create a bus outage at VCSNS 230kV or Parr 115 kV. Additionally, any equipment that exceeds the user-defined loading threshold in the Real-time State Estimator solution will be flagged for contingency analysis dynamically. If that contingency causes a voltage violation at VCSNS or Parr the TSO is alerted and notification is made to VCSNS.

The notification from the TSO is based upon the predicted post-trip switchyard voltage using an RTCA program with the violation (alarm) criteria set based on a bounding study.

If any of the contingencies predict a voltage at an off-site source bus to be outside of the criteria the condition is reported to VCSNS by the TSO. These contingencies are single failures such as trips of plants (including VCSNS), trips of breakers, loss of each bus in the 230KV switchyard, and loss of specific transmission lines.

The analyzed contingencies that are evaluated against the plants voltage requirements include:

- Loss of generators, including VCSNS.
- Loss of significant transmission elements.

If the VCSNS voltage requirement cannot be met under any of the contingencies considered, VCSNS will be notified. The same minimum required switchyard voltage limit bases that are used in the grid operating procedures are also used in the predictive analysis computer programs.

(f) *If an interface agreement exists between the TSO and the NPP licensee, does it require that the NPP licensee be notified of periods when the TSO is unable to determine if offsite power voltage and capacity could be inadequate? If so, how does the NPP licensee determine that the offsite power would remain operable when such a notification is received?*

Yes. The agreement does specifically require VCSNS notification for periods of time when the RTCA programs are not available.

The offsite sources are not declared inoperable upon loss of the RTCA. Actions are taken to minimize risk (restoring or ensuring availability of systems needed for coping with LOOP, stopping evolutions that increase the risk of a plant trip). The voltage alarms for the offsite sources are set to allow for the expected drop in offsite voltage that would result from a plant trip.

(g *After an unscheduled inadvertent trip of the NPP, are the resultant switchyard voltages verified by procedure to be bounded by the voltages predicted by the analysis tool?*

This has not been required in the past, but the TSO has committed to do this verification in the NTSIA. VCSNS requires management oversight prior to plant restart and a procedure change has been initiated to add a step to verify offsite voltage response prior to restart.

(h) *If an analysis tool is not available to the NPP licensee's TSO, do you know if there are any plans for the TSO to obtain one? If so, when?*

Not applicable to VCSNS, since TSO analysis tools are presently in use.

(i) *If an analysis tool is not available, does your TSO perform periodic studies to verify that adequate offsite power capability, including adequate NPP post-trip switchyard voltages (immediate and/or long-term), will be available to the NPP licensee over the projected timeframe of the study?*

(a) *Are the key assumptions and parameters of these periodic studies translated into TSO guidance to ensure that the transmission system is operated within the bounds of the analyses?*

(b) If the bounds of the analyses are exceeded, does this condition trigger the notification provisions discussed in question 1 above?

Not applicable to VCSNS, since TSO analysis tools are presently in use. Specifically, the TSO performs periodic studies for VCSNS in addition to the state estimator and RTCA offsite power analysis tool.

(a) Yes. Although an RTCA tool is available, key assumptions and parameters from periodic studies are translated into TSO guidance.

(b) Yes, grid operation outside the bounds of the key assumptions and parameters from periodic studies does trigger VCSNS notification.

(j) If your TSO does not use, or you do not have access to the results of an analysis tool, or your TSO does not perform and make available to you periodic studies that determine the adequacy of offsite power capability, please describe why you believe you comply with the provisions of GDC 17 as stated above, or describe what compensatory actions you intend to take to ensure that the offsite power system will be sufficiently reliable and remain operable with high probability following a trip of your NPP.

Not applicable to VCSNS, since the TSO utilizes analysis tools and communicates the applicable results to VCSNS.

See the response to Question 1(e) regarding compliance with GDC-17.

3. Use of criteria and methodologies to assess whether the NPP's offsite power system and safety-related components will remain operable when switchyard voltages are inadequate.

(a) If the TSO notifies the NPP operator that a trip of the NPP, or the loss of the most critical transmission line or the largest supply to the grid would result in switchyard voltages (immediate and/or long-term) below TS nominal trip setpoint value requirements (including NPP licensees using allowable value in its TSs) and would actuate plant degraded voltage protection, is the NPP offsite power system declared inoperable under the plant TSs? If not, why not?

Yes; VCSNS operators will declare the offsite power system inoperable for an RTCA violation on VCSNS's off site sources resulting from postulating a unit trip. This action will take place after analysis and verification that determines the predicted offsite power to be inadequate to meet procedure requirements.

The off-site sources are the VCSNS 230KV and Parr 115KV buses.

1. Any source that is actually outside its requirements (for voltage, frequency, or carrying capacity) is inoperable.

2. Any source must be declared inoperable if it would be outside its requirements for the postulated loss of the main generator.

3. To cause inoperability, a single postulated failure (other than "loss of VCSNS main generator") must impact both offsite sources. Any single postulated failure (other than "loss of VCSNS main generator") impacting only one offsite source will cause an increase in risk, but not inoperability.

(b) *If onsite safety-related equipment (e.g., emergency diesel generators or safety-related motors) is lost when subjected to a double sequencing (LOCA with delayed LOOP event) as a result of the anticipated system performance and is incapable of performing its safety functions as a result of responding to an emergency actuation signal during this condition, is the equipment considered inoperable? If not, why not?*

Yes. If onsite safety related equipment is lost (as governed by plant Technical Specifications), then the equipment is declared inoperable. Double sequencing is not in the VCSNS licensing basis and VCSNS is not designed or analyzed for double sequencing scenarios.

(c) *Describe your evaluation of onsite safety-related equipment to determine whether it will operate as designed during the condition described in question 3(b).*

No specific evaluation has been performed as described above; however, the ESF loading sequencer has been designed and tested with the required logic to load the respective ESF bus for a sequential occurrence of LOOP and SI.

(d) *If the NPP licensee is notified by the TSO of other grid conditions that may impair the capability or availability of offsite power, are any plant TS action statements entered? If so, please identify them.*

No. Technical Specifications are not entered for other grid conditions that might occur. Risk management is performed for those occasions where the TSO informs VCSNS that in their judgment there is an elevated risk of LOOP.

(e) *If you believe your plant TSs do not require you to declare your offsite power system or safety-related equipment inoperable in any of these circumstances, explain why you believe you comply with the provisions of GDC 17 and your plant TSs, or describe what compensatory actions you intend to take to ensure that the offsite power system and safety-related components will remain operable when switchyard voltages are inadequate.*

Not applicable. Refer to response 1(e) and 3(a) above.

(f) Describe if and how NPP operators are trained and tested on the compensatory actions mentioned in your answers to questions 3(a) through (e).

VCSNS operators are trained on operability determinations due to degraded grid conditions and subsequent compensatory actions. Operators are trained on the following procedures in Licensed Operator Requalification:

- Classroom training on System Operating Procedure (SOP) -304, Enclosure A, which identifies the off-site bus voltage requirements for determining operability.
- Classroom and the simulator training on the draft procedure AOP-301.1, Response to Grid Issues, is in progress and will be completed by 4/6/2006 for all operating crews. This training covers communication with the TSO, the voltage operability tables in SOP-304, Enclosure A, and risk management issues in OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment. Additionally, this training covers the essential elements of the NTSIA, notification from the TSO of changing grid conditions (real-time and RTCA), off site power supply operability determination and compensatory actions, control of VARS in major grid events with large grid voltage changes, operation of the Power System Stabilizer, and degraded grid conditions.

AOP-301.1 Response to Grid Issues will be added to the base curriculum for RO and SRO initial programs, when it is approved.

When AOP-301.1 is approved test items will be developed to examine operators on degraded grid conditions and appropriate follow-up actions.

4. Use of criteria and methodologies to assess whether the offsite power system will remain operable following a trip of your NPP.

(a) Do the NPP operators have any guidance or procedures in plant TS bases sections, the final safety analysis report, or plant procedures regarding situations in which the condition of plant-controlled or -monitored equipment (e.g., voltage regulators, auto tap changing transformers, capacitors, static VAR compensators, main generator voltage regulators) can adversely affect the operability of the NPP offsite power system? If so, describe how the operators are trained and tested on the guidance and procedures.

Yes. Procedural guidance is available to VCSNS operators on the operation of the load tap changers for the 115KV offsite source, and the requirements for the main generator voltage regulator and Power System Stabilizer.

Operators are trained to operate equipment in accordance with approved procedures. This would apply to the operation the main generator within the approved operating limits, operation of XTF 6 (load tap changer for the 115KV off-site source), and operation of the Power System Stabilizer.

Operators are trained on the following procedures in Licensed Operator Requalification:

- Classroom training on OAP-100.4 Communication; which describes the communications between VCSNS and the TSO, when plant equipment which could adversely affect the operability of offsite power supplies, are taken out of service.
- Classroom and the simulator training on the draft procedure AOP-301.1, Response to Grid Issues, is in progress and will be completed by 4/6/2006 for all operating crews. This training covers communication with the TSO, the voltage operability tables in SOP-304, Enclosure A, and risk management issues in OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment. Additionally, this training covers the essential elements of the NTSIA, notification from the TSO of changing grid conditions (real-time and RTCA), off site power supply operability determination and compensatory actions, control of VARS in major grid events with large grid voltage changes, operation of the Power System Stabilizer, and degraded grid conditions.

OAP-100.4, Communication is in the base curriculum for RO and SRO initial programs. AOP-301.1 Response to Grid Issues will be added to the base curriculum for RO and SRO initial programs, when it is approved.

When AOP-301.1 is approved test items will be developed to examine operators on degraded grid conditions and appropriate follow-up actions.

(b) *If your TS bases sections, the final safety analysis report, and plant procedures do not provide guidance regarding situations in which the condition of plant-controlled or -monitored equipment can adversely affect the operability of the NPP offsite power system, explain why you believe you comply with the provisions of GDC 17 and the plant TSs, or describe what actions you intend to take to provide such guidance or procedures.*

Not applicable, guidance is provided in plant procedures as described in the response to 4(a).

5. *Performance of grid reliability evaluations as part of the maintenance risk assessments required by 10 CFR 50.65(a)(4).*

(a) *Is a quantitative or qualitative grid reliability evaluation performed at your NPP as part of the maintenance risk assessment required by 10 CFR 50.65(a)(4) before performing grid-risk-sensitive maintenance activities? This includes surveillances, post-maintenance testing, and preventive and corrective maintenance that could increase the probability of a plant trip or LOOP or impact LOOP or SBO coping capability, for example, before taking a risk-significant piece of equipment (such as an EDG, a battery, a steam-driven pump, an alternate AC power source) out-of-service?*

Yes. The VCSNS operator contacts the TSO immediately prior to taking a Grid Risk-Sensitive (GRS) component out of service. 10CFR 50.65(a)(4) requires performance of a risk assessment prior to maintenance activities. Maintenance is defined broadly and would include surveillances, post maintenance testing, and preventive and corrective maintenance. Relative to increasing the initiating event frequency, such as the frequency of a plant trip, the industry guidance, NUMARC 93-01 (endorsed without exception by NRC Regulatory Guide 1.182), states in Section 11.3.2.2 that the following should be considered:

- The likelihood of an initiating event or accident that would require the performance of the affected safety function.

- The likelihood that the maintenance activity will significantly increase the frequency of a risk-significant initiating event (e.g., by an order of magnitude or more as determined by each licensee, consistent with its obligation to manage maintenance-related risk).

The first bullet above is generally met by using the PRA and associated configuration risk management tools, which explicitly consider initiating event frequencies for transients and accidents. LOOP sequences are important elements of PRAs, and are thoroughly modeled and assessed during plant peer reviews. Risk management personnel are sensitized to the importance of these sequences.

The second bullet clarifies that if a maintenance activity is expected to increase initiating-event likelihood by an order of magnitude, then it should be considered in the assessment. Otherwise, the baseline initiating event frequencies may be used. These frequencies are based on generic data updated with plant specific data, and would take into account the plant specific LOOP and trip frequencies.

(b) *Is grid status monitored by some means for the duration of the grid-risk-sensitive maintenance to confirm the continued validity of the risk assessment and is risk reassessed when warranted? If not, how is the risk assessed during grid-risk-sensitive maintenance?*

Yes. The protocols set forth for communication between the TSO and VCSNS ensure that grid risk is monitored at all times.

NUMARC 93-01 does not define "grid-risk-sensitive maintenance", so there is no unique guidance for such activities. The following guidance is included in Section 11.3.2.8 (emphasis added):

Emergent conditions may result in the need for action prior to conduct of the assessment, or could change the conditions of a previously performed assessment. Examples include plant configuration or mode changes, additional SSCs out of service due to failures, or significant changes in external conditions

(weather, offsite power availability). The following guidance applies to this situation:

- The safety assessment should be performed (or re-evaluated) to address the changed plant conditions on a reasonable schedule commensurate with the safety significance of the condition. Based on the results of the assessment, ongoing or planned maintenance activities may need to be suspended or rescheduled, and SSCs may need to be returned to service.

- Performance (or re-evaluation) of the assessment should not interfere with, or delay, the operator and/or maintenance crew from taking timely actions to restore the equipment to service or take compensatory actions.

- If the plant configuration is restored prior to conducting or re-evaluating the assessment, the assessment need not be conducted, or re-evaluated if already performed.

(c) *Is there a significant variation in the stress on the grid in the vicinity of your NPP site caused by seasonal loads or maintenance activities associated with critical transmission elements? Is there a seasonal variation (or the potential for a seasonal variation) in the LOOP frequency in the local transmission region? If the answer to either question is yes, discuss the time of year when the variations occur and their magnitude.*

EPRI document TR-1011759 (Frequency Determination Method for Cascading Grid Events) dated December 2005, has shown that there is no statistically significant seasonal-regional variation in recorded grid-centered LOOP events from 1997 through 2003 because of the small number of grid-centered LOOP events during this period.

However, NRC information notice 2006-006 states that plant-specific LOOP frequencies change significantly based on regional uniqueness resulting from seasonal generating and transmission limitations. The information notice also states that the overall LOOP frequency is more than twice as high during the summer compared to the annual average.

Discussions at VCSNS have included the idea that grid loss may actually be more likely during periods of light grid loading because one large generating unit loss could have a bigger impact during these periods.

VCSNS has not conducted studies to determine if there is seasonal variation in the local regional LOOP frequency. Currently, VCSNS does not change the LOOP frequency in the Configuration Risk Management model based on seasonal variation. However, this may be done in the future if region-specific studies or standard industry practice indicates that this is prudent.

(d) *Are known time-related variations in the probability of a LOOP at your plant site considered in the grid-risk-sensitive maintenance evaluation? If not, what is your basis for not considering them?*

As part of VCSNS's configuration risk management program, time-related variations (e.g., grid instability, severe weather) are considered a configuration change. They are evaluated as appropriate. There is no known predictable pattern of time-related variations in our risk.

Severe weather is routinely considered within the Configuration Risk Management (CRM) model.

Switchyard maintenance and test activities are routinely considered within the CRM model.

VCSNS's CRM program procedures require increased controls on maintenance during the described conditions. Risk is not usually calculated solely due to changes in grid reliability and is assessed in conjunction with plant equipment being out of service.

According to preliminary work by the Westinghouse Owners Group, there is no statistically significant time-of-day or day-of-week variation in the frequency of LOOP at nuclear power plants. This is largely a result of a small number of LOOP events. The analysis has yet to normalize factors such as:

- Most tasks are done on the day-shift.
- Most tasks are performed from Monday to Friday.

Thus, the risk assessment for the purposes of 10CFR50.65(a)(4) does not vary the LOOP frequency strictly as a function of "time-related" issues.

(e) *Do you have contacts with the TSO to determine current and anticipated grid conditions as part of the grid reliability evaluation performed before conducting grid-risk-sensitive maintenance activities?*

Yes. The TSO relies on Contingency Analysis tools for evaluating requested transmission and generator scheduled outages. Typically, the TSO has the ability to take snapshots of the State Estimator program and use tomorrows forecasted peak load to study tomorrow's requested outages. The TSO sets up a power flow case to represent the day-ahead peak load conditions and perform a contingency analysis to verify that outage schedules would not threaten grid reliability. Although loads and generation on the power-grid are dynamic, the TSO is still able to evaluate the effect of scheduled outages on the grid conditions before maintenance tasks commence. The TSO can provide commentaries on grid conditions at anytime maintenance tasks are underway.

The same dynamic nature of loads and active generation make prediction of grid conditions days or weeks ahead of time highly uncertain.

The control room is required to contact the TSO immediately prior to starting any GRS activity, to ensure the planned conditions still prevail.

(f) *Describe any formal agreement or protocol that you have with your TSO to assure that you are promptly alerted to a worsening grid condition that may emerge during a maintenance activity.*

Notification occurs whether or not maintenance is on-going. The type of alerts provided to the VCSNS conforms to the accepted practice promulgated by the NERC. Important alerts such as the one suggested by this question would be made to all generators in the control area.

Agreements are in place to establish the interfaces between the grid operators and the VCSNS operators. The agreements, along with the operating procedures used by the grid operators, ensure that early notification of worsening grid conditions take place. This occurs whether or not a specific maintenance activity is in progress at VCSNS.

With respect to potential grid problems which may be anticipated in advance, the agreement requires both daily and weekly communications between VCSNS operations and the TSO to:

- Discuss the status of VCSNS and the transmission system.
- Review upcoming work activities.
- Discuss the operating conditions scheduled or anticipated for the next 3 days and the next 17 days.

This communication provides a means for the grid and VCSNS operators to know what is going on with each others systems.

With respect to potential grid problems which may occur with little or no advance warning, the TSO is in a unique position to anticipate and assess grid problems via information obtained from:

- The grid SCADA System.
- Communications with field personnel.
- Communications with neighboring utilities.
- Timely reports from various weather services.

Implementing procedures require that the TSO monitor system conditions and promptly notify VCSNS operations of any existing or anticipated conditions that would result in inadequate voltage support.

See the answer to 1(b).

(g) Do you contact your TSO periodically for the duration of the grid-risk-sensitive maintenance activities?

The TSO is contacted daily and weekly and GRS items are discussed at that time.

(h) If you have a formal agreement or protocol with your TSO, describe how NPP operators and maintenance personnel are trained and tested on this formal agreement or protocol.

Operators are trained on the essential elements of the NTSIA and the station implementing procedures.

Operators are trained on the following procedures in Licensed Operator Requalification:

- Classroom training on OAP-100.4 Communication; which describes the communications between VCSNS and the TSO.
- Classroom and the simulator training on the draft procedure AOP-301.1, Response to Grid issues, is in progress and will be completed by 4/6/2006 for all operating crews. This training covers communication with the TSO, the voltage operability tables in SOP-304, Enclosure A, and risk management issues in OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment. Additionally, this training covers the essential elements of the NTSIA, notification from the TSO of changing grid conditions (real-time and RTCA), off site power supply operability determination and compensatory actions, control of VARS in major grid events with large grid voltage changes, operation of the Power System Stabilizer, and degraded grid conditions.

OAP-100.4, Communication is in the base curriculum for RO and SRO initial programs. AOP-301.1 Response to Grid Issues will be added to the base curriculum for RO and SRO initial programs, when it is approved.

Decisions to remove equipment from service to conduct maintenance are made by Operations personnel. The equipment is then turned over to maintenance personnel to conduct maintenance. As a result, the focus of the training is directed to Operations personnel. However, training on the NTSIA will be conducted with electrical maintenance personnel and planning and scheduling personnel, to ensure the essential elements of the agreement are understood by plant personnel who plan and schedule work activities that could impact grid reliability. This training will be conducted by May 1, 2006.

When AOP-301.1 is approved, test items will be developed to examine operators on degraded grid conditions and appropriate follow-up actions.

(i) *If your grid reliability evaluation, performed as part of the maintenance risk assessment required by 10 CFR 50.65(a)(4), does not consider or rely on some arrangement for communication with the TSO, explain why you believe you comply with 10 CFR 50.65(a)(4).*

Not applicable.

(j) *If risk is not assessed (when warranted) based on continuing communication with the TSO throughout the duration of grid-risk-sensitive maintenance activities, explain why you believe you have effectively implemented the relevant provisions of the endorsed industry guidance associated with the maintenance rule.*

Not applicable.

(k) *With respect to questions 5(i) and 5(j), you may, as an alternative, describe what actions you intend to take to ensure that the increase in risk that may result from proposed grid-risk-sensitive activities is assessed before and during grid-risk-sensitive maintenance activities, respectively.*

Not applicable, no alternative actions.

6. *Use of risk assessment results, including the results of grid reliability evaluations, in managing maintenance risk, as required by 10 CFR 50.65(a)(4).*

(a) *Does the TSO coordinate transmission system maintenance activities that can have an impact on the NPP operation with the NPP operator?*

Yes, the TSO and VCSNS coordinate GRS maintenance activities. This is done in advance via OAP-100.4. The TSO verifies that VCSNS is not in a GRS condition immediately prior to initiating GRS work items under the direction of the TSO.

(b) *Do you coordinate NPP maintenance activities that can have an impact on the transmission system with the TSO?*

Yes, VCSNS GRS activities are coordinated with the TSO both in the planning stage and immediately prior to starting the work. This is accomplished via OAP 100.4.

(c) *Do you consider and implement, if warranted, the rescheduling of grid-risk-sensitive maintenance activities (activities that could (i) increase the likelihood of a plant trip, (ii) increase LOOP probability, or (iii) reduce LOOP or SBO coping capability) under existing, imminent, or worsening degraded grid reliability conditions?*

Yes. Although rescheduling is not in the Maintenance Rule definitions, the risk informed Maintenance Rule allows many choices for VCSNS.

Emergent issues with the grid are managed to maintain a high level of plant safety. At times appropriate management means rescheduling activities, at other times the shift-supervisor will order the on-shift plant staff to back-out of the task and restore the safety-related function of the equipment.

(d) *If there is an overriding need to perform grid-risk-sensitive maintenance activities under existing or imminent conditions of degraded grid reliability, or continue grid-risk-sensitive maintenance when grid conditions worsen, do you implement appropriate risk management actions? If so, describe the actions that you would take. (These actions could include alternate equipment protection and compensatory measures to limit or minimize risk.)*

Yes. The plant CRM tool is used to model degraded grid conditions and impacting equipment. Prior to authorizing work, the CRM tool is reviewed to ensure conditions have not changed such that an activity would result in a moderate or elevated risk level. Increasing risk levels require increasing levels of management involvement and approval. In such cases, compensatory measures may be used to limit or minimize risk.

Refer to the response for 6.c.

(e) *Describe the actions associated with questions 6(a) through 6(d) above that would be taken, state whether each action is governed by documented procedures and identify the procedures, and explain why these actions are effective and will be consistently accomplished.*

As described above, increasing levels of management approval are required for increasing risk levels in the CRM tool. These approval levels are specified in OAP-102.01 Conduct of the Operations Scheduling Unit.

OAP-100.6 Control Room Conduct and Control of Shift Activities, specifies that the Work Authorizer and the Tagout Authorizer should review the CRM tool prior to tagout or work release. Also, the Shift Supervisor relief checklist in OAP-100.6 has shift supervisors initial that the CRM tool status agrees with actual plant status for shift turnover.

Other procedures associated with the Maintenance Rule are in SAP-0157, Maintenance Rule Program, OAP-100.4, Communications, OAP-100.5, Giudelines for Configuration control and Operation of Plant Equipment OAP-102.1, Conduct of Operations Scheduling Unit, ES-0514, Maintenance Rule Program Implementation, SSP-001, Planning and Scheduling On-Line Maintenance Activities, and SSP-007, Twelve Week Planning Process.

Implementation of these procedures will ensure effective and consistent implementation of GRS activities.

(f) *Describe how NPP operators and maintenance personnel are trained and tested to assure they can accomplish the actions described in your answers to question 6(e).*

Operators are trained on the use of risk assessment results when managing maintenance risk.

Operators are trained on the following procedures in Licensed Operator Requalification:

- Classroom training on OAP-100.4 Communication; which describes the use of risk assessment tools for when managing maintenance risk.
- Classroom and the simulator training on the draft procedure AOP-301.1, Response to Grid Issues, is in progress and will be completed by 4/6/2006 for all operating crews. This training covers communication with the TSO, the voltage operability tables in SOP-304, Enclosure A, and risk management issues in OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment. Additionally, this training covers the essential elements of the NTSIA, notification from the TSO of changing grid conditions (real-time and RTCA), off site power supply operability determination and compensatory actions, control of VARS in major grid events with large grid voltage changes, operation of the Power System Stabilizer, and degraded grid conditions.
- Classroom training on OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment, which describes using EOOS for managing risk associated with switchyard work.

OAP-100.4, Communication, OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment are in the base curriculum for RO and SRO initial programs. AOP-301.1 Response to Grid Issues will be added to the base curriculum for RO and SRO initial programs, when it is approved.

Decisions to remove equipment from service to conduct maintenance are made by Operations personnel. Risk management tools as described in OAP-100.5, Guidelines for Configuration Control and Operation of Plant Equipment, are used when making these decisions. The equipment is then turned over to

maintenance personnel to conduct maintenance. As a result the focus of the training is directed to Operations personnel. The need for training of maintenance personnel on this topic will be evaluated by July 1, 2006.

When AOP-301.1 is approved, test items will be developed to examine operators on degraded grid conditions and appropriate follow-up actions.

(g) *If there is no effective coordination between the NPP operator and the TSO regarding transmission system maintenance or NPP maintenance activities, please explain why you believe you comply with the provisions of 10 CFR 50.65(a)(4).*

Not applicable. There is effective coordination between the VCSNS operator and the TSO regarding transmission system maintenance or VCSNS maintenance activities. Such coordination is in accordance with the protocols.

(h) *If you do not consider and effectively implement appropriate risk management actions during the conditions described above, explain why you believe you effectively addressed the relevant provisions of the associated NRC-endorsed industry guidance.*

Not applicable. As discussed in questions 6(a)-6(d), VCSNS effectively implements appropriate risk management actions.

(i) *You may, as an alternative to questions 6(g) and 6(h) describe what actions you intend to take to ensure that the increase in risk that may result from grid-risk-sensitive maintenance activities is managed in accordance with 10 CFR 50.65(a)(4).*

Not applicable. No alternative actions.

7. *Procedures for identifying local power sources[1] that could be made available to resupply your plant following a LOOP event.*

Note:Section 2, "Offsite Power," of RG 1.155 (ADAMS Accession No. ML003740034) states:

> *Procedures should include the actions necessary to restore offsite power and use nearby power sources when offsite power is unavailable. As a*

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[1] This includes items such as nearby or onsite gas turbine generators, portable generators, hydro generators, and black-start fossil power plants.

minimum, the following potential causes for loss of offsite power should be considered:

- Grid under-voltage and collapse
- Weather-induced power loss
- Preferred power distribution system faults that could result in the loss of normal power to essential switchgear buses

(a) *Briefly describe any agreement made with the TSO to identify local power sources that could be made available to re-supply power to your plant following a LOOP event.*

Existing plant procedures and commitments are adequate and addressed in the NTSIA. The TSO has a System Restoration procedure for use during blackstart conditions. There are some pre-determined desirable plant and path options for supplying power to VCSNS. There are options for both the 230kv grid and the 115kv grid. These include local hydro generators. The TSO will utilize the best sources available for specific events to restore offsite power and to determine the specific power sources and paths, since there is no way to predict the extent and characteristics of a specific blackout. The TSO has many options available to restore offsite power and would not be limited to identified local power sources.

The procedure specifies various means of accomplishing the required power restoration. TSO personnel train on this procedure annually per NERC training requirements.

(b) *Are your NPP operators trained and tested on identifying and using local power sources to resupply your plant following a LOOP event? If so, describe how.*

VCSNS operators are trained on procedures for off-site power recovery. Operators are trained on the following procedure in Licensed Operator Requalification:

- Classroom and simulator training on Emergency Operations Procedure (EOP) -6.0, Loss of All ESF AC Power. This procedure has operators contact the TSO to restore power to the VCSNS using their procedure for system restoration.

EOP-6.0, Loss of All ESF AC Power is in the base curriculum for RO and SRO initial programs.

Operators are tested on the contents of EOP-6.0; however they have not been specifically tested on communications with the TSO. When AOP-301.1 Response to Grid Issues, is approved, test items will be developed to examine Operators on degraded grid conditions and appropriate follow-up actions.

(c) *If you have not established an agreement with your plant's TSO to identify local power sources that could be made available to resupply power to your plant following a LOOP event, explain why you believe you comply with the provisions of 10 CFR 50.63, or describe what actions you intend to take to establish compliance.*

Not applicable; an agreement exists.

8. *Maintaining SBO coping capabilities in accordance with 10 CFR 50.63.*

(a) *Has your NPP experienced a total LOOP caused by grid failure since the plant's coping duration was initially determined under 10 CFR 50.63?*

VCSNS experienced a loss of offsite power to the ESF buses on July 11, 1989 (reference LER 89-012). The final NRC Safety Evaluation Report (SER) for our Station Blackout submittal was received on June 1, 1992. The cause of the event was attributed to a grid disturbance caused by a trip of VCSNS along with additional contributing factors which subsequently resulted in a degraded voltage condition on the offsite power sources.

(b) *If so, have you reevaluated the NPP using the guidance in Table 4 of RG 1.155 to determine if your NPP should be assigned to the P3 offsite power design characteristic group?*

No reevaluation has occurred to determine if the SBO coping duration should change.

(c) *If so, what were the results of this reevaluation, and did the initially determined coping duration for the NPP need to be adjusted?*

Not applicable; no reevaluation was performed.

(d) *If your NPP has experienced a total LOOP caused by grid failure since the plant's coping duration was initially determined under 10 CFR 50.63 and has not been reevaluated using the guidance in Table 4 of RG 1.155, explain why you believe you comply with the provisions of 10 CFR 50.63 as stated above, or describe what actions you intend to take to ensure that the NPP maintains its SBO coping capabilities in accordance with 10 CFR 50.63.*

Since the event, discussed in 8(a) above, corrective actions have been completed to minimize the probability of a similar occurrence in the future. In addition, system stability studies performed by SCE&G Transmission Planning indicate the grid does not become unstable for a trip of VCSNS at peak loading

conditions as experienced on July 11, 1989. VCSNS has not experienced any additional LOOP events in more than 20 years of operation.

VCSNS complies with the applicable regulations as discussed in the original Safety Evaluation Report (SER) dated January 30, 1992 and the supplemental SER dated June 1, 1992.

9. *If you determine that any action is warranted to bring your NPP into compliance with NRC regulatory requirements, including TSs, GDC 17, 10 CFR 50.65(a)(4), 10 CFR 50.63, 10 CFR 55.59 or 10 CFR 50.120, describe the schedule for implementing it.*

Not applicable. VCSNS has determined that no actions are required or warranted to bring the plant into compliance with NRC regulations.