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March 30, 2006

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

Subject: Duke Energy Corporation
Oconee Nuclear Station, Units 1, 2, and 3
Docket Nos. 50-269, 50-270, 50-287
McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369, 50-370
Catawba Nuclear Station, Units 1 and 2
Docket Nos. 50-413, 50-414
Response to NRC Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power

On February 1, 2006, the NRC issued Generic Letter (GL) 2006-02. The NRC issued this GL to determine if compliance is being maintained with NRC regulatory requirements governing electric power sources and associated personnel training.

Pursuant to 10 CFR 50.54(f), Duke's 60 day response to GL 2006-02 is provided in Attachment 1.

Please note that Duke responses to GL 2006-02 questions 1(b), 2(a), 2(b), 2(c), 2(d), 2(e), 2(f), 2(i), 2(j), 6(a) and 7(a) provide information about analyses, procedures, and activities concerning grid reliability that have been provided by the Power Delivery Department of Duke in response to the request of the Duke nuclear power plants. The Power Delivery Department operates under requirements and procedures that are different than those of the Duke nuclear power plants.

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This correspondence contains no regulatory commitments. If any questions arise or additional information is needed, please contact M. J. Archambo at (704) 382-7075 or R. L. Gill, Jr. at (704) 382-3339.

Very truly yours,

Dhiaa M. Jamil

Attachment

Dhiaa M. Jamil affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

Dhiaa M. Jamil

Subscribed and sworn to me: 3/30/06
Date

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My Commission Expires: 7/2/2014
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Attachment 1
Duke Power Company
Response to GL 2006-02

Use of protocols between the NPP licensee and the TSO, ISO, or RC/RA and the use of analysis tools by TSOs to assist NPP licensee in monitoring grid conditions to determine the operability of offsite power systems under plant Technical Specifications.

GDC 17, 10 CFR Part 50, Appendix A, requires that licensees minimize the probability of the loss of power from the transmission network given a loss of the power generated by the nuclear power unit(s).

Question 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 Technical Specifications.

Question 1(a)
Do you have a formal agreement or protocol with your TSO?

Duke Response
Yes. Duke Power Company is a regulated, vertically integrated utility with regards to its Electric Generation and Transmission operations. Duke Power's Nuclear Generation Department (NGD) (i.e., Catawba, McGuire and Oconee Nuclear Power Plants (NPPs)) has established a formal agreement with the TSO, which is Duke Power's Power Delivery (PD) Department. (NOTE: Duke's PD Department includes the Transmission Control Center (TCC) and (Transmission) System Operating Center (SOC) and Transmission Planning and Grid Operations). The agreement is documented in the Service Level Agreement (SLA) document titled "Service Level Agreement between Power Delivery, Nuclear Generation, Fossil hydro Support Services (FHSS), I/M Telecommunications" and it is supplemented by other related Department Directives.

Question 1(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.

Duke Response
Duke Power TSO operators are required to notify the Duke NPP operators, whenever a degraded or potentially degraded grid condition is recognized. Specific examples of known degraded or potentially degrading conditions include the following:

- Loss of a Critical Transmission Line and/or Transformer
- Trip of any one Nuclear Power Plant Unit
- Trip of the largest non-Nuclear Power Plant Unit in the Control Area
- NERC Energy Emergency Alerts
- NPP voltage support problems

Such TSO to NPP communications have been applied when any of the Duke NPP Units or other Duke large non-NPP Units have tripped.

The occurrence of a grid contingency related event that impacts the operation of the NPPs, requires the TSO to notify the NPP operator as soon as the condition is identified and confirmed. In any event, such a notification occurs in no later than 30 minutes.

Normal day to day operational communications between the TSO and NPP include topics such as

- Work coordination,
- Switching,
- Generation dispatch, and
- Planning.

Question 1(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.

Duke Response
Monitoring grid conditions and status are primarily the responsibility of Duke Power's TSO. The NPP's Operator Aid Computers (OAC) have alarm points that monitor switchyard voltage, frequency, Unit MWe & MVAR output, line power circuit breaker (PCB) status, line status, and certain alarms for certain switchyard equipment conditions. OAC voltage alarm setpoint values have been determined by Engineering in order to indicate whether grid conditions may not be able to supply sufficient post-trip voltage requirements to safety related equipment in the event of a LOCA. Alarm Response Procedures (ARP) for these OAC alarm points direct the NPP operators to contact the TSO and request a status of the most current contingency analysis for existing grid conditions. If the results of the contingency analysis indicate that

insufficient voltage would exist to the NPP switchyard, then the NPP operators are directed by the OAC ARP to enter the applicable procedures (e.g. Abnormal Procedure (AP) for degraded grid conditions.)

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

Duke Response
NPP operators received training on the procedures for degraded grid conditions when they were developed and issued. When the OAC computer alarm responses were revised, NPP Senior Reactor Operators (SROs), on each operating crew, were briefed on how to respond to adverse contingency analysis results communicated from the TSO.

Information was added to the appropriate NPP Operator training lesson plans and simulator scenarios were developed. Frequencies of these topics/scenarios are determined using a systematic approach to training process.

Question 1(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.

Duke Response
Duke Power NPPs have instituted a formal Service Level Agreement (SLA) and related Department Directives with the TSO. Therefore, this question is NOT APPLICABLE.

Question 1(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).

Duke Response
As previously stated, Duke Power's NPPs have instituted a formal Service Level Agreement (SLA) and related Department Directives that serve as the communications protocol with the TSO. These documents ensure adequate and prompt communications between the TSO and NPP.

Prompt notification and a pre-trip analysis of what the post-trip voltage will be at the NPP switchyard are included in the Service Level Agreement (SLA) and related Department Directives that dictate TSO Communications requirements.

Question 1(g)
Describe the low switchyard voltage conditions that would initiate operation of plant degraded voltage protection.

Duke Response
The Duke Power NPP's Degraded Voltage Protection is initiated by a low or no switchyard voltage condition concurrent with the voltage at the essential bus(s) dropping to below the Degraded Voltage relay dropout setpoint. The minimum switchyard voltage that is required to ensure minimum NPP voltage recovery, following start of post-LOCA loads and Degraded Voltage dropout and reset setpoints, are determined and documented by NPP calculations.

Question 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.

Question 2(a)
Does your NPP's TSO use <u>any analysis tools</u>, 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?
<u>If available</u> to you, please provide a brief description of the analysis tool that is used by the TSO.

Duke Response
Yes. Duke Power's TSO makes use of grid analysis tools to predict grid conditions that would identify potential offsite power system inadequacies, which are communicated to the NPP operators so that they can determine NPP offsite power supply OPERABILITY. The TSO has grid analysis tools with back up capability to determine contingency analysis of grid conditions.

Such tools include the following:
- Contingency analysis program
- Grid state estimator
- Real time pre- and post- contingency NPP switchyard bus voltage alarms

The contingency analysis program simulates transmission system element outages and provides the TSO Operator an alarm and a report, which may exceed defined alarm limits if the contingency was to occur.

The contingency analysis program simulates single transmission system contingencies such as:

- Trip of the NPP generator with LOCA loads applied
- Trip of another large generator
- Trip of an important transmission line or transformer

The TSO's pre- and post- contingency NPP switchyard bus voltage alarms are developed by a bounding analysis study, which is performed by a collaborated effort between the TSO and NPP engineering staff.

These same pre- and post- contingency NPP switchyard bus voltage alarms are simultaneously and in real time monitored by the NPP Operators, using the Operator Aid Computer (OAC) and accompanied alarm response procedures and processes.

Question 2(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?

Duke Response
Yes. Duke Power's TSO uses grid analysis tools, as stated in 2(a) above, in conjunction with a TSO developed work place procedure "Grid Operations Procedure TCC/SOC Low voltage at a NPP SWYD Response Procedure," as the basis for determining when grid conditions, such as the ones stated in the response to question 1(b) above, warrant notification to the NPP operators. The established Service Level Agreement (SLA) and related Department Directives identify the communications requirements between the TSO and the NPP operators.

Question 2(c)
If your TSO uses an analysis tool, would the analysis tool <u>identify a condition</u> in which a trip of the NPP would result in switchyard voltages (<u>immediate and/or long-term</u>) 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.

Duke Response
Yes. Duke Power's TSO grid analysis tools (e.g., state estimators, contingency analysis tools, etc.), in conjunction with NPP engineering analysis identifies conditions which could actuate the NPP's Degraded Voltage Protection Logic. This NPP's Degraded Voltage Protection Logic is based upon actual operating voltages with consideration of margins and contingencies. The setpoints of the NPPs Degraded Voltage Protection Logic are bounded by TS nominal trip setpoint requirements.

The TSO is aware of the voltage values (or conditions) and component (e.g., breaker, line, transformer, etc.) status in the NPPs' Switchyards. Typically, Duke Power's TSO does not know the voltage conditions inside the NPPs, but is made aware of critical conditions via communications from the NPP operator.

The use of state estimators and contingency analysis tools only project final states; there is no assurance that during a transient that results from a contingency, the grid will not reach the under-voltage or degraded voltage settings at the NPP switchyard. The voltage value that is used to determine contingency violations is established to be above the degraded voltage setpoint to allow for this transient.

Question 2(d)
If your TSO uses an analysis tool, how frequently does the analysis tool program update?

Duke Response
Duke Power's TSOs Supervisory Control and Data Acquisition (SCADA) information, which is only available to the TSO Operator, provides switchyard bus voltage and presently auto-updates on a once per every 4 second basis for Generator parameters (i.e., Generator Amps, MW, MVAR and KV readings), and on a once per every 10 second basis for Switchyard parameters (i.e., Switchyard Breaker Amps, Switchyard Bus KV, and Transmission Line/Transformer Amps, MW, and MVAR readings).

Duke Power's TSO contingency analysis tools presently provide automatic updates on a once per 10-minute basis or manual updates on a per requested basis.

The analysis of the NPP Switchyard bus voltage alarm levels is reviewed and updated periodically, or on an as needed basis by the TSO. The established Service Level Agreement and related Department Directives require that the NPP provides the TSO with the calculated minimum acceptable degraded grid voltage values and associated NPP load conditions, for each NPP, at a set periodic frequency. This data is used by the TSO to update its analysis. The SLA and related Department Directives require advance notifications by the TSO to the NPP regarding any planned changes to the grid which are local to the NPP.

Question 2(e)
Provide <u>details</u> of analysis tool-identified contingency <u>conditions</u> that would trigger an NPP licensee notification from the TSO.

Duke Response
The notification from the Duke Power TSO is based upon the predicted post-trip voltage at the NPP switchyard, which is determined by the TSO using information from its grid contingency analysis tool. Refer to response 1(b) for contingency conditions. Also refer to response 2(a) for grid contingency analysis tools.

Question 2(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?

Duke Response
The current Service Level Agreement and related Department Directives do not direct the TSO to notify the NPP operator when the available grid analysis tools are out of service. The reason that this communication is not a requirement is based on the availability of various tools that have a demonstrated and proven availability and reliability record. The defense-in-depth of available grid analysis tools is outlined in the response 2(a).

In addition, the NPP operator aid computer (OAC) alarm monitoring points on switchyard voltages would typically still be available to the NPP operator to monitor for indications of potential problems with the NPP switchyard voltage. NPP operators monitor their switchyard voltages and enter appropriate procedures as necessary upon receipt of low voltage alarms.

The NPP procedures do not address the unavailability of the TSO tools.

Question 2(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?

Duke Response
No. Neither the NPP nor TSO have any procedurally driven requirements to verify NPP switchyard voltages following a Unit trip.

Question 2(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?

Duke Response
Duke Power's TSO does use contingency analysis tool(s). Therefore, this question is NOT APPLICABLE.

Question 2(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?

Duke Response
Duke Power's TSO uses grid analysis tool(s). Therefore, this question is NOT APPLICABLE.

Question 2(j)
If your TSO does <u>not</u> 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 <u>comply</u> with the provisions of <u>GDC 17</u> 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.

Duke Response
The available TSO tools are described in the response to Questions 2(a) above. However, compliance with GDC-17 is not dependent on the TSO tools.

Compliance with the GDC-17 "Electric Power Systems" requirements is assured by the existing respective Catawba, McGuire NPP's licensing basis documentation and Technical Specifications (TS). Therefore, compliance with GDC-17 is not predicated on such an agreement with the Duke TSO. (NOTE: Oconee NPP is licensed to AEC-39 in lieu of GDC-17 requirements).

(NOTE: When GDC-17 is referenced throughout this Generic Letter response, it will only be applicable to the McGuire and Catawba NPPs and not to the Oconee NPP. This is because the Oconee NPP was licensed in compliance with the AEC-39 requirements, which preceded the issuance of the GDC-17).

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

Question 3(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?

Duke Response
Yes. When the TSO notifies the NPP operator that the switchyard voltage is inadequate to support required post-trip voltage, then the NPP operators are required by procedure(s) to evaluate offsite power system OPERABILITY.

Under the above stated condition of inadequate switchyard voltage, the NPP will declare the offsite power sources INOPERABLE.

Question 3(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?

Duke Response
Yes, Catawba and McGuire NPPs, in addition to declaring both offsite power sources INOPERABLE under these conditions, enter TS 3.0.3 Action statement because of the potential for double sequencing of ECCS components. Actions are taken to arm the degraded voltage relaying, so that the emergency (ECCS) loads are immediately sequenced to the emergency power sources (Emergency Diesel Generators) in order to eliminate the potential double sequencing scenario, upon receipt of a LOCA signal. The Catawba and McGuire NPPs may not exit the TS 3.0.3 Action statement because of the normal and emergency power requirements on shared systems, contingent upon the established line up of such systems at the time of the event.

Oconee NPP also declares offsite power INOPERABLE under these conditions, and enters TS 3.0.3 because of impact to the applicable ECCS Technical Specifications. However, Oconee NPP exits TS 3.0.3 once the degraded voltage relaying is armed such that upon receipt of a LOCA signal, the emergency loads are immediately aligned to the emergency power source (Keowee) to eliminate the potential for a double sequencing scenario.

Double sequencing is not in the NPP's licensing basis and the NPPs are not designed or analyzed for double sequencing scenarios. However, as previously described, proactive measures are taken at Duke Power NPPs to preclude loss of grid related double sequencing events.

Question 3(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).

Duke Response
The NPP offsite power supply is the preferred power source. Once the NPP receives a TSO notification that the NPP post-trip switchyard voltages are inadequate, then the offsite power system is considered INOPERABLE by the NPP operators and steps are taken by the NPP staff to preclude the potential for double sequencing until the offsite power system is restored to OPERABLE status. During the time of the offsite power system INOPERABILITY, the safety related equipment (i.e. ECCS systems) is considered INOPERABLE until actions that can prevent loss of grid related double sequencing events have been implemented.

Question 3(d)
If the NPP licensee is notified by the TSO of <u>other grid conditions</u> that may impair the capability or availability of offsite power, are any plant TS action statements entered? If so, please identify them.

Duke Response
NPP operators would assess the condition, along with the TSO, and if it is confirmed that the grid condition will imminently impact minimum required switchyard voltages, then applicable TS action statements may be entered at that time, in relation to such notifications. At this time, an immediate NPP evaluation for a potential entry into a TS Action statement is initiated by the NPP operators based on TSO notification to the NPP of confirmed degraded or potentially degraded grid conditions.

The NPP operator declares offsite power INOPERABLE when the predicted post-trip Switchyard voltage is low enough to cause actuation of the Degraded Voltage relays and a consequential LOOP event.

Notification by the TSO to the NPP Operators of other grid conditions, such as projected or actual MW reserve shortages, only prompts a risk assessment of planned work by the NPP, using the Duke Power Electronic Risk Assessment tool.

Postulated contingencies on the transmission grid are not used as a basis for OPERABILITY determinations because:

- Such events are only postulated and have not actually occurred.

- Offsite power circuits remain capable of effecting a safe shutdown and mitigating the effects of an accident.
- GDC 17 criterion discussed in the Generic Letter is still met, (i.e., loss of power from the transmission network would not occur as a result of loss of power generated by the NPP Unit).
- Compliance with GDC-17 is addressed in the response to Question 2(j) above.

Question 3(e)
If you believe your plant TSs do not require you to declare your offsite power system or safety-related equipment inoperable in <u>any</u> of these circumstances, explain why you believe you comply with the provisions of <u>GDC 17</u> 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.

Duke Response
NOT APPLICABLE, as stated in the response to Question 3(c) above.

Question 3(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).

Duke Response
NPP operators received training on the procedures for degraded grid when they were developed and issued. Information on the use of the contingency analyses and its effect on OPERABILITY of the offsite power sources and other required equipment were added to the appropriate NPP operator lesson plans. Simulator training exercises incorporating information on the use of the contingency analysis and its effect on OPERABILITY of the offsite power sources and other required equipment were developed. Training frequencies of these topics/scenarios are determined using a systematic approach to training process.

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

Question 4(a)
Do the NPP operators have <u>any guidance or procedures</u> 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.

Duke Response
Yes, NPP procedures direct monitoring and operation of plant-controlled equipment that could potentially affect the offsite power system. Also, procedures will be implemented anytime when abnormal switchyard voltage or frequency alarms are received. Therefore, anytime NPP controlled or monitored equipment were to fail and cause problems, these procedures will provide guidance to protect the Generator up to tripping the unit and/or separating from the grid.

Frequency of training on NPP procedures is determined using a systematic approach to training process.

Question 4(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.

Duke Response
NOT APPLICABLE, because NPP procedural controls are provided, as stated within Duke response to Question 4(a).

Use of NPP licensee/TSO protocols and analysis tool by TSOs to assist NPP licensees in monitoring grid conditions for consideration in maintenance risk assessments

The Maintenance Rule (10 CFR 50.65(a)(4)) requires that licensees assess and manage the increase in risk that may result from proposed maintenance activities before performing them.

Question 5
Performance of grid reliability evaluations as part of the <u>maintenance risk</u> assessments required by 10 CFR 50.65(a)(4).

Question 5(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?

Duke Response
Yes. 10CFR 50.65(a)(4) requires performance of a risk assessment prior to the performance/execution of maintenance activities. The term "maintenance" is defined broadly and would include surveillances, post maintenance testing, as well as preventive and corrective maintenance. Relative to increasing the initiating event frequency, such as the frequency of a NPP trip, the industry guidance, NUMARC 93-01, Section 11.3.2.2 states 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).

At Duke Power NPPs, grid reliability is assessed qualitatively as directed in the Department Directives. This assessment is routinely performed for activities occurring in the switchyard and on the tie lines from the grid to the switchyard, as described in Department Directives.

Question 5(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?

Duke Response
Yes. 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:

> "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)."

At Duke Power, conditions are monitored by the TSO, and changes in grid reliability are communicated to the NPP either through the Nuclear Duty Engineer, or in the event of emergent low voltage conditions, directly to the NPP control room. These communications protocols are documented in the SLA and related Department Directives. Upon notification of changes in grid status, the NPP performs an updated risk assessment.

Question 5(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.

Duke Response
No. The maintenance outage scheduling of generators and transmission facilities are coordinated by the TSO using tools for evaluating the reliability and economic impacts of these outages. At times, scheduled outages may have to be changed due to reliability concerns in the day ahead or current day.

The TSO notifies the NPP of the capacity shortage and mitigating activities. Maintenance activities on all transmission elements are studied by the TSO to ensure they can operate the system within NERC Operating Procedures.

Seasonal load variations are unlikely to be significant factors directly, although maintenance activities are influenced by the opportunities to perform maintenance during off-peak seasons.

The TSO maintains a stable grid in the event of a major disturbance by taking steps to reduce/shed load as necessary to ensure continued grid reliability. Thus, two situations exist: Grid Reliability and Service Reliability. The residential customers may experience electrical outages at the distribution level while the grid is unaffected. Hence, offsite power continues to be available to the NPP.

EPRI TR-1011759 "Frequency Determination Method for Cascading Grid Events", dated December 2005, has shown that there is no statistically significant seasonal-regional variation in the recorded LOOP events from 1997 to 2004.

Question 5(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?

Duke Response
No. There are no known time-related variations in the probability of a LOOP at the Duke Power NPPs.

EPRI TR-1011759 "Frequency Determination Method for Cascading Grid Events," has

shown that there is no statistically significant seasonal-regional variation in the recorded LOOP events from 1997 to 2004.

Also, according to preliminary work by the Westinghouse Owners Group in WCAP-16316-P "Lessons Learned from the August 14, 2003 Loss of Offsite Power Events in North America," dated February 2005, 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.

Question 5(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?

Duke Response
Yes. Transmission network reliability is evaluated daily by the TSO, and communicated to the NPP. This process is detailed in Department Directives. The NPP sites are notified of the conditions in advance as part of the normal day-to-day operational practice. If grid conditions change, the NPP is notified and the NPP evaluates the impact on grid-risk-sensitive maintenance activities.

Question 5(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.

Duke Response
Notification occurs whether or not maintenance is on-going. The type of alerts provided to the NPPs 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.

Protocols are in place for notification of the NPPs by the Transmission Control Center in the event of contingency tool results indication a potential inadequate voltage at a NPP, and for notification by the System Operation Center of actual or potential MW reserve shortages. Department Directives require that the Nuclear Duty Engineer immediately notifies the NPP of conditions that result in a potential or actual degraded offsite power supply. Notification occurs whether or not maintenance is on-going. The type of alerts

provided to the NPP conforms to the accepted practice promulgated by the NERC. Important alerts would be made to all generators in the control area.

Agreements are in place to establish interfaces between the grid operators and the NPP operators. The agreements, along with 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 the NPP. The department directives require that the Nuclear Duty Engineer immediately notifies the NPP of conditions that result in a potential or actual degraded offsite power supply.

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

- Grid Supervisory Control and Data Acquisition System (SCADA System),
- Communications with field personnel
- Communications with neighboring utilities
- Timely reports from various weather services

Question 5(g)
Do you contact your TSO <u>periodically</u> for the duration of the <u>grid-risk-sensitive</u> maintenance activities?

Duke Response
Yes. The SLA provides the structure for coordination of scheduled maintenance activities which affect power supplies to the NPP. A member of the station Maintenance Technical Support Organization has been assigned to function as the single point of contact between the NPP and the Power Delivery organization for scheduling of maintenance activities. This site representative communicates the status of maintenance activities in progress to the NPP and the TSO, as needed. In the event that the duration of scheduled maintenance activities is projected to extend beyond the original planned duration, the Electronic Risk Assessment Tool is utilized to evaluate the new configuration. This ongoing assessment of plant configuration risk is described in Department Directives.

Question 5(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.

Duke Response
In general, it is not a typical practice for our organization to provide a detailed formal training for Interface and Service Level Agreement type of documents for each and every employee of sizable NPP groups such as Operations, Maintenance and Work Control. The approach used is to develop the detailed knowledge and expertise of

designated individuals within the affected NPP groups, who will in turn become proficient on the contents and intent of such documents and serve as "Single Points of Contact" for addressing questions and recommending direction for the rest of the affected staff within their respective group .

Question 5(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).

Duke Response
NOT APPLICABLE

Question 5(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.

Duke Response
NOT APPLICABLE

Question 5(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.

Duke Response
NOT APPLICABLE

Question 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).

Question 6(a)
Does the TSO coordinate transmission system maintenance activities that can have an impact on the NPP operation with the NPP operator?

Duke Response
Yes, based on the Service Level Agreement and related Department Directives, normal NPP switchyard maintenance activities are to be scheduled through the NPP switchyard coordinator at least seven weeks in advance to allow for sufficient time for planning and scheduling. For switching operations that are required to isolate a transmission line for

planned work on the line or equipment at the remote end, a four week notice is desired (a 10 calendar day minimum notice is required). Emergent work will be handled by the NPP policies and procedures.

Specific high-voltage circuit outages or substation work is not directly indicative of "grid conditions" that are relevant to determining offsite power operability. The reason is that the power-grid outages affect transmission, which is only one factor affecting the quality of voltage available in the plant switchyard. Besides transmission, the quality of voltage is affected by parameters such as the amount of generating resources and the load on the network.

The TSO has no means of predicting voltage in the NPP switchyard more than a few hours in advance. Thus, whether or not the TSO coordinates transmission system maintenance activities with the NPP has little bearing on the operation of the NPP, except in the case of the NPP switchyard.

When the transmission system maintenance activities involve the plant switchyard, then there are some effective risk management actions available, i.e. deferring work or postponing testing on important components such as auxiliary feedwater pumps or emergency diesel generators.

Question 6(b)
Do you coordinate NPP maintenance activities that can have an <u>impact</u> on the <u>transmission system</u> with the TSO?

Duke Response
Yes. Department Directive "Nuclear Facilities/Generation Status Communications" details the process whereby NPP maintenance activities are evaluated by the NGD Duty Engineer utilizing a computer application to determine the effect on grid reliability.

Question 6(c)
Do you consider and implement, if warranted, the <u>rescheduling</u> 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?

Duke Response
Yes, activities that have the potential to cause a load reductions or NPP Unit trips are rescheduled, when possible, upon a TSO notification to the NPPs of system MW shortages. In addition, if the NPP is notified by the TSO that system reserves are or predicted to be less than established thresholds, then the Nuclear Duty Engineer will immediately notify each NPP with the recommendation that action be taken to protect emergency power sources.

Question 6(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.)

Duke Response
Yes. Department Directives describe the NPPs risk management approach, including actions to be taken to limit or minimize risk, which is consistent with the guidance provided in NUMARC 93-01.

Question 6(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.

Note: Duke Department Directives entitled "Operational Risk Management" and "Nuclear Facilities/Generation Status Communications" are considered to contain business sensitive information and Duke requests that they be withheld from public disclosure pursuant to 10 CFR 2.390.

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

Duke Response
Yes. Risk assessment of transmission system maintenance activities that can have an impact on the NPP are limited to those activities performed on tie lines which directly connect to the NPP switchyard, and are evaluated under the normal configuration risk management program as described in Department Directive "Operational Risk Management." Also, the SLA directs the TSO and NPP communications concerning TSO maintenance activities that potentially affect NPP operation.

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

Duke Response
Yes. Department Directive "Nuclear Facilities/Generation Status Communications" details the process whereby NPP maintenance activities are evaluated by the NGD Duty Engineer utilizing a computer application to determine the effect on grid reliability.

6(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?

Duke Response
Yes. Department Directive "Operational Risk Management" describes the requirement to evaluate emergent conditions and to reschedule maintenance activities, if possible, to avoid high risk configurations.

6(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.)

Duke Response
Yes. Department Directive "Operational Risk Management" describes the risk management actions required to respond to a high risk configuration that cannot be resolved by delaying maintenance activities. The risk maintenance actions required are consistent with the guidance provided in NUMARC 93-01.

The Duke NPPs use procedures and formal agreements to minimize risk. These processes have proven over time to be effective.

Question 6(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).

Duke Response
In general, it is not a typical practice for our organization to provide a detailed formal training for Interface and Service Level Agreement type of documents for each and every employee of sizable NPP groups such as Operations, Maintenance and Work Control. The approach used is to develop the detailed knowledge and expertise of designated individuals within the affected NPP groups, who will in turn become proficient on the contents and intent of such documents and serve as "Single Points of Contact" for addressing questions and recommending direction for the rest of the affected staff within their respective group.

Question 6(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).

Duke Response
NOT APPLICABLE.

Question 6(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.

Duke Response
NOT APPLICABLE.

Question 6(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).

Duke Response
NOT APPLICABLE

Offsite power restoration procedures in accordance with 10 CFR 50.63 as developed in Section 2 of RG 1.155

Pursuant to 10 CFR 50.63, the NRC requires that each NPP licensed to operate be able to withstand an SBO for a specified duration and recover from the SBO. NRC RG 1.155 gives licensees guidance on developing their approaches for complying with 10 CFR 50.63.

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

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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.

- 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

Question 7(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.

Duke Response
The TSO Restoration Plan (i.e., re-supply offsite power to the NPP following a LOOP event) identifies the Blackstart Facility that is located in the area of the NPP and establishes an Express Transmission System from the Blackstart Facility to the NPP. North American Electric Reliability Council (NERC) Standard EOP-005-0 R9.4 states that the TSO shall give high priority to the restoration of off-site power to NPPs. This is also repeated in Duke power's TSO "Emergency Guidelines for Capacity Shortages" document. The TSO is fully aware of their responsibility in supplying power to the NPPs following LOOP events. The TSO performs training yearly on this responsibility as well as the TSO restoration procedures.

Question 7(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.

Duke Response
NPP procedures were reviewed and revised as necessary to ensure they were compatible with Grid Operations Restoration Plan when it was revised in 2004. Training requirements on procedures used to recover from a LOOP event are determined using a systematic approach to training process.

Question 7(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.

Duke Response
NOT APPLICABLE.

Losses of offsite power caused by grid failures at a frequency of equal to or greater than once in 20 site-years in accordance with Table 4 of Regulatory Guide 1.155 for complying with 10 CFR 50.63

Pursuant to 10 CFR 50.63, the NRC requires that each NPP licensed to operate be able to withstand an SBO for a specified duration and recover from the SBO. NRC RG 1.155 gives licensees guidance on developing their approaches for complying with 10 CFR 50.63.

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

Question 8(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?

Duke Response
No. Duke Power NPPs have never experienced a total LOOP event that has been caused by a grid failure, either before the SBO coping duration was initially determined or afterwards.

Question 8(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?

Duke Response
NOT APPLICABLE.

Question 8(c)
If so, what were the results of this reevaluation, and did the initially determined coping duration for the NPP need to be adjusted?

Duke Response
NOT APPLICABLE.

Question 8(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.

Duke Response
NOT APPLICABLE.

Actions to ensure compliance

Question 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.

Duke Response
There are no known non-compliance issues related to the content of this Generic Letter.