Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

April 3, 2006
LIC-06-0025

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

Reference: 1. Docket No. 50-285
2. NRC Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power" (NRC-06-0013)

SUBJECT: 60 Day Response to Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power"

As requested by Generic Letter 2006-02 (Reference 2), attached please find the Omaha Public Power District's (OPPD) 60-day response. No commitments to the NRC are made in this letter.

I declare under penalty of perjury that the foregoing is true and correct. (Executed on April 3, 2006.)

If you have additional questions, or require further information, please contact T. C. Matthews at (402) 533-6938.

Sincerely,

H. J. Faulhaber
Division Manager
Nuclear Engineering

HJF/mle

Attachment: 60 Day Response to Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power"

ATTACHMENT

60 Day Response to Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power"

REQUESTED INFORMATION
In accordance with 10 CFR 50.54(f), addressees are required to submit written responses to this GL within 60 days of its date.

In their responses, addressees are requested to answer the following questions and provide the information to the NRC with respect to each of their NPPs:

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 TS.

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).

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.

NRC Question

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

OPPD Answer

Yes. The Omaha Public Power District (OPPD) is the owner of Fort Calhoun Station, Unit No. 1 (FCS) and also owns and operates the transmission and distribution (T&D) system supplying FCS. For OPPD, the term Control Area Operator (CAO) is synonymous with the term Transmission System Operator (TSO) as used in Generic Letter 2006-02. The CAO is responsible for control and monitoring of the OPPD transmission system.

At FCS, the protocol is documented in Quality Procedure NOD-QP-36, "Grid Operations and Control of Switchyard at FCS." The purpose of NOD-QP-36 is to ensure the highest possible availability and reliability of the offsite power grid supplying FCS, a commercial nuclear power plant. As such, FCS is deemed a priority load for load shedding and grid restoration actions. To this end, this policy provides guidance to establish and maintain communications between the CAO and the FCS Control Room on the current conditions of the electrical distribution grid affecting FCS.

NRC Question

(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.

OPPD Answer

For pre-planned activities affecting the availability of FCS substation circuits, the T&D Scheduler will notify FCS at least two days in advance. FCS personnel perform a risk assessment of the activity,

review its impact on the existing maintenance schedule, and make adjustments if necessary. Prior to performance of the activity, the FCS Shift Manager determines if the activity can be accomplished without adversely impacting plant operation and ensures conditions have not changed since initial evaluation of the activity. The CAO will notify the FCS Shift Manager just prior to commencing the activity to obtain final approval.

For emergent activities affecting the availability of FCS substation circuits, the T&D Scheduler or the CAO will notify FCS at least one day in advance, if possible. As stated above, FCS personnel perform a risk assessment of the activity, review its impact on the existing maintenance schedule, and make adjustments if necessary. Prior to commencing the activity, the CAO will notify the FCS Shift Manager to obtain final approval.

For emergency activities affecting the availability of FCS substation circuits, the CAO will notify the FCS Shift Manager as soon as practical when unanticipated conditions require any manipulation of circuits affecting FCS substation circuits. The CAO will notify the FCS Shift Manager of potential threats to grid stability or reliability. Examples of conditions that could affect grid stability or reliability are:

- low grid voltage due to system demand,
- acts of nature, such as tornados, high winds or flooding,
- extreme weather conditions affecting the grid,
- acts of sabotage to the grid,
- structural or equipment failures affecting the grid, or
- an energy emergency in a neighboring system.

The FCS Control Room monitors weather conditions using the National Warning System (NAWAS) radio. Conditions that cause concern are discussed with the CAO. The FCS Shift Manager evaluates out-of-service safety-related equipment and expedites the return of equipment that may impact the plant risk assessment. The FCS Shift Manager continues to monitor conditions and directs actions necessary to maintain FCS in a safe condition. When grid reliability is degraded, risk assessments are adjusted accordingly. The CAO will inform the FCS Shift Manager when conditions no longer pose a threat to grid stability or reliability.

Both FCS and the CAO have access to analysis software that monitors grid conditions and alerts operators to changes in the grid. If an alarm is received, Operating Instruction (OI)-EG-3, "EMS Post-FCS-Trip 161kV Voltage Prediction and Switchyard Status," directs communications to take place between FCS and the CAO on the validity of the alarm and stability/reliability of the grid. If a degraded grid condition exists, Abnormal Operating Procedure (AOP)-31, "161kV Grid Malfunctions," will be entered and appropriate actions taken to mitigate the situation.

NRC Question

(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.

OPPD Answer

The FCS Shift Manager or Control Room Supervisor will inform the CAO as soon as practical, of any conditions that would have an impact on FCS maintaining its commitment to grid stability. Examples of these conditions can be, but are not limited to:

- technical specification driven power reduction or plant shutdown,
- river temperature limits, or
- main generator limiting conditions.

The FCS Shift Manager or Control Room Supervisor will inform the CAO, as soon as practical, of any FCS conditions that would require stability on the grid such as:

- emergency diesel generator failures or testing,
- reactor coolant system at mid-loop, or
- outages on 4160V safeguard buses.

Both FCS and the CAO have access to analysis software that monitors grid conditions and alerts operators to changes in the grid. If an alarm is received, OI-EG-3, directs communications to take place between FCS and the CAO on the validity of the alarm and stability/reliability of the grid. If a degraded grid condition exists, AOP-31 will be entered and appropriate actions taken to mitigate the situation.

NRC Question

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

OPPD Answer

Technical Specification 2.7, "Electrical Systems," NOD-QP-36 "Grid Operations and Control of Switchyard at FCS," OI-EG-3, "EMS Post-FCS-Trip 161kV Voltage Prediction and Switchyard Status," and AOP-31, "161kV Grid Malfunctions" are presented to licensed operators in initial and requalification training programs in lesson plans 07-17-31 (AOP-31) and 07-13-01 (High Voltage Grid System). Additionally, training on loss of offsite power is covered in lesson plan 07-18-17 (EOP-07, "Station Blackout").

The objectives concerning these items are applicable to initial and requalification training sessions, and are presented to all operators (in a requalification setting) every two years, in accordance with the Licensed Operator Requalification Training Program Master Plan (LOR TPMP), Section 3. Additionally, Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 99-01, "Loss of Grid" is referenced in lesson plan 07-13-01 (High Voltage Grid System) and is presented each time the lesson is taught in initial operator training and at least every 6 years in a requalification setting as directed by the LOR TPMP, Section 5. These topics are being presented in the current LOR training rotation (2006, Rotation 2), and were last presented in 2004, Rotation 6. Applicable training objectives are evaluated as presented through written examinations.

Additionally, these topics (switchyard/grid reliability, loss of offsite power) were presented in the simulator on several occasions during requalification training, including four times in the last two years (SSG 82104g in Rotation 2004-02, SSG 82111d in Rotation 2005-01, SSG 82109c in Rotation 2005-02, and SSG 82110a in Rotation 2005-05). Loss-of-offsite-power (LOOP) scenarios were also used as evaluation tools in the simulator in Rotation 2005-03 (SEG 84206a/b) and Rotation 2005-05 (SEG 84206c/d). The LOR TPMP specifically addresses SSG 82104f as the response to SOER 99-01, and is mirrored in actions in all 82104-series SSGs. Initial licensed operator training sessions are conducted on the simulator to address these events in lesson plans 07-17-31, 07-18-12, 07-18-17, and 07-68-82, as well as SSGs 08-12-01, 08-13-03, 08-13-04, and 08-13-25.

Periodically, LOOP is part of an Emergency Response Organization (ERO) exercise scenario, which evaluates the ability of FCS operators to respond appropriately. The most recent ERO exercise containing a LOOP event was conducted in March 2006.

NRC Question

(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.

OPPD Answer

This question is not applicable to FCS. The protocol is documented in NOD-QP-36.

NRC Question

(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).

OPPD Answer

In accordance with NOD-QP-36, the CAO will notify the FCS Shift Manager as soon as practical of potential threats to grid reliability/stability. Both FCS and the CAO have access to analysis software that monitors grid conditions and alerts operators to changes in the grid. If an alarm is received, OI-EG-3 directs communications to take place between FCS and the CAO on the validity of the alarm and stability/reliability of the grid. If a degraded grid condition exists, AOP-31 will be entered and appropriate actions taken to mitigate the situation.

NRC Question

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

OPPD Answer

Plant degraded voltage protection is designed to automatically isolate plant safety buses from offsite power sources and power these buses from associated emergency diesel generators in the event that plant bus voltage drops below an established setpoint for a period of time greater than 4.8 ± 0.5 seconds. The degraded voltage sensing system is identified as OPLS (Offsite Power Low System). The setpoints for OPLS are bus dependent and are established to ensure that adequate voltage is available to accelerate and operate safety-related loads required to mitigate the consequences of an accident. Using a detailed model of the plant electrical system, case studies have been performed to identify the offsite power system voltage below which it is possible that OPLS would actuate in the event of an accident coincident with a plant trip. This offsite voltage has been determined to be 160.8kV on the 161kV system at the station switchyard. Note that the OPLS actuation circuitry is only enabled in the event that an accident signal has occurred. If no accident signal has occurred, then the degraded voltage protection scheme is automatically disabled and plant buses are protected by a separate undervoltage detection circuit, which operates at a lower setpoint than the degraded voltage system (OPLS).

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.

NRC Question

(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.

OPPD Answer

Yes. The analysis tool is documented in OI-EG-3, "EMS Post-FCS-Trip 161kV Voltage Prediction and Switchyard Status." A predicted value for the post-plant-trip voltage at Substation 1251 is calculated every five minutes by the Security Analysis application at the Midwest Independent System Operator-St. Paul Security Center. The value is sent to OPPD's Energy Management System (EMS), which will generate alarms when the value is below certain levels. This calculation of post-plant-trip voltage is done only for the real-time system configuration.

NRC Question

(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?

OPPD Answer

Yes. Please see the reply to question 2(a) above.

NRC Question

(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.

OPPD Answer

Yes. Alarms are generated on the OPPD EMS to notify both FCS and the CAO when the predicted post-plant-trip voltage at Substation 1251 drops below 161kV, 160.8kV, and 158.8kV. These post-plant-trip voltages are specified in NOD-QP-36 for maintaining FCS stability. The calculation of post-plant-trip voltage is done only for the real-time system configuration.

NRC Question

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

OPPD Answer

The analysis tool updates every five minutes.

NRC Question

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

OPPD Answer

Alarms are generated on the OPPD EMS to notify both FCS and the CAO when the predicted post-plant-trip voltage at Substation 1251 drops below 161kV, 160.8kV, and 158.8kV. These post-plant-trip voltages are specified in NOD-QP-36 for maintaining FCS stability. The calculation of post-plant-trip voltage is done only for the real-time system configuration.

The grid steady-state analysis considered the following six worst-case contingencies to determine the grid's capability to supply plant loads following a plant trip:

1. Outage of the 345kV line from OPPD Substation 3451 to MidAmerican (MEC) Raun Substation.
2. Outage of MEC Council Bluffs Unit 3.
3. Simultaneous outage of MEC Council Bluffs Unit 3, the 345kV line from OPPD Substation 3451 to OPPD Substation 3459 and the 345kV line from OPPD Substation 3451 to OPPD Substation 3454.
4. Outage of the 345kV line from MEC Council Bluffs Substation to OPPD Substation 3456.
5. Simultaneous outage of both 161kV lines from OPPD Substation 1211 to OPPD Substation 1250.

6. Simultaneous outage of the 345kV line from OPPD Substation 3451 to OPPD Substation 3459 and the 345kV line from OPPD Substation 3451 to OPPD Substation 3454.

NRC Question

(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?

OPPD Answer

Yes. NOD-QP-36 and OI-EG-3 require communication between FCS and the CAO if offsite power voltage and capacity could be inadequate. If the analysis tool is not working properly (as indicated by the three data quality checks on the EMS display), the CAO contacts FCS to discuss outages and the potential effects on FCS. OI-EG-3 contains a table, "Table 1 - Summary of Voltages at Substation 1251 Caused by Generation and/or Transmission Outages and a Trip of FCS," that can be used, as a tool should the EMS be unavailable to predict the effect on offsite power reliability. OPPD's T&D Planning Department will be consulted to verify that the calculated voltage drop is reasonable for the current grid conditions.

NRC Question

(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?

OPPD Answer

Yes. Standing Order (SO)-O-46, "Post Trip Review Procedure," requires a comparison between the predicted value of the post-trip offsite power voltage with the actual value present after the trip. The intent of this comparison is to use real data to evaluate how well the predictive model performed with respect to its intended purpose. If discrepancies are identified between predicted and actual post-trip voltage, the appropriate corrective action will be taken.

NRC Question

(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?

OPPD Answer

This is not applicable to FCS, since analysis tools are presently in use.

NRC Question

(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?

OPPD Answer

This is not applicable to FCS, since analysis tools are presently in use. Please see reply to question 2(f) above.

NRC Question

(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?

OPPD Answer

Not Applicable.

NRC Question

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

OPPD Answer

Not Applicable

NRC Question

(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.

OPPD Answer

This is not applicable to FCS, since analysis tools are presently in use.

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.

NRC Question

(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?

OPPD Answer

Yes. In accordance with NOD-QP-36 and AOP-31, at an actual or post-trip calculated value of 160.8kV, FCS will enter Technical Specification 2.7 due to inoperability of house transformers T1A-3 and T1A-4. The NRC Operations Center will be notified within four hours. If at the same time either emergency diesel generator is inoperable, the reactor will be placed in hot shutdown within six hours. At an actual or post-trip calculated value of 158.8kV for more than eight hours, the reactor will be placed in hot shutdown within twelve hours. The house transformers are considered inoperable due to the increased likelihood of activating the degraded voltage circuitry in the event of a design basis accident coincident with loss of the offsite power supply.

NRC Question

(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?

OPPD Answer

No. Safety related loads are not expected to be lost as a result of double sequencing, discounting the short period of time that safety-related loads are without power between the point at which offsite power is lost and the point at which the loads are re-sequenced back onto associated buses. Control circuits are designed to respond to double sequencing scenarios by bringing emergency diesel generators to full speed, opening circuit breakers associated with the larger safeguards loads, resetting the motor sequencer timing circuits and then re-sequencing the safeguards loads on to the emergency diesel generator supplied buses.

NRC Question

(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).

OPPD Answer

As stated above, engineered safety feature (ESF) control circuits are designed in anticipation of a double sequencing scenario. If offsite power is lost or degraded after the initiating accident signals have sequenced loads on to safety buses, the resulting OPLS actuation responds by isolating safety buses from offsite power and re-sequencing ESF loads back on to associated buses after the emergency diesel generator supply breakers have auto-closed. Further, the double sequencing capability is tested at a frequency of once per operating cycle by first initiating a test accident signal with offsite power available followed by the initiation of a test OPLS signal which verifies that double sequencing can be

performed successfully. Analysis has been performed to demonstrate that emergency diesel generators are capable of supplying all associated safety-related loads during and after the starting sequence and that available voltage is capable of accelerating all motors within appropriate time intervals.

NRC Question

(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.

OPPD Answer

No. Technical Specifications are not entered for grid conditions that might occur. As described in response to question 3(a), Technical Specifications are entered only if actual or post-trip calculated value is less than 160.8kV. Postulated grid impairment impacts are not used as a basis since:

- such events have not actually affected actual or post-trip calculated values,
- off-site power remains capable of supporting a safe shutdown and mitigating an accident, and
- loss of offsite power would not occur as a result of loss of power generated by FCS.

NRC Question

(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.

OPPD Answer

This question is not applicable to FCS. As stated above, in accordance with NOD-QP-36 and AOP-31, at an actual or post-trip calculated value of 160.8kV, FCS will enter Technical Specification 2.7 due to inoperability of house transformers T1A-3 and T1A-4. The house transformers are considered inoperable due to the increased likelihood of activating the degraded voltage circuitry in the event of a design basis accident coincident with loss of the offsite power supply.

Postulated grid impairment impacts are not used as a basis to declare the house transformers inoperable and enter Technical Specification 2.7 since:

- such events have not actually affected actual or post-trip calculated values,
- offsite power remains capable of supporting a safe shutdown and mitigating an accident, and
- loss of offsite power would not occur as a result of loss of power generated by FCS.

Finally, ESF control circuits are designed in anticipation of a double sequencing scenario. If offsite power is lost or degraded after the initiating accident signals have sequenced loads on to safety buses, the resulting OPLS actuation responds by isolating safety buses from offsite power and re-sequencing ESF loads back on to associated buses after the diesel generator supply breakers have auto-closed.

Analysis has demonstrated that emergency diesel generators are capable of supplying all associated safety-related loads during and after the starting sequence and that available voltage is capable of accelerating all motors within appropriate time intervals.

NRC Question

(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).

OPPD Answer

Technical Specification 2.7, "Electrical Systems," NOD-QP-36, "Grid Operations and Control of Switchyard at FCS," and AOP-31, "161kV Grid Malfunctions" are presented to licensed operators in initial and requalification training programs in lesson plans 07-17-31 (AOP-31) and 07-13-01 (High Voltage Grid System).

The objectives concerning these items are applicable to initial and requalification training sessions, and are presented to all operators (in a requalification setting) every two years, in accordance with the Licensed Operator Requalification Training Program Master Plan (LOR TPMP), Section 3. Additionally, SOER 99-01 is referenced in lesson plan 07-13-01 (High Voltage Grid System) and is presented each time the lesson is taught in initial operator training and at least every 6 years in a requalification setting as directed by the LOR TPMP, Section 5. These topics are being presented in the current LOR training rotation (2006, Rotation 2), and were last presented in 2004, Rotation 6. Applicable training objectives are evaluated as presented through written examinations.

Additionally, these topics (switchyard/grid reliability, loss of offsite power) were presented in the simulator on several occasions during requalification training, including four times in the last two years (SSG 82104g in Rotation 2004-02, SSG 82111d in Rotation 2005-01, SSG 82109c in Rotation 2005-02, and SSG 82110a in Rotation 2005-05). Loss of offsite power scenarios were also used as evaluation tools in the simulator in Rotation 2005-03 (SEG 84206a/b) and Rotation 2005-05 (SEG 84206c/d). The LOR TPMP specifically addresses SSG 82104f as the response to SOER 99-01, and is mirrored in actions in all 82104-series SSGs. Initial licensed operator training sessions are conducted on the simulator to address these events in lesson plans 07-17-31, 07-18-12, 07-18-17, and 07-68-82, as well as SSGs 08-12-01, 08-13-03, 08-13-04, and 08-13-25.

Emergency diesel generator load sequencing is addressed in Operations Training lesson plans 07-13-05 and 07-12-14, and is addressed in each of the simulator training (SSG) and evaluation (SEG) guides listed above, as their response is integral with any loss of offsite power events. Emergency diesel generator response to multiple sequencer events is also addressed in these training documents. Additionally, ESF testing is addressed in just-in-time training for qualified operators, and in lesson plans 07-68-08 and 07-68-12, and simulator training guidelines 08-11-03 and 08-11-09 for initial operator training. Availability and/or operability of safety-related components following a loss of any or all power sources is specifically addressed in lesson plan 07-13-01, which is identified as FCS's primary host for SOER 99-01 information. These topics are presented and evaluated in the same requalification and initial training frequencies as noted above.

Periodically, LOOP is part of an Emergency Response Organization (ERO) exercise scenario, which evaluates the ability of FCS operators to respond appropriately. The most recent ERO exercise containing a LOOP event was conducted in March 2006.

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

NRC Question

(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.

OPPD Answer

Yes. The methodology for establishing voltage limits for offsite power operability relies, in part, on a region wide grid calculation, which is used to predict the post trip voltage expected for the offsite power supply based on current grid conditions. The only plant-controlled equipment interfacing directly with offsite power sources which could impact the determination of adequate offsite power is the main generator. To address the impact of main generator output, the calculation of predicted post-trip voltage does account for the change in real and reactive power that would occur as a result of grid loading, generation and transmission outages or a plant trip. The EMS Post-FCS-Trip 161kV Voltage Prediction and Switchyard Status Procedure provides the necessary guidance to the operators to validate the EMS status and displays to ensure that low voltage alarms are valid and are not caused by short-term system transients or minor inaccuracies in the EMS modeling.

The plant model that is used to predict the low voltage operability limit for offsite power makes assumptions regarding the degree to which safety-related buses are loaded such that normal operating conditions will be bounded. For example, the model assumes that one of the two safety-related 4160V buses is heavily loaded for one case study while the other bus is heavily loaded for another case study. (Assuming heavily loaded buses is conservative for the purpose of determining the minimally acceptable offsite power voltage.) The model assumes that the postulated accident is of such a magnitude that safety-related loads are maximized. Any load or design feature of the plant that could significantly impact the ability of the model to accurately predict the limitation of offsite power system voltage with regard to its capability for supplying post accident loads without actuation of OPLS was included in the model.

If the plant is operated in accordance with normal operating procedures, the assumptions made in the development of models demonstrating the adequacy of offsite power will be bounding and limits associated with offsite power operability will be conservative. Operating FCS in this manner complies with the offsite power capability required by GDC-17.

As stated in the response to question 3(f) above, Technical Specification 2.7, NOD-QP-36, and AOP-31 are presented to licensed operators in initial and requalification training programs in lesson plans 07-17-31 and 07-13-01.

NRC Question

(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.

OPPD Answer

This question is not applicable to FCS. Please see the response to question 4(a) above.

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.

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

NRC Question

(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?

OPPD Answer

Yes. A blended grid reliability evaluation, that has both quantitative and qualitative components, is performed before performing grid-risk-sensitive maintenance activities.

NRC Question

(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?

OPPD Answer

Yes. Grid status is monitored for the duration of the grid-risk-sensitive maintenance, as detailed in the responses to question 2 above.

NRC Question

(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.

OPPD Answer

No. EPRI Technical Report 1011759, "Frequency Determination Method for Cascading Grid Events," evaluated the possibility that there could be seasonal variations in grid reliability. Table 4-7 of the report recommends no seasonal adjustment for plants within the Mid-Continent Area Power Pool (MAPP). FCS, through its owner OPPD is a member of MAPP. Maintenance of transmission elements typically has minimal impact on grid stress at FCS.

NRC Question

(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?

OPPD Answer

There are no regularly predictable time-related variations in the probability of a LOOP. However, as indicated in the responses to question 2, grid conditions are monitored on essentially a real-time basis. Indications that offsite power is in jeopardy would be factored into a revised risk assessment.

NRC Question

(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?

OPPD Answer

Yes. For example, NOD-QP-36 and SO-M-100, "Conduct of Maintenance," contain requirements such that before a diesel-generator is removed from service for significant maintenance, the CAO is contacted to discuss any offsite power reliability concerns. The possibility of severe weather impact is also evaluated.

NRC Question

(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.

OPPD Answer

Please see the response to question 1(b) above.

NRC Question

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

OPPD Answer

No. The CAO is not contacted periodically for the duration of grid-risk-sensitive maintenance activities. As described in the Section 1 response, a protocol exists to ensure that the FCS operating crew would be informed of conditions that jeopardize offsite power.

NRC Question

(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.

OPPD Answer

NOD-QP-36 is identified as our protocol/agreement between the CAO and plant personnel. For FCS Operations Department personnel, the method, frequency, and content of our training and evaluation commitments are listed in our response to question 3(f). FCS Maintenance Department personnel do not perform any maintenance activities that affect offsite power availability. OPPD Substation and System Protection personnel conduct all maintenance activities regarding this type of work.

The System Operations Trainer provides training on NOD-QP-36 annually to the CAO. Training on NOD-QP-36 is provided to Substation and System Protection personnel prior to each refueling outage (approximately every 18 months). FCS training instructors provide training, which covers the requirements and authorizations of entry into, work within and exit from the switchyard. This training has proven to be an effective method of ensuring compliance with the procedures.

NRC Question

(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).

OPPD Answer

This question is not applicable to FCS. The grid reliability evaluation does rely on an arrangement for communication with the CAO.

NRC Question

(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.

OPPD Answer

Although the CAO is not contacted periodically during grid-risk-sensitive maintenance activities, NOD-QP-36 contains the protocol and processes to ensure that the FCS operating crew will be promptly informed of conditions that jeopardize offsite power. Both FCS and the CAO have access to analysis software that monitors grid conditions and alerts operators to changes in the grid.

NRC Question

(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.

OPPD Answer

No alternative actions are anticipated.

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).

NRC Question

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

OPPD Answer

Yes. Please see the response to question 1(b) above.

NRC Question

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

OPPD Answer

Yes. Please see the response to question 1(c) above.

NRC Question

(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?

OPPD Answer

Yes. Maintenance that has an associated risk to the plant or grid is performed when OPPD concludes that the risk of the work is small compared to the safety benefit. As part of the 10 CFR 50.65(a)(4) (Maintenance Rule) process, a risk assessment is performed and risk significant contributors, including offsite power availability, are identified. NOD-QP-36 requires a review of maintenance activities, the associated performance risk, and necessary rescheduling for either case. Recent examples where work was rescheduled include 1) the deferral of turbine control valve testing and scheduled FCS switchyard activities when OPPD's Nebraska City fossil unit tripped offline, and 2) delaying a scheduled monthly emergency diesel generator surveillance run due to severe thunderstorms in the area.

NRC Question

(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.)

OPPD Answer

Yes. Risk management actions, such as those described in SO-M-100, are considered. Examples of possible risk management actions include protection of risk-significant equipment, review of applicable abnormal or emergency operating procedures, working around-the-clock to minimize time out-of-service, and briefings of the operating crews to ensure they understand the dominant risk sequences.

NRC Question

(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.

OPPD Answer

Control of grid and switchyard related activities at FCS are governed by NOD-QP-36. For pre-planned activities affecting the availability of FCS substation circuits, the T&D Scheduler will typically notify

FCS at least two days in advance. A risk assessment is performed per NOD-QP-36 and SO-M-100. The activity is reviewed for impact on existing maintenance schedule and adjustments are made if necessary. Prior to performance of the activity, the FCS Shift Manager will determine if the activity can be accomplished without adversely impacting plant operation and will ensure that conditions have not changed since initial planning of the activity. Prior to commencing the activity, the CAO will notify the FCS Shift Manager to obtain final approval.

For emergent activities affecting the availability of FCS substation circuits, the T&D Scheduler or the CAO will notify FCS at least one day in advance, if possible. Plant risk and schedule conflicts will be evaluated and resolved if the grid is in a degraded condition. The CAO will notify the FCS Shift Manager just prior to commencing the activity to obtain final approval. For emergency activities affecting the availability of FCS substation circuits, the CAO will notify the FCS Shift Manager, as soon as practical, when unanticipated conditions require any manipulation of circuits affecting FCS substation circuits. The CAO will notify the FCS Shift Manager of potential threats to grid stability or reliability.

Requirements for risk assessments are contained in SO-M-100, and outlined in FCSG-19, "Performing Risk Assessments." Measures are taken to protect risk significant equipment or functions (e.g., offsite power) that are identified from the assessment. These measures may include actions such as placing barriers around equipment, hanging temporary tags on control switches, and restricting access to areas such as the switchgear and emergency diesel generator rooms. Guidelines for establishing these protective measures are contained in OPD-6-08, "Plastic Label Usage." Additionally, SO-M-100 also requires considerations such as weather severity forecast and grid reliability as qualitative inputs to the assessment.

During shutdown operation, SO-O-21, "Shutdown Operations Protection Plan," specifies the minimum available equipment needed to provide adequate safety margin based upon various shutdown conditions. Included in this plan is the availability of offsite power.

Depending upon the nature of the activities, SO-G-87, "Non-Routine Activities Requiring Formalized Plans," maybe implemented. SO-G-87 pertains to activities that may require a heightened level of awareness, those that could adversely affect equipment or plant operation or require considerable coordination and administrative controls. Plant operators are thoroughly briefed on the activity and made aware of the associated risks and the contingency actions.

NRC Question

(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).

OPPD Answer

FCS Operations Department and OPPD T&D personnel are trained and tested on the duties and responsibilities of NOD-QP-36 as stated in the response to questions 3(f) and 5(h).

NRC Question

(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).

OPPD Answer

This question is not applicable to FCS. NOD-QP-36 requires coordination between FCS and the CAO regarding transmission system maintenance or FCS maintenance activities.

NRC Question

(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.

OPPD Answer

This question is not applicable to FCS. Risk management actions are considered and effectively implemented, as described in the responses above.

NRC Question

(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).

OPPD Answer

No alternative actions are required. Increases in risk that may result from grid-risk-sensitive maintenance activities are managed in accordance with 10 CFR 50.65(a)(4).

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.

7. Procedures for identifying local power sources[2] that could be made available to resupply your plant following a LOOP event.

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

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:

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

NRC Question

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

OPPD Answer

The CAO 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. Local power sources are not available to FCS. However, the CAO has many options available to restore offsite power. These plans and strategy are located in the OPPD Load Shedding and Restoration Procedure Manual. FCS is a priority load for load shedding and grid restoration activities. CAO personnel train on this procedure annually per North American Electric Reliability Council (NERC) training requirements.

Per NOD-QP-36, in the unlikely event that grid frequency and voltage deteriorate to unacceptable levels, the CAO will commence the OPPD Manual Load Reduction and/or Automatic Under-Frequency Load Shedding Plans as appropriate. Under the Automatic Under-Frequency Load Shedding Plan, 161kV breakers will open to prevent excess flow from the 161kV grid to 345kV at 58.1 Hz. At 57.7 Hz, 345kV breakers will open after a six-second time delay to trip FCS. These plans and strategy are located in the OPPD Load Shedding and Restoration Procedure Manual.

NRC Question

(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.

OPPD Answer

There is no other local power source available to FCS. The CAO works to restore offsite power to the FCS switchyard in accordance with the OPPD Load Shedding and Restoration Procedure Manual. Until then, FCS operators do not have any additional power sources. FCS operators are trained to request assistance from System Operations in restoring offsite power. This training is included in EOP-07 training as described in the response to question 1(d) above.

NRC Question

(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.

OPPD Answer

This question is not applicable to FCS. Please see the response to question 7(a) above.

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.

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

NRC Question

(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?

OPPD Answer

No. FCS has not experienced a total LOOP caused by grid failure since the plant's coping duration was initially determined under 10 CFR 50.63.

NRC Question

(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?

OPPD Answer

This question is not applicable to FCS. Please see the response to question 8(a) above.

NRC Question

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

OPPD Answer

This question is not applicable to FCS. Please see the response to question 8(a) above.

NRC Question

(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.

OPPD Answer

This question is not applicable to FCS. Please see the response to question 8(a) above.

Actions to ensure compliance

NRC 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.

OPPD Answer

It is OPPD's position that no actions are warranted at this time. FCS complies with GDC-17 of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants." FCS is also in compliance with Technical Specifications and the 10 CFR sections listed above.