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U. S. Nuclear Regulatory Commission
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Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO NRC GENERIC LETTER 2006-02
GRID RELIABILITY AND THE IMPACT ON PLANT RISK
AND THE OPERABILITY OF OFFSITE POWER **Docket Nos. 50-387**
PLA-6031 **and 50-388**

Reference: 1) NRC Generic Letter 2006-02: "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," dated February 1, 2006

2) PJM Response to the NRC Generic Letter 2006-02: "Grid Reliability and the Impact on Plant Risk on Operability of Offsite Power," dated March 3, 2006

The objective of this letter is to respond to the NRC Generic Letter request for information (Reference 1). The purpose of the NRC request is to obtain information to determine if compliance is being maintained with NRC regulatory requirements governing electric power sources and associated personnel training for PPL Susquehanna, LLC (SSES).

Specific responses pertaining to SSES and the operational interfaces with PPL Electric Utilities (EU), the Transmission System Owner (TO), and PJM, the Transmission System Operator (TSO), are provided to the questions as they relate to the four areas identified in the Generic Letter. These responses are submitted as required pursuant to 10 CFR 50.54(f).

Some of the questions in Generic Letter 2006-02 seek information about analyses, procedures, and activities concerning grid operations for which SSES does not have first-hand knowledge and are beyond the control of SSES. In providing information responsive to such questions, SSES provided information supplied by the TSO. While SSES believes such information to be accurate and complete, we have not verified and thus cannot make any specific representation as to its accuracy or completeness. The responses directly applicable to SSES for which SSES has verified accuracy and completeness are designated as "PPL Response (SSES)."

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Reference 2 provides PJM information to support member utilities' responses to the Generic Letter. PPL has utilized this information in its responses where applicable and designated them as "PJM Response."

This document is submitted pursuant to 10 CFR 2.390 and the response to Question 1(g) on Pages 7 and 8 is requested to be withheld from public disclosure; therefore, these pages contain the statement "Withhold from Public Disclosure Under 10 CFR 2.390(d)(1)." Unlike the requirements for withholding proprietary information, an affidavit is not required for sensitive information withheld under 10 CFR 2.390(d)(1) related to physical protection.

If you have any questions regarding this submittal, please contact Mr. Duane L. Filchner at (610) 774-7819.

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

Executed on: 3.28.06

B. T. McKinney

Attachment – Responses to Generic Letter 2006-02 Questions

cc: NRC Region I
Mr. A. J. Blamey, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. Janati, DEP/BRP

Attachment to PLA-6031

Responses to
Generic Letter 2006-02 Questions

PPL Background and Clarification to Responses:

The following is provided for the PPL Susquehanna, LLC (SSES) responses to Generic Letter 2006-02:

- The SSES is located in the service territory of the PJM Interconnection, LLC (PJM). The PPL transmission system is operated under the direction of PJM. Responses to the Generic Letter, which refer to the Transmission System Operator (TSO), are in reference to PJM, unless otherwise noted.

- The transmission system is owned by PPL Electric Utilities (EU). It is designated as the Transmission Owner (TO) in the Generic Letter responses.

- The term "NPP Licensee" refers to PPL Susquehanna Steam Electric Station (SSES).

- Generic Letter references to a trip of a nuclear unit are interpreted to mean a single unit trip on one of the SSES units.

- Some Generic Letter responses contain information applicable to PPL or PJM, or both. The applicability is denoted in the response.

NRC 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 TS.

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

PPL Response (SSES):

Yes, PPL has a formal agreement with PJM. The PJM operating manuals contain formal protocols used by SSES to determine operability of the offsite power system under plant Technical Specification (TS). The response below by PJM provides additional detail regarding the formal agreements and protocols.

PJM Response:

SSES is located in the service territory of PJM Interconnection, LLC (PJM). PJM is the TSO for SSES.

The TO providing interconnection services to SSES is PPL EU. The TO is a member of PJM.

All members of PJM execute the PJM Operating Agreement, which details the obligations and responsibilities of PJM to the members and vice versa. In the Operating Agreement, each member agrees to abide by the requirements contained in the PJM Manuals. The PJM Manuals contain the specific operational requirements that each member is required to follow and also indicates the obligations of PJM to the members.

The PJM Operating Agreement requires PJM to "Incorporate the grid reliability requirements applicable to nuclear generating units in the PJM Region planning and operating principles and practices."

PJM Manual M-1, "Control Center Requirements," Attachment B entitled "Nuclear Plant Communication Protocol" provides the roles and responsibilities of nuclear stations, Transmission Owners, and PJM with regard to communications both in normal and emergency circumstances.

The nuclear plant notification requirements are contained in PJM Manual M-3, "Transmission Operations."

The TOs are also signatories to a PJM Transmission Owners Agreement ("TOA"). Section 4.5 of the TOA requires the TOs to operate and maintain their Transmission Facilities in accordance with, among other things, the PJM Manuals. Moreover, the TOs are required, under that section of the TOA, to conform to PJM's operating instructions as they apply to the TO's Transmission Facilities. In Section 4.7 of the TOA, the TOs agree to follow PJM's operating instructions during an emergency.

(1b) 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.

PPL Response (SSES):

There is no response required from SSES. This question is directly related to the TSO.

PJM Response:

PJM Manual M-3 ,"Transmission Operations" requires PJM to initiate notification to an NPP through its respective transmission owner's control center if PJM identifies an NPP switchyard voltage violation. PJM Manual M-3 states "This notification should occur within 15 minutes for voltage contingency violations and immediately for actual voltage violations. To the extent practical, PJM shall

direct operations such that the violation is remedied within 30 minutes." [PJM Manual M-3, "Transmission Operations," Section 3, p.40].

In addition, PJM Manual M-13, "Emergency Operations" identifies a series of alerts, warnings, and actions that PJM issues to PJM members depending on the identified grid condition. The PJM message is communicated to the NPP by their generation dispatcher for a variety of system conditions, including:

Capacity Emergencies
- Maximum Emergency Generation Loading
- Load Management Curtailment
- Voltage Reduction Initiation
- Manual Load Dump Initiation
- Light Load Emergencies
- Minimum Generation Emergency

Local Minimum Generation Emergency
- Weather/Environmental Emergency
- Hot/Cold Weather Alerts
- Thunderstorms and Tornadoes
- Solar Magnetic Disturbances

Sabotage/Terrorism Emergencies

(1c) 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.

PPL Response (SSES):

As required by PJM Manuals, communications between an NPP and PJM are generally through the TO.

An SSES control room operator contacts the TO for grid conditions that have parameters that are observable at SSES, as required by plant operating instruction, emergency operating procedures, and a jointly approved interface agreement.

An operating instruction gives direction to the SSES control room operator to report equipment malfunctions and status changes that affect or potentially could affect station operation to the Generation Power Dispatcher and/or TO. This instruction provides specific direction for the following grid conditions:

(a) Power system disturbances
(b) Line, Transformer, Circuit Breaker Work Requests
(c) Switchyard alarms
(d) Telephone communications trouble
(e) Black start/system restoration
(f) Offsite power requirements
(g) Weather conditions
(h) MVAR (mega volt-amperes reactive)/Voltage issues
(i) Security threats/potential fire/property damage of transmission lines

The SSES control room operator contacts both the TO and the Generation Dipatcher during the grid restoration process to obtain grid status in preparation for restoring the plant buses to the offsite source as directed by emergency operating procedures.

A jointly approved interface agreement between SSES and the TO identifies communication protocols. The TO and the SSES control room operator are required to communicate identified switchyard deficiencies. The interface agreement also requires the SSES Work Week Manager to communicate SSES work activities that need coordination and communication with the TO.

In addition, the SSES control room operator and Work Management organizations notify the TO of SSES operating configurations that could potentially impact grid conditions. These notifications include:

- Station MVAR limitations;
- Main generator voltage regulator not in "Automatic" mode;
- Transfer and restoration of the Main Generator Voltage regulator from 'Auto' to 'Manual.'

The procedures associated with these communications are in the following documents:

OI-AD-032	"Station Operation Reporting"
EO-100-030	"Unit 1 Response to Station Blackout"
EO-200-030	"Unit 2 Response to Station Blackout"
EO-000-031	"Station Power Restoration"
PSP-30	"SSES Tactics for excellence through accountable management team"
PSP-32	"Interface Agreement and Procedures for PPL EU Transmission Facilities Related to PPL Susquehanna, LLC"

ON-198-001	"Unit 1 Main Generator MVAR Control for Auto Voltage Regulator Operation When Synched to Grid"
ON-298-001	"Unit 2 Main Generator MVAR Control for Auto Voltage Regulator Operation When Synched to Grid"
ON-198-002	"Unit 1 Main Generator MVAR Control for Manual Voltage Regulator Operation When Synched to Grid"
ON-298-002	"Unit 2 Main Generator MVAR Control for Manual Voltage Regulator Operation When Synched to Grid"
OP-198-001	"Main Generator System"
OP-298-001	"Main Generator Voltage Regulator System"

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

PPL Response (SSES):

The SSES operators are trained and tested during Licensed Operator Requalification (LOR) cycles that include Off Normal (ON) procedures on "Main Generator MVAR Control for Auto Voltage Regulator Operation When Synched to Grid" and "Main Generator MVAR Control for Manual Voltage Regulator Operation When Synched to Grid." These ON procedures address MVAR instabilities on the main generator and required actions, which include notifying the TO and/or Generation Power Dispatcher, and are required to be reviewed or exercised every two years.

LOR training includes demonstration of operator response following a degraded grid condition. This LOR training is performed every two years and includes exercises with classroom presentations. In addition, annual LOR training includes operator response to a transmission system blackout. Operator LOR exercise performance is debriefed and evaluated using a 'Crew Simulator Performance' evaluation form.

Weekly quizzes also include questions related to these topics. The annual exam Sample Plan may include some questions related to the above topics on transmission system blackout and/or degraded grid conditions and would be included in the biennial written exam or annual Operating Simulator exercises.

The Initial Licensed Operator training includes training on ON procedures and Emergency procedures in response to a Loss of Offsite Power (LOOP) Event, Station Blackout (SBO), and Station Power Restoration. SSES operators during initial licensed operator training were trained on SSES operating instructions, "Emergency Load Control" and "Station Operation Reporting," which deal directly with communications to and from the TSO and TO.

(1e) 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.

PPL Response (SSES):

Not applicable. Formal agreements exist as described in response to Question 1(a).

(1f) 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).

PPL Response (SSES):

As previously stated, SSES does have a formal agreement with the TSO.

Notification from the TSO to the SSES control room operator occurs in accordance with the PJM operating manuals for conditions on the grid resulting in any actual or post-contingency voltages below the SSES offsite voltage requirements that could result in a degraded voltage or LOOP after a trip of the reactor unit.

The SSES voltage requirements are based on the SSES design basis analysis and are available to the control room operator in a plant operating instruction.

PJM Response:

PJM Manual, M-3, "Transmission Operations" requires PJM to initiate notification to an NPP via the TO's control center if PJM identifies an NPP switchyard voltage violation. PJM Manual M-3 states, "This notification should occur within 15 minutes for voltage contingency violations and immediately for actual voltage violations. PJM directs operations such that the violation is remedied within 30 minutes." The trip of the NPP is one of the contingencies analyzed by PJM. PJM analyzes the NPP switchyard contingency voltages to the voltage limits provided by the NPP. The voltage limits provided by the NPP are based on the plant's design basis analysis.

NRC 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.

(2a) Does your NPPs 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.

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

Yes. The PJM Energy Management System (EMS) includes a Security Analysis application, which currently runs every one minute and analyzes ~4,000 contingencies on the PJM system. The analysis provides results with respect to thermal, voltage, and voltage drop limit violations. One of the contingencies analyzed by the PJM EMS is the trip of one SSES unit.

In addition, the TO, PPL EU, utilizes a similar analysis application to calculate post-contingency voltage limit violations. One of the contingencies analyzed by the TO is the trip of one SSES unit.

(2b) Does your NPPs 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?

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

Yes. The results of the PJM Security Analysis application contain the specific contingency of the nuclear power plant tripping as the contingent element. Violation of the unit trip contingency voltage limit would result in notification by the TSO to the NPP.

The TO also possesses similar capability to monitor the same condition.

(2c) 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.

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

Yes. The trip of an SSES unit is one of the contingencies analyzed by the PJM Security Analysis application. PJM compares the NPP switchyard contingency voltages to the voltage limits provided by the NPP, which are based on the plant's design basis analysis.

The TO also possesses similar capability to monitor the same condition.

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

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

As stated in the response to 2(a) above, the PJM EMS includes a Security Analysis application, which currently updates approximately every one minute.

The TO possesses a Security Analysis application that currently updates every 10 minutes.

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

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

PJM is required to notify the SSES control room operator via the TO control center whenever actual or post-contingency voltages are determined to be below the switchyard voltage limits established by the SSES design basis analysis. This requirement applies to all contingencies involving the tripping of a SSES unit or any transmission facility as the contingent element. The notification is required even if the voltage limits are the same as the standard PJM voltage limits. These notification requirements are discussed in PJM Manual M-3, "Transmission Operations."

(2f) 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?

PPL Response (SSES):

Yes. PJM notification to SSES is based on the PJM operating manuals. If SSES is notified that PJM and the TO have both lost real time contingency analysis capability, SSES would request PJM and the TO to provide an assessment of the current grid condition based on the tools available to PJM and the TO. Based on this information, operability of the offsite power supply is evaluated in accordance with plant technical specifications.

SSES control room supervision is required to perform the following additional actions per an existing operating instruction:

A. Confirm with the local Transmission Operator (TO), PPL EU, and/or PJM that monitoring capability for SSES is unavailable and the ability to calculate the post-contingency real time has been lost.

a. Request PJM and/or the local Transmission Operator (PPL EU) to provide an assessment of the current condition of the grid based on other analytical tools PJM and the Transmission Operator have available.

B. When the grid assessment as determined by PJM and/or the TO (PPL EU) has the potential to challenge grid operability perform the following:

a. Notify the Work Week Manager to consider, if necessary, canceling or rescheduling of plant work;

b. Evaluate current plant conditions and system availability necessary to mitigate the consequences of a LOOP and initiate restoration activities and/or equipment protection actions as appropriate;

c. Notify the TO and PJM of plant actions taken as required per an operating instruction;

d. Generate an AR.

PJM Response:

Yes. NPP unit trip contingency voltage calculations are performed by the PJM EMS and the TO Security Analysis application. The PJM EMS consists of a primary and backup system. If the PJM EMS fails, the transmission owner Security Analysis application continues to analyze the NPP unit trip contingency voltage. The NPP is notified if the real time contingency analysis capability of PJM and the TO are both unavailable.

(2g) 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?

PPL Response (SSES):

No. There is no procedure requirement for comparing the actual post-trip voltages to the post-trip contingency voltage results calculated by the PJM or TO Security Analysis applications.

PJM Response:

The PJM transmission-owning member companies have a Security Analysis program similar to PJM. Therefore, there are many opportunities to compare the results of the respective Security Analysis programs. There is high confidence that the Security Analysis program results are accurate within the precision of the calculations.

PJM retains the EMS results for a period of approximately three weeks real time. It is possible to use saved EMS cases to repeat the Security Analysis calculations and compare them to the actual voltages after a unit trip occurs. However, since the NPP trips occur infrequently, it would require a number of data points to verify the accuracy with any statistical significance. This process could take years if the process is limited to a comparison of only NPP trips.

(2h) 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?

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

Not Applicable. The TSO and the TO both have an analysis tool as described in responses to Questions 2(a) through 2(e).

(2i) 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?

PPL Response (SSES):

There is no response on this question from SSES. This question is directly related to the TSO.

PJM Response:

Not Applicable. The TSO and the TO both have an analysis tool as described in responses to Questions 2(a) through 2(e).

(2j) 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.

PPL Response (SSES):

Not Applicable. The TSO and TO both have an analysis tool and the results are available to SSES.

PJM Response:

Not Applicable. The SSES TSO and TO both have an analysis tool as discussed in Responses 2a through 2e above. The applicable contingency voltage results are made available to SSES control room operator as required by PJM operating manuals.

NRC Question 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.

(3a) 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?

PPL Response (SSES):

If the TSO notifies the SSES control room operator that a trip of an SSES unit would result in switchyard voltages below the nominal trip setpoint value requirements, the operator declares the offsite power system inoperable in accordance with SSES Technical Specifications.

If the TSO notifies the SSES operator for any other postulated contingencies on the transmission grid (i.e., loss of the most critical transmission line or the largest supply) the control room operator does not declare the offsite power system inoperable. Compliance to GDC 17 requirements is still met because these conditions do not represent an impact on the nuclear plant operation that has been caused by a LOCA and subsequent generator trip.

(3b) 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?

PPL Response (SSES):

Double sequencing is not in the SSES licensing basis, and SSES is not designed or analyzed for double sequencing.

If onsite safety-related equipment is not capable of performing its safety function (as governed by plant technical specifications) then the equipment is declared inoperable.

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

PPL Response (SSES):

As stated in response to 3(b) above, SSES is not designed or analyzed for double sequencing. Therefore, an evaluation supporting double sequencing is not required.

SSES has performed an evaluation to address Information Notice (IN) 93-17 "Safety Systems Response to Loss of Coolant and Loss of Offsite Power." The current plant design for SSES has no identified design base scenarios that would result in double sequencing.

(3d) 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.

PPL Response (SSES):

No. SSES does not enter into LCOs for postulated conditions on the grid that is not the direct result of an SSES unit trip. For grid conditions, as monitored by the TSO and TO that result in an offsite circuit actual voltage violation or contingency voltage violation for a trip of an SSES unit, the offsite circuit is declared inoperable per Technical Specification 3.8.1.

The Operability of the off-site power systems, as described in the Technical Specifications LCO 3.8.1 Bases, is maintained if each offsite circuit contains the following:

a. An energized Start-up transformer with the load tap changer (LTC) in automatic operation.
b. The respective circuit path including energized ESS transformers and feeder breakers capable of supplying the 4.16kV ESS Buses.
c. Acceptable offsite grid voltage, defined as a voltage that is within the grid voltage requirements established for SSES. The grid voltage requirements include both a minimum grid voltage and an allowable grid voltage drop during normal operation, and for a predicted voltage for a trip of the SSES unit.

(3e) 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.

PPL Response (SSES):

Compliance to GDC 17 for operation of safety-related equipment in any of the circumstances is discussed in the Response to Question 3(a) above.

The SSES Technical Specifications require offsite power to be declared inoperable when the actual or predicted voltage for an SSES generator trip is below the SSES switchyard minimum voltage requirements.

The SSES operator does not declare the offsite power system inoperable for postulated contingencies on the transmission grid (i.e., loss of the most critical transmission line or the largest supply) that are not the result of a generator trip of one SSES unit. Those postulated conditions do not represent an impact (that has been caused by a LOCA and subsequent generator trip) on SSES plant operation. Therefore, the GDC 17 criteria 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 nuclear unit.

The following compensatory actions are required to be performed by the control room operator per a plant operating instruction for contingency voltage violations that occur for grid events other than a trip of a SSES unit.

1. Notify the Work Week Manager to consider, if necessary, canceling or rescheduling of plant work;
2. Evaluate current plant conditions and system availability necessary to mitigate the consequences of a LOOP and initiate restoration activities and/or equipment protection actions as appropriate;
3. Notify the TO and PJM of plant actions taken as required per an Operating instruction;
4. Generate an AR.

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

PPL Response (SSES):

Training and re-qualification training is provided to the operators for declaring equipment inoperable when conditions meet the criteria as specified in the plant Technical Specifications and/or Technical Specifications Basis sections.

NRC Question 4:

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

(4a) 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.

PPL Response (SSES):

Yes, plant procedures and Technical Specifications Bases provide guidance to the control room operator on conditions that can adversely affect the operability determination of the SSES offsite power system.

The Technical Specifications Bases define each operable offsite circuit as an energized start-up transformer with a load tap changer (LTC) in automatic operation, and a circuit path through the transformers and feeder breakers to the respective 4kV ESS Buses.

Plant procedures provide guidance for notification from the control room operator to the TO when entry into a Limiting Condition of Operation (LCO) for equipment or plant conditions that affect station operation.

Control room operators are trained and tested on the guidance and procedures as described in the previous response to Question 1(d).

(4b) 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.

PPL Response (SSES):

Not applicable. See response to Generic Letter Question 4(a).

NRC Question 5:

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

(5a) 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.

PPL Response (SSES):

SSES does not perform grid reliability evaluations as part of maintenance risk assessments. The TSO is responsible for evaluating grid reliability.

SSES performs risk assessments before performing in-plant grid-risk-sensitive maintenance activities.

SSES performs qualitative risk assessment when comparing scheduled plant maintenance activities with scheduled maintenance activities performed on the transmission system in the vicinity of the plant.

For the portion of work performed inside the plant, a quantitative risk assessment is performed using the SSES Probabilistic Risk Assessment (PRA). The PRA model calculates the increase in Core Damage Frequency and Large Early Release Frequency when performing maintenance on equipment that mitigates a LOOP/SBO. The PRA model for offsite power includes the power lines that directly feed the offsite power transformers, the offsite power transformers (T-10, T-20 and ESS transformers), start-up and ESS Buses, and associated breakers. The PRA model is designed to increase the probability of a LOOP when one source of plant offsite power is out of service.

(5b) 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?

PPL Response (SSES):

Yes. Monitoring of the grid is the responsibility of the TSO and TO. Based on these notifications, SSES control room supervision contacts the work management personnel to assess the impact on plant maintenance activities.

PJM Response:

Yes. Grid status is continually evaluated by PJM using the Security Analysis application. PJM notifies the SSES control room operator through the TO of emergent grid conditions, as discussed in the response to Question 1(b). In addition, the TO is performing similar monitoring and evaluation of the grid. Based on these notifications, NPP personnel reassess impacts to in-plant maintenance activities.

(5c) 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.

PPL Response (SSES):

SSES does not have the necessary transmission system information available to make a determination on grid stress in the vicinity of SSES caused by seasonal variations in transmission load or transmission maintenance activities.

The LOOP frequency used by SSES does not distinguish between seasonal variations with respect to the local transmission region. SSES does take into consideration transmission system conditions based on the notifications the TSO reports to SSES as described in the Response to Question 1(b). For these transmission conditions, a qualitative risk assessment is performed when comparing scheduled plant maintenance activities with scheduled activities performed on the transmission system.

PJM Response:

Stress on the grid is manifested in a number of ways. Stress can mean the loading levels on individual facilities, overall demand levels, the degree of facilities out of service for maintenance, occurrence of severe weather, etc. Each aspect creates a level of stress on the grid and challenges for the system operators.

Regarding the seasonal variability of the stress causers, each has a seasonal component. For example, peak load levels occur at the peak seasons of the summer and winter seasons. While the specific days cannot be predicted, it is known roughly when they will occur. Consequently, maintenance during these times of the year is avoided.

From a transmission system operations perspective, it is the simultaneous combination of stress causers that results in the most difficult operational challenges. For example, experiencing very hot (or cold) weather during the maintenance seasons combined with equipment out of service can cause the most severe challenges.

PJM is aware of the NERC and NRC data regarding LOOP frequency. However, it is difficult to assign differential risks to any seasonal variation based on this data because of the complexity of the various competing factors.

(5d) 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?

PPL Response (SSES):

No. Time-related variations in the probability of a LOOP are not modeled at SSES. The SSES PRA was peer reviewed in 2003 and benchmarked against the NRC SDP model in 2004. Neither group identified an issue that the LOOP frequency should be time-related.

There is no regulatory requirement for consideration of time-related LOOP frequencies during grid-risk-sensitive maintenance.

(5e) 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?

PPL Response (SSES):

Yes. Communications are established between the SSES control room operator and the TO in accordance with an interface agreement between PPL SSES and PPL EU.

Plant activities and scheduled transmission outages are coordinated between SSES, the TO, and the TSO to minimize risk before grid risk sensitive maintenance activities are conducted.

Changes in grid conditions that impact the SSES offsite circuit reliability, require the TSO/TO to contact the SSES control room operator.

(5f) 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.

PPL Response (SSES):

Grid status is continually evaluated by the TSO (PJM) using the Security Analysis application. PJM notifies SSES through its respective transmission owner of emergent grid conditions pursuant to the protocol discussed in the Response to Question 1(b). In addition, the transmission owner is performing similar monitoring and evaluation.

Based on these notifications, SSES control room supervision contacts the work management personnel to assess the impact on plant maintenance activities.

In addition to the monitoring of the transmission system by the TSO and the TO, the interface agreement between PPL SSES and PPL EU requires the TO to notify the SSES control room for emergent work activities that potentially impact safe operation of SSES.

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

PPL Response (SSES):

No. The TSO is not periodically contacted for the duration of grid-risk sensitive maintenance activities. However, the interface agreement between SSES and PPL EU requires the TO to contact the SSES control room operator when changes in grid conditions potentially affect SSES.

In addition, grid status is continually evaluated by the TSO (PJM) using the Security Analysis application. PJM notifies the SSES control room supervision through the TO of emergent grid conditions as discussed in the Response to Question 1(b). Based on these notifications, SSES operations personnel and work management personnel assess the impact on plant maintenance activities.

(5h) 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.

PPL Response (SSES):

No formal training or testing regarding the TSO protocols is given to operators and maintenance personnel.

An interface agreement between PPL EU and PPL SSES is the formal agreement between the TO and SSES. No formal training or testing regarding this document is given to operations, engineering, work management and maintenance personnel; however, SSES personnel are required to review and follow this procedure.

(5i) 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).

PPL Response (SSES):

Not applicable. Communication is required for maintenance risk assessments as described in responses to Generic Letter Question 5(f).

(5j) 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.

PPL Response (SSES):

SSES has a specific phone "hotline" for communication between the TO and Generation Power Dispatcher. An interface agreement delineates the protocol for these communications to occur. In general, continuing communication with the TO for the duration of grid-risk-sensitive maintenance is not warranted unless changes on the transmission system or changes within the SSES have occurred. Until such changes occur, no further communication is required from the SSES control room operator to the TSO.

Grid status is continually evaluated by the TSO (PJM) using the Security Analysis application. PJM notifies the SSES control room operator through the TO of emergent grid conditions as discussed in the Response to Question 1(b). In addition, the transmission owner is performing similar monitoring and evaluation. Based on these notifications, SSES operations supervision then contact the work management personnel to assess the impact on plant maintenance activities.

(5k) 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.

PPL Response (SSES):

Based on the responses to Question 5, no additional actions are identified for SSES.

NRC 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).

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

PPL Response (SSES):

Yes. SSES, along with the TO and the Generation System Operator coordinate work activities (planned or emergent) in accordance with a jointly agreed procedure.

PJM Response:

Planned transmission outages are coordinated in accordance with Section 1.9.3 of Schedule 1 to the PJM Operating Agreement, Section 4.5 of the TOA, and in accordance with a process detailed in PJM Manual M-3, "Transmission Operations," Section 4. p. 56-68. The process requires advanced notice and subsequent PJM approval for all outages to ensure grid reliability. On the outage start day, the system is analyzed by PJM prior to permitting the transmission equipment to be switched out of service.

While the equipment is switched out of service, grid status is continually evaluated by the PJM Security Analysis application. In addition, the TO performs similar monitoring and evaluations. PJM notifies the SSES control room operator through the control center as discussed in the Response to Question 1(b).

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

PPL Response (SSES):

Yes, SSES procedures provide direction for reporting equipment malfunctions and status changes affecting or potentially affecting station operation to the Generation Power Dispatcher and/or Transmission Power System Dispatcher.

(6c) 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?

PPL Response (SSES):

Yes. PPL SSES reschedules in-plant grid-risk-sensitive maintenance activities as required based on information received from the TO. For grid-risk-sensitive maintenance activities that cannot be rescheduled, plant risk is assessed and the appropriate contingencies are put in place. PJM alerts, warnings, and actions issued to PJM members, as listed in Response to Question 1(b), are also considered when performing risk assessment.

Decisions are made by the on-shift Control Room operations staff and/or the Work Management staff to notify the TO for rescheduling of grid-risk-sensitive maintenance activities as required based on plant work activities.

(6d) 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.)

PPL Response (SSES):

Yes. Risk is managed in accordance with plant procedures requiring appropriate risk management actions for grid conditions.

Compensatory actions are taken to limit or minimize risk to the loss of the offsite circuits such as rescheduling of plant and/or transmission work or protecting redundant plant equipment.

Emergent work or changes in grid conditions are evaluated for possible increased risk to generation. Evaluation per plant procedures considers the need to reschedule work and testing, complete and restore from work in progress and evaluate system

operability to reduce risk to the operating plant.

(6e) 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.

PPL Response (SSES):

The actions described in responses to Questions 6(a)-6(d) are contained in the following plant procedures:

NDAP-00-1912	"Scheduling and Coordination of Work"
NDAP-QA-1901	"Susquehanna Station Work Management Process"
OI-AD-032	"Station Operation Reporting"
PSP-25	"Configuration Risk Identification Assessment Management and Documentation"
PSP-30	"SSES Tactics for Excellence Through Accountable Management Team"
PSP-32	"Interface Agreement and Procedures for PPL EU Transmission Facilities related to PPL Susquehanna"

These SSES procedures provide direction to report equipment malfunctions and status changes affecting or potentially affecting station operation to the Generation Power Dispatcher and/or Transmission Power System Dispatcher. Risk is managed in accordance with PSP-25 "Configuration Risk Identification, Assessment, Management and Documentation."

These procedures are followed on a day-to-day basis and have been demonstrated to be effective at controlling risk to generation from a plant and TO perspective. Following the appropriate procedure and effective communication protocols ensures consistent performance in managing our risk and when required, reducing risk by restoring and re-scheduling work due to emergent issues as they occur.

PJM Response:

The transmission outage coordination process is an agreement between PJM and members and is documented in PJM Manuals. In addition, PJM utilizes computerized tools to track the process throughout its evolution, in order to assure PJM and the members are clear on status and expectations.

(6f) 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).

PPL Response (SSES):

All SSES personnel are expected to follow station procedures when performing their work activities. No actual training or testing is provided for this function; however, adherence to the procedural requirements is monitored to ensure compliance. For operator training on grid conditions, see the Response to Question 1(d).

(6g) 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).

PPL Response (SSES):

Not applicable. Effective coordination between the SSES control room operator and the TSO regarding transmission system maintenance or SSES maintenance activities occurs as described in Responses to Questions 6(a)-6(f).

(6h) 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.

PPL Response (SSES):

Not applicable. As explained in previous responses to Question 6, SSES considers and effectively implements appropriate risk management actions during grid-risk-sensitive maintenance activities.

(6i) 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).

PPL Response (SSES):

It is not necessary to provide an alternate Response to Questions 6(g) and 6(h).

NRC Question 7:

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

(7a) 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.

PPL Response (SSES):

The SSES TSO and TO both have operating manuals or instructions that provide direction for offsite power restoration to SSES. SSES does not have an agreement with the TSO or TO to identify specific local power sources that could be made available to resupply power to SSES following a LOOP event.

Based upon North American Electric Reliability Council (NERC) standards, both the TO and TSO require that the nuclear power plants be given priority for offsite power restoration.

PJM Response:

The PJM Restoration Manual (M-36) details the process to be followed during a system restoration. The process reiterates the specific offsite power requirements for NPPs:

"Offsite power should be restored as soon as possible to nuclear units, both units that had been operating and those that were already off-line prior to the system disturbance, without regard to using these units for restoring customer load."

However, due to the myriad of possible restoration scenarios, no specific power sources to resupply NPPs are identified. The PJM restoration process allows for the fact that the blacked out area may or may not be separated from the remainder of the system. Regardless of the scenario, there is a clear recognition of the importance of restoring the offsite power source(s) to an NPP.

PJM Manual M-36 further states: "Transmission Owners and Nuclear Power Plants must effectively communicate to keep the Nuclear Power Plant apprised of the anticipated restoration time for offsite power."

The manual also states that for PJM Restoration Drills the objectives should include "Ensure that all nuclear units have been provided with one offsite source within four

hours "and that the PJM Nuclear Generation Owner/Operator Users Group should be debriefed on the drill results.

In support of the restoration objectives outlined in the PJM Restoration Manual, there are generating units designated as critical black-start units electrically close to each of the NPPs. These black-start units are required to provide black-start capability whenever necessary. The adequacy of black-start resources to support system restoration is managed through a process contained in PJM Manual M-10 "Pre-Scheduling Operations," Section 2, p. 16. The process ensures the continuous availability of black-start units to support the restoration needs of the NPPs even when a designated black-start unit is on a planned outage.

(7b) 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.

PPL Response (SSES):

No. Training and testing on identifying and using local power sources to resupply SSES following a LOOP event is not under the SSES operator control. The SSES control room operator cannot identify or control the use of local power sources to supply SSES following a LOOP. Identifying and using local power sources to resupply SSES is the requirement of the TSO.

Re-energizing onsite AC distribution from offsite power supplies is accomplished in accordance with plant operating procedures. The actions required to perform this evolution include confirmation from the TSO on a reliable available offsite power source and specific onsite breaker alignments in order to allow for a controlled re-energization of the plant buses to offsite power.

(7c) 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.

PPL Response (SSES):

Identification of local power sources to resupply power following a LOOP is not specifically included in the agreement with the TSO and is not part of 10 CFR 50.63, "Loss of All Alternating Current Power." 10CFR 50.63 refers to the loss of all alternating current power as "station blackout" (SBO). Section 15.9 of the SSES FSAR addresses SSES Compliance with 10 CFR 50.63. Section 15.9 includes the following statement "The NRC has accepted the coping assessment (Reference 15.9-1) for SSES categorizing the plant as capable of coping with SBO for at least four hours, as documented in the NRC's "Supplemental Safety Evaluation (SSE) on the Station Blackout Rule for Susquehanna Steam Electric Station, Units 1 and 2."

NRC Question 8:

Maintaining SBO coping capabilities in accordance with 10 CFR 50.63.

(8a) 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?

PPL Response (SSES):

The SSES initial SBO Coping Assessment was completed in 1989. Since then, SSES has not experienced a total LOOP caused by grid failure.

(8b) If so, have you re-evaluated 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?

PPL Response (SSES):

Not required based on our Response to Question (8a).

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

PPL Response (SSES):

Not required based on our Response to Question (8a).

(8d) 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 re-evaluated 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.

PPL Response (SSES):

Not required based on our Response to Question (8a).

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.

PPL Response (SSES):

No actions are warranted.