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U. S. Nuclear Regulatory Commission
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SUSQUEHANNA STEAM ELECTRIC STATION
REQUEST FOR REGIONAL ENFORCEMENT DISCRETION:
INOPERABLE OFFSITE POWER SOURCE
PLA-5533 **Docket No. 50-387**

The purpose of this letter is to request that the NRC exercise enforcement discretion to not enforce compliance with the requirements of Susquehanna Steam Electric Station Unit 1 Technical Specification LCO 3.8.1 ACTION A.3. Each of the elements of a licensee request for Regional Enforcement Discretion specified in NRC Manual Chapter 9900 is addressed herein.

Technical Specification LCO 3.8.1 addresses AC Sources – Operating with one inoperable offsite power source, ACTION A.3 requires the offsite source to be restored to an OPERABLE condition within 72 hours. If the offsite source is not restored within 72 hours, ACTION F.1 requires the unit to be in MODE 3 within 12 hours.

Two independent offsite power sources are supplied to and shared by both Unit 1 and Unit 2. These two independent circuits provide AC power through Startup Transformers ST No. 10 and ST No. 20 to the four 4.16 kV Engineered Safeguards System (ESS) buses in each Unit 1 and Unit 2.

Due to a failure experienced on the ST No. 20 (one offsite power source), ST No. 20 was declared inoperable at 0230 hours on October 3, 2002. A replacement transformer will be installed. This replacement transformer will not be installed prior to reaching the LCO 3.8.1 ACTION A.3 completion time of 72 hours which expires at 0230 hours on October 6, 2002. PPL has an aggressive plan in place to complete the installation, testing and startup of the replacement transformer as expeditiously as possible. Thus, enforcement discretion is requested to allow continued operation of Unit 1 until the replacement transformer is installed and declared OPERABLE.

Unit 2 was in MODE 2 when ST No. 20 failed and is currently in MODE 4 – Cold Shutdown. Unit 2 will be maintained in MODE 4 until sometime after the ST No. 20 transformer is declared OPERABLE.

This enforcement discretion is requested to be granted for an additional 4 days until 0230 hours on October 10, 2002 at which time the transformer is expected to be OPERABLE. As described below, PPL has instituted compensatory measures whose effect is to compensate for the extended completion time such that the overall risk for Unit 1 is neutral.

DISCUSSION OF ELEMENTS FOR A REQUEST FOR ENFORCEMENT DISCRETION AS SPECIFIED IN NRC INSPECTION MANUAL PART 9900

1. **The TS or other license conditions that will be violated.**

   Unit 1 TS LCO 3.8.1 AC Sources – Operating ACTION A.3 requires the restoration of an inoperable offsite source to OPERABLE status within 72 hours. Replacement of the ST No. 20 transformer will not be completed within this 72-hour period. Since the completion time of 72 hours (expires at 0230 hours on October 6, 2002) required by ACTION A.3 will not be met, LCO 3.8.1 CONDITION F applies. ACTION F.1 requires MODE 3 to be achieved within 12 hours and ACTION F.2 requires MODE 4 to be achieved in 36 hours. This enforcement discretion is requested to allow Unit 1 to continue operation in lieu of implementing the LCO 3.8.1 CONDITION F ACTIONS F.1 and F.2 by extending the completion time of ACTION A.3 to 7 days.

2. **The circumstances surrounding the situation, including apparent root causes, the need for prompt action and identification of any relevant historical events.**

   At approximately 0230 hours on October 3, 2002, a fire occurred on transformer ST No. 20. The fire was extinguished automatically by the deluge system. Unit 1 was in MODE 1 - Power Operation operating at 100% power and Unit 2 was in MODE 2 – Startup. Unit 2 was manually scrammed due to a loss of both Reactor Recirculation pumps. Unit 1 continued operation at 100% power.

   Preliminary damage assessment indicates a fault internal to the transformer was the most probable cause of the failure. An Event Review Team has been formed to determine the root cause(s). Preliminary assessment by the root cause team did not identify any inherent failure in design or maintenance practices that would be indicative of common mode failures.

Preventative Maintenance (PM) thermography is performed on the tranformers on a two year cycle, typically during unit outages, since this is the time that the transformers are more highly loaded. The PM was last performed on the ST No. 20 on March 10, 2001. No problems were identified.

Prompt action is necessary to allow continued operation of Unit 1 to avoid an undesirable and unnecessary shutdown transient that is not justified by the safety consequences and operational risk impacts a shutdown transient imposes.

3. **The safety basis for the request, including an evaluation of the safety significance and potential consequences of the proposed course of action. This evaluation should include at least a qualitative risk assessment using both risk insights and informed judgements, as appropriate.**

System Design Description:

The station's Class 1E AC Electrical Power Distribution System AC sources consist of two offsite power sources, and the onsite standby power sources (diesel generators (DGs) A, B, C, and D). A fifth diesel generator, DG E, can be used as a substitute for any one of the four DGs A, B, C or D. As required by 10 CFR 50, Appendix A, GDC 17, the design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The Class 1E AC distribution system is divided into redundant load groups, so loss of any one group does not prevent the minimum safety functions from being performed. Each load group has connections to two offsite power supplies and a single DG.

The two offsite power sources each consist of a circuit between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System. These offsite power sources are independent. A 230 kV line from the Susquehanna ST No. 10 tap 230 kV switching station feeds Startup Transformer ST No. 10; and, a 230 kV tap from the 500-230 kV tie line feeds the Startup Transformer ST No. 20.

Startup Transformers ST No. 10 and ST No. 20 each provide the normal source of power to two of the four 4.16 kV ESS buses in each Unit and the alternate source of power to the remaining two 4.16 kV ESS buses in each Unit. If any 4.16 kV ESS bus loses power, an automatic transfer from the normal to the alternate occurs after the normal supply breaker trips. As a result of the failure on Startup Transformer

ST No. 20, this second off site power source is not available. Therefore, Startup Transformer ST No. 10 is presently providing power to each of the four 4.16 kV Engineered Safeguards System (ESS) buses (A, B, C and D) in each unit (8 total buses) for both Unit 1 and Unit 2, respectively.

The Susquehanna ST No. 10 tap 230 kV Switchyard is supplied by two 230 kV transmission lines, the Mountain-Susquehanna T10 and Montour-Susquehanna T10 lines. A total of three 230 kV circuit breakers are electrically configured in a ring bus connecting the Montour-Susquehanna T10 230 kV line and Mountain-Susquehanna ST No. 10 230 kV line to the Startup Transformer ST No. 10 providing optimum reliability and redundancy.

The onsite standby power source for 4.16 kV ESS buses A, B, C and D consists of five DGs. DGs A, B, C and D are dedicated to ESS buses A, B, C and D, respectively. DG E is available to be used as a substitute for any one of the four DGs (A, B, C or D) to supply the associated ESS bus. Each DG provides standby power to two 4.16 kV ESS buses — one associated with Unit 1 and one associated with Unit 2. The four required DGs are those aligned to a 4.16 kV ESS bus to provide onsite standby power for both Unit 1 and Unit 2.

Any DG, when aligned to an ESS bus, starts automatically on a loss of coolant accident (LOCA) signal (i.e., low reactor water level signal or high drywell pressure signal) or on loss of offsite power (LOOP) which could be the result of an undervoltage or sustained degraded grid voltage.

When a DG is connected to its respective ESS bus, loads are sequentially connected to the ESS bus by individual load timers which control the permissive and starting signals to large motor circuit breakers to prevent overloading the DG. The ESS electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA).

<u>Safety basis for the request, including an evaluation of the safety significance and potential consequences of the proposed course of action:</u>

The effect of increasing the completion time for ST No. 20 has been assessed for its impact on plant risk. The following Table summarizes the calculated core damage frequency for the three cases evaluated. This PRA evaluation shows that when the risk significant equipment related compensatory measures are evaluated, the effect on plant risk of the inoperable ST No. 20 for the additional 4 days is reduced. When the additional compensatory measures related to the monitoring and reliability of ST

No. 10 and the offsite power lines are considered, the risk impact has been determined to be neutral on a qualitative basis.

Case #	Case Description	Core Damage Frequency
1	ST No. 20 Operable / Normal operation	2.3E-5
2	ST No. 20 Inoperable / without compensatory actions	4.0E-5
3	ST No. 20 Inoperable / with risk significant equipment related compensatory actions	2.0E-5

In order to evaluate the effect of increasing the completion time for ST No. 20 from 3 to 7 days, the core damage frequency was calculated for both ST No. 20 Operable and for ST No. 20 inoperable (both with and without the risk significant equipment related compensatory actions specified in Item 7 implemented). The evaluation process consisted of performing calculations with the SSES PRA model modified as described below.

The current PRA base model incorporates a number of improvements based on NRC feedback from their SDP Notebook benchmarking visit. The specific improvements in the current SSES base model, based on PPL's reevaluation of these issues, are:

1. It was assumed that containment failure or venting eliminates all active equipment in the reactor building due to the harsh environment. Thus, containment failure or venting was assumed to result in core damage.

2. The use of 2 CRD pumps as a success criterion for high-pressure injection was eliminated for preventing core damage.

Two other conservative features of the PRA model used for this evaluation were:

1. Late injection (after containment failure) was not credited. This is conservative since it overestimates the core damage frequency.

2. No credit was taken for the use of RWCU blowdown path for containment heat removal.

For evaluating the risk of allowing 7 days with ST No. 20 inoperable, the following modeling assumptions were also used:

1. Credit was taken for the E Diesel Generator being substituted for the A Diesel Generator in the event of a LOOP and failure of the A Diesel Generator.

2. The LOOP frequency was adjusted to reflect that only one source of offsite power was available.

3. The probability of recovery of offsite power following a LOOP was reduced to reflect the fact that only one source of offsite power would be available.

4. Since the "random maintenance" model was used for the base case, random maintenance was not allowed on those key systems identified in Item 7 for the evaluation of the ST No. 20 inoperable case. Thus, consistent with the compensatory measures in Item 7, the model reflected the fact that certain work activities on key components (such as the five Diesel Generators) will be prohibited. It is acceptable to not perform elective maintenance during this short period of time.

In this model, LOOP events are attributed to four causes: plant centered, grid centered, severe weather centered and extreme weather. The calculated core damage frequencies for ST No. 20 operable and inoperable were calculated using the current SSES PRA model modified as described above.

With the mitigating measures taken for Unit 1 and common equipment, the core damage frequency is comparable to operation with ST No. 20 operable. The mitigating measures discussed in Item 7 will be taken. Thus, the compensatory measures make operation with ST No. 20 inoperable risk neutral during the time the NOED is in effect.

Additionally, geomagnetic activity from solar storms is currently low. Forecasts provided to the PJM interconnection do not predict unusual amounts of geomagnetic activity prior to the scheduled return of the ST No. 20 transformer.

Based on the above, it is deemed that the safety significance and potential consequences of extending the 72 hour completion time required in ACTION A.3 to 7 days is acceptable.

4. **The justification for the duration of the noncompliance.**

   This one time request for a 4 day extension of the completion time for LCO 3.8.1 ACTION A.3 from 72 hours to 7 days is justified because this proposed change in conjunction with the compensatory measures described in Item 7 represents a neutral plant risk profile for Unit 1.

5. **The basis for the licensee's conclusion that the noncompliance will not be of potential detriment to the public health and safety and that no significant hazard consideration is involved.**

   The noncompliance will not be of potential detriment to the public health and safety because the safety significance, potential consequences and risk associated with continued operation of Unit 1 for 4 additional days with the ST No. 20 transformer inoperable is neutral as demonstrated in Item 3 above.

   <u>No Significant Hazards Considerations</u>

   I. This proposal does not involve a significant increase in the probability or consequences of an accident previously evaluated.

      The probability of a LOOP is affected by the inoperable ST No. 20. However, when the compensatory measures related to the monitoring and reliability of ST No. 10 and the offsite power lines are considered, the increase in probability is considered neutral.

      The consequences of losing offsite power have been evaluated in the FSAR and the Station Blackout evaluation. Increasing the completion time for one off site power source from 72 hours to 7 days does not increase the consequences of a LOOP event nor change the evaluation of LOOP events as stated in the FSAR or Station Blackout evaluation.

      Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   II. This proposal does not create the possibility of a new or different type of accident from any accident previously evaluated.

      Allowing the completion time for ST No. 20 to increase from 72 hours to 7 days is a one time exemption that will allow continued operation of Unit 1 while replacing the failed ST No. 20. The accident analyses affected by this extension are the LOOP events that are discussed in the FSAR. The potential for the loss of other plant systems or equipment to mitigate the effects of an accident are not altered.

Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

III. This change does not involve a significant reduction in a margin of safety.

The proposed change allows, on a one-time basis, ST No. 20 to be out of service for an additional 4 days than is allowed by Technical Specifications. This increase in completion time for ST No. 20 results in a slight decrease in the margin of safety. Implementation of the compensatory measures described in Item 7 below mitigates and reduces the core damage frequency during the time the NOED is in effect such that the potential impact of extending the completion time is neutral. Therefore, this one time exemption will not involve a significant reduction in safety margin.

6. The basis for the licensee's conclusion that the noncompliance will not involve adverse consequences to the environment.

Operation of Unit 1 with one OPERABLE offsite source as described above in Item 3 will not change the types or increase any amount of effluents that may be released offsite. The proposed change does not involve any physical changes to the plant (no new or different type of equipment is being installed to allow operation with one OPERABLE off-site source). Therefore, no environmental consequences that have not been previously evaluated are anticipated.

7. Any proposed compensatory measures.

The following information has been developed and actions taken shortly after the ST No. 20 failure occurred to assess the condition of the ST No. 10 transformer (the currently OPERABLE offsite source).

- Thermography was performed on ST No. 10, on October 3, 2002 after the failure occurred on ST No. 20. No hot spots were found.

- Predictive Maintenance trending data has been reviewed for ST No. 10. No adverse trends are present.

- All four required Emergency Diesel Generators, (EDGs) are OPERABLE and the spare fifth is available to be substituted for any of the four required EDGs.

- Review of ST No. 10 corrective maintenance work orders produced no items that affect ST No. 10 reliability.

- On October 4, 2002 thermography inspections were performed of the ST No. 10 Local Control Panel and the On Load Control Box and verified there are no ST No. 10 control logic concerns.

Also, on October 3, 2002, thermography was performed on the main transformers and on the ESS transformers. No problems were found.

The following mitigating measures are being taken to reduce the potential for loss of ST No. 10 and to increase the ability to identify and take appropriate actions before a problem arises with ST No. 10:

- Engineering Inspections of ST No. 10 for obvious signs of degraded conditions will be performed. These will include:
    - Visually inspect the high voltage bushings and other insulators on ST No. 10.
    - Perform daily thermography inspections of ST. No. 10.
    - Trend ST No. 10 and Bus 10 voltage levels.
    - Perform daily engineering rounds of ST No. 10 to monitor overall performance.

- **Operator Rounds (enhanced based on the INPO SOER 02-3) will be increased to once per shift from once per day for ST No. 10 except for the bushing oil level check which will be done once per day.**

- **High-risk activities within the confines of the plant that may result in a loss of ST No. 10 during the ST No. 20 outage will be prohibited.**

- **High-risk grid activities that may result in a loss of ST No. 10 during the ST No. 20 outage will be prohibited.**

- For the duration of the ST No. 20 outage, Transmission and Distribution Operations will NOT grant any work requests that would jeopardize the reliability of ST No. 10. This includes, but is not limited to, canceling any requests that would cause ST No. 10 to operate in a radial manner from either the Montour or the Mountain 230kV Substation.

- If it is determined through the ongoing investigation into the ST No. 20 failure during the time that the NOED is in effect that the condition(s) that caused the ST No. 20 failure exists on ST No. 10, it will be declared inoperable and Technical Specifications implemented.

To ensure the risk significant equipment required to mitigate the consequences of a loss of ST No. 10 are available during the effective period of the NOED, elective maintenance will not be performed, and, except for any required surveillance activities, these risk significant systems will be maintained operable. Any failed system/component will be returned to operable status as soon as possible (The failed system/component shall be worked around the clock. The following is the list of equipment and systems that are considered risk significant along with their risk significant function.

- Unit 1 CRD pumps – reactivity mitigation
- Diesel fire pump, yard fire hydrant and associated hydrant hose station (located near the ESSW pump house) – late injection capability
- Unit 1 RHR – decay heat removal and low pressure injection
- Unit 1 RHRSW – decay heat removal
- ESW – decay heat removal
- Unit 1 RHR/RHRSW cross tie valves - late injection capability
- Unit 1 RCIC - high pressure makeup
- Unit 1 HPCI - high pressure makeup
- Unit 1 SBLC – reactivity mitigation
- Unit 1 CIG 150 psig header and bottles support for ADS depressurization function
- Unit 1 Turbine Building Closed Cooling Water - support for instrument air, condensate pumps, and CRD pumps
- Portable diesel generator ("blue max") - charging power for batteries
- Four emergency diesel generators – Class 1E AC power
- The spare emergency diesel generator shall be maintained available – Class 1E AC power
- Unit 1 Class 1E 250 vdc – HPCI and RCIC valve power
- Unit 1 Class 1E 125 vdc – 4.16 kV breaker controls and DG start
- Startup buses – AC power
- Unit 1 Class 1E 4.16 kV- ESS buses

Shift Operating crews will review severe weather, LOOP, and station blackout procedures to enhance readiness.

The above compensatory measures offset the risk of operating with one inoperable offsite power source and return the plant risk profile to risk neutral.

Should any of the above equipment or systems become unavailable or inoperable, PPL will immediately begin and promptly complete a risk evaluation of the impact to determine if the basis for the NOED remains valid, and within 1 hour, contact the NRC Operations Center and an NRC Resident Inspector.

Additionally, should degradation of ST No. 10 be identified, PPL will immediately begin to evaluate the impact and promptly complete an evaluation to determine operability of ST No. 10. If determined to be inoperable, Technical Specification requirements will be implemented and within 1 hour, PPL will contact the NRC Operations Center and an NRC Resident Inspector.

8. **A statement that the request has been approved by the facility organization that normally reviews safety issues (Plant On-Site Review Committee or its equivalent).**

On October 5, 2002, this request was reviewed and approved by the Plant Operations Review Committee (PORC). The PORC is the SSES organization that reviews safety issues.

9. **The request must specifically address which one of the NOED criteria for appropriate plant conditions specified in Section B is satisfied and how it is satisfied.**

NOED criterion for Situations Affecting Radiological Safety – Regular NOEDs that is applicable is criteria 1.a. This criteria is satisfied for the following reasons:

- SSES Unit 1 is operating at power.
- Compliance with Technical Specification 3.8.1 Action F.1 and F.2 would create an undesirable and unnecessary shutdown transient on Unit 1 that is not justified by the safety consequences and operational risk impact as discussed in Item 3 above.
- Based on the evaluation presented, the proposed enforcement discretion will minimize these potential safety consequences and operational risks.

10. **If a follow-up license amendment is required, both the written NOED request and the license amendment request must be submitted within two working days. The licensee's amendment request must describe and justify the exigent circumstances (See 50.91(a)(6)).**

    A follow-up amendment is not required due to the short duration in which this enforcement discretion is to be effective.

11. **For severe weather or other natural phenomena - related NOEDs , the licensee's request must be sufficiently detailed for the staff to evaluate the likelihood that the event could affect the plant, the capability of the ultimate heat sink, on-site and off-site emergency preparedness status, access to and from the plant, acceptability of any increased radiological risk to the public and the overall public benefit.**

    This NOED does not involve severe weather thus this request does not contain related information.

Any questions regarding this information should be directed to Mr. R. R. Sgarro, Manager – Nuclear Regulatory Affairs at (610) 774-7552.

Sincerely,

Richard L. Anderson

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