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 FACIL: 50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylvania

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SUBJECT: Requests enforcement discretion from SES unit 2 TS re post accident monitoring instrumentation.

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**SUSQUEHANNA STEAM ELECTRIC STATION  
REQUEST FOR ENFORCEMENT DISCRETION :  
INOPERABLE EX-CORE NEUTRON FLUX MONITOR  
PLA-4262 FILES A17-2/R41-2**

Docket No. 50-388

Dear Sir:

The purpose of this letter is to request enforcement discretion from the Susquehanna SES (SSES) Unit 2 Technical Specifications regarding Post Accident Monitoring Instrumentation. This enforcement discretion will avoid an undesirable plant shutdown as a result of forcing compliance with a license condition and thus minimize potential safety consequences and operational risks that are inappropriate for the plant condition. Such action will allow Unit 2 to operate until the next unit shutdown which allows for containment entry of sufficient duration to properly evaluate and correct the impaired condition, not to exceed the seventh refueling and inspection outage, with the 'B' Neutron Flux Monitor (Ex-core Monitor) inoperable.

**BACKGROUND**

At 2130 hours on January 30, 1995 the Excore Neutron Flux Channel 'B,' log power range indicator was found to be reading upscale by the Unit 2 Plant Control Operator (PCO). The 'B' channel was declared inoperable and the appropriate limiting condition of operation (LCO) action statement was entered. The 'A' channel remains operable.

**REQUIREMENTS FOR WHICH ENFORCEMENT DISCRETION IS REQUESTED**

PP&L is requesting enforcement discretion for the applicability requirements of Unit 2 Technical Specification (TS) 3.3.7.5 for Neutron Flux instrumentation so that Unit 2 could continue to operate in Operational Conditions 1 and 2 while a proposal to amend the Technical Specifications is processed. Specifically, it is requested that the requirements of TS 3.3.7.5 be amended to allow continued operation with the 'B' Ex-core Neutron Flux Monitor inoperable. Additionally, TS

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3.3.7.5 is requested to be amended for Neutron Flux instrumentation to address continued operation with less than the Minimum Channels OPERABLE; allowing restoration of the inoperable channel(s) to OPERABLE status within 7 days.

**CIRCUMSTANCES SURROUNDING THE SITUATION, INCLUDING ROOT CAUSES, THE NEED FOR PROMPT ACTION AND IDENTIFICATION OF ANY RELEVANT HISTORICAL EVENTS**

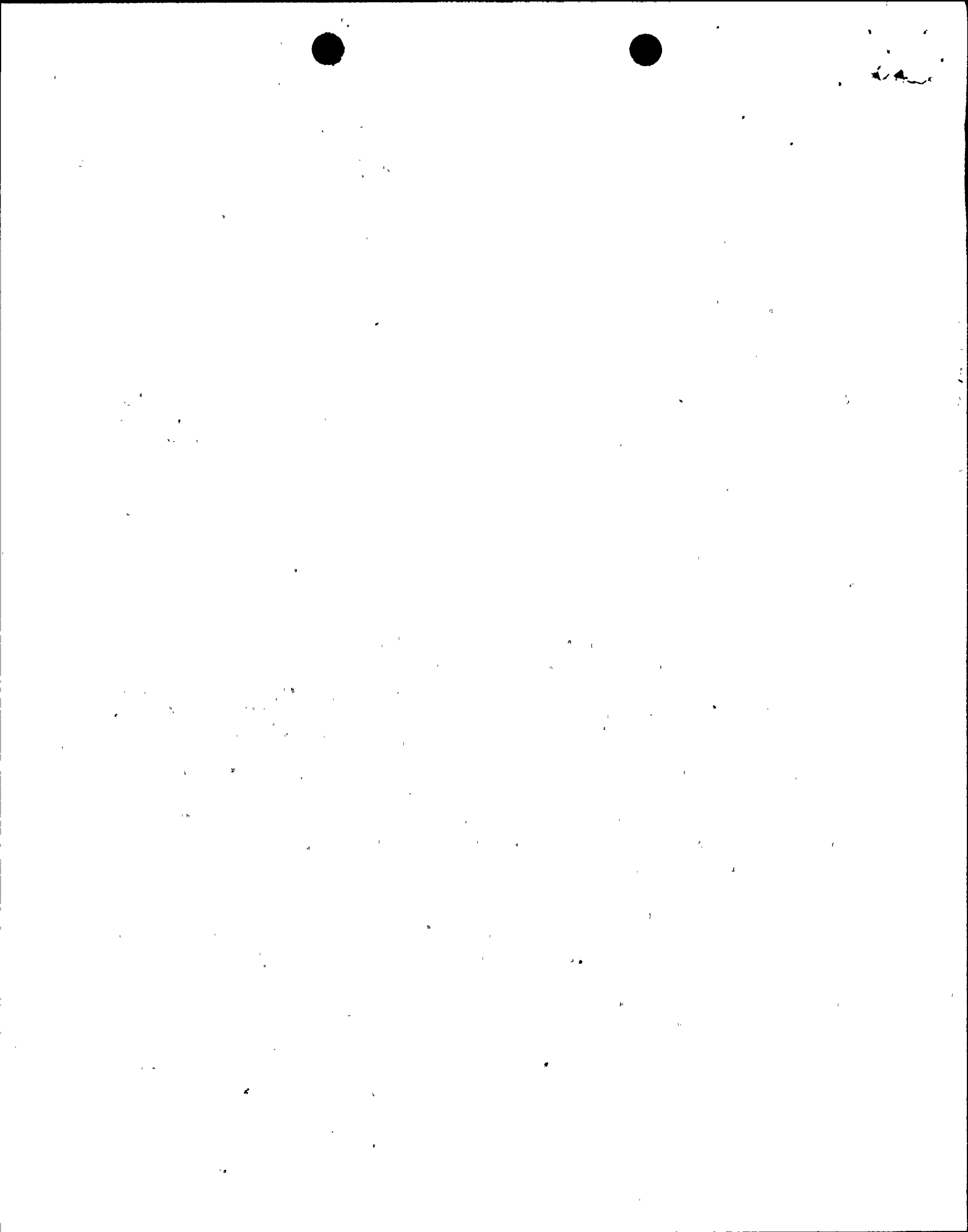
Technical Specification LCO 3.3.7.5 Action 80a restoration time expires at 2130 hours on February 6, 1995. PP&L has completed all reasonable efforts to identify the cause and correct the condition to enable restoring the indicator to OPERABLE status, including obtaining troubleshooting guidance directly from the original equipment manufacturer (OEM). However, these efforts have been unsuccessful in correcting this inoperable situation and unless this indicator is restored to an OPERABLE status, Unit 2 will be required to shutdown.

A review of work history for the Ex-core Neutron Flux channel 'B' instrument has revealed two distinct periods of time in which erratic behavior was observed since the June 1994 restart following the Unit 2 sixth refueling outage.

The first period of this erratic behavior was in mid-July and resulted in corrective actions which included replacement of multiple components. Upon completion of this component replacement, surveillance testing was successfully performed and normal operation continued until December, 1994. Beginning December 12, 1994 and continuing to the present, a series of anomalies occurred requiring additional component replacements. However, up until this most recent anomaly, all surveillance testing following these repairs was satisfactorily completed and the instrument functioned as required. As stated previously, the Ex-core Neutron Flux Channel 'B,' log power range indicator was found to be reading upscale at 2130 hours on January 30, 1995. An extensive effort was immediately initiated to address this latest event. These efforts, including OEM troubleshooting guidance, have resulted in the testing and replacement of many related electronic components and assemblies outside the Unit 2 primary containment.

However, this latest testing and component replacement has not resulted in the correction of this inoperable condition, but has provided credible evidence that the root cause of this inoperable condition may be a faulty detector or a cable/connection problem inside primary containment.

PP&L, with the OEM, is continuing to pursue identification of the root cause of this inoperable condition by performing analysis on several replaced circuit boards. However, the evidence at this time supports PP&L's belief that an entry into the Unit 2 primary containment, and hence the shut down of Unit 2, is required to fully identify the root cause of the Ex-core Neutron Flux Channel 'B' instrument, and to effect its repair and return to OPERABLE status.



### SAFETY SIGNIFICANCE AND CONSEQUENCES OF PROPOSED REQUEST

Technical Specifications 3.3.7.5 Action 80a states, "With the number of OPERABLE accident monitoring instrumentation channels less than the Required Number of Channels shown in Table 3.3.7.5.-1, restore the inoperable channel(s) to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours. The OPERABILITY of the accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess important variables following an accident. To provide this accident neutron flux monitoring capability, Susquehanna Steam Electric Station (SSES) Units 1 and 2 have an ex-core neutron monitoring system. The ex-core neutron monitoring system is comprised of two separate and redundant channels, each with four detectors mounted in the containment on the outside of the biological shield.

The ex-core system provides indication and alarm functions only. It provides log and low power countrate information to the Safety Parameter Display System (SPDS) and the plant computer. Indication of log and low power countrate and period is provided in the Control Room. The system also provides countrate information at the Shutdown Margin monitor. The ex-core system receives its power supply from instrument AC, which is backed by the diesel generators.

Although the ex-core system was installed at SSES to meet the neutron flux monitoring requirements of Regulatory Guide 1.97, the post-accident neutron flux monitoring functions can be accomplished by the SRMs, IRMs, LPRMs, and APRMs, which are referred to as the NMS. The Boiling Water Reactor Owners' Group (BWROG) Report, NEDO-31558 provides a review of the available neutron monitoring instrumentation and provides alternate requirements to those stated in Regulatory Guide 1.97.

To support the BWROG NEDO report, the NRC has issued a Safety Evaluation Report (SER) which analyzed event scenarios to determine the consequences of neutron flux monitoring unavailability and concludes that the failure of this instrumentation will not prevent the operator from determining appropriate reactor power levels. Alternate parameter status will be available from which reactor power may be inferred. Some alternate indications may require more than one input to determine reactor power. However, based on the multiple inputs available to the operator, sufficient information will be available upon which to base operational decisions and to conclude that reactivity control has been accomplished. Further, NEDO-31558 contains criteria regarding the range, power supplies, and qualifications for neutron flux monitoring instrumentation that provide sufficient confidence that the neutron flux monitoring instrumentation will be available to confirm reactor shutdown for a wide range of events including an Anticipated Transient Without Scram (ATWS). Consistent with PP&L's understanding, the BWROG also stated that for BWR design bases events, recriticality is not a significant contributor to core melt risk for BWR accident scenarios that go beyond the design basis.



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Based on a preliminary review of the NEDO report and NRC issued SER, PP&L has concluded that the results apply to SSES. Further work will be needed to confirm that all technical issues can be addressed which would conclude that the Excore Monitors are not needed for Susquehanna and can be removed from the Technical Specifications.

**BASIS FOR CONCLUSION THAT THE NON-COMPLIANCE WILL NOT BE OF POTENTIAL DETRIMENT TO THE PUBLIC HEALTH AND SAFETY AND THAT A SIGNIFICANT SAFETY HAZARD IS NOT INVOLVED.**

As stated in the NRC SER, the staff concludes that the post-accident neutron flux monitoring instrumentation at existing BWRs should meet the criteria in NEDO-31558 and the SSES exceeds such criteria. With approval of the enforcement discretion, Unit 2 will retain one channel of the excore monitor operable, will have available sufficient alternate accident monitoring functions and emergency operating procedures in place to assure protection of public health and safety. We conclude that neither an unreviewed safety question nor a significant hazards consideration is in the non-compliance. Based on the BWROG submittals, the Director of NRR has determined that Category 1 neutron flux monitoring instrumentation is not needed for existing BWRs to cope with a Loss-of-Coolant Accident (LOCA), ATWS, or other accidents that do not result in severe core damage conditions. Instrumentation to monitor the progression of core melt accidents is best addressed by the current severe accident management program. Therefore, for existing BWRs, neutron flux monitoring instrumentation does not need to meet the Category 1 criteria of Reg. Guide 1.97. PP&L supports this position.

**No Significant Hazards Consideration**

- 1. This proposal does not involve a significant increase in the probability or consequence of an accident previously evaluated.*

The ex-core system at SSES was installed for the purposes of providing accident neutron flux monitoring capabilities in accordance with Regulatory Guide 1.97. The ex-core system provides indication and alarm functions only. It provides log and low power countrate information to SPDS and the plant computer. Indication of log and low power countrate and period is provided at Control Room panel 2C652-42B. The system also provides countrate information at the Shutdown Margin monitor on panels 2C690 A and B.

Although the ex-core system was installed at SSES to meet the requirements of Regulatory Guide 1.97, the accident monitoring functions can be accomplished by the NMS instrumentation (SRMs, IRMs, LPRMs, and APRMs). NEDO-31558 provides an review of the available neutron monitoring instrumentation from an Emergency Procedure Guidance

(EPG) standpoint and provide alternate requirements to those stated in Regulatory Guide 1.97.

The NEDO report examined the consequences of post-accident failures of the existing NMS. The report evaluated a range of events where the operator might be required to use the NMS for post-accident monitoring, and determined the effect of a NMS failure. This review was based on the generic BWROG EPGs. The events selected provided a spectrum of impacts, but the study concluded that they bound the importance of NMS for all events within the scope of the regulatory Guide 1.97 criteria.

The conclusion reached by the NEDO-31558 was that for these analyzed events, the long term post-accident function to monitor neutron flux is not needed after reactor shutdown has been confirmed. Although the environment of the NMS equipment will undergo severe environmental conditions, the automatic plant responses make the NMS indication of low importance to plant operators.

The analysis showed that for these events operator actions are not affected by the loss of the NMS if the RPIS remains operable. In addition to this, the initial environment in which the equipment is located is not expected to be harsh. Therefore, failure of the NMS or the RPIS is not expected to occur prior to shutdown confirmation.

The NMS at SSES meets the intent of the design requirements given in NEDO-31558 (both generic and plant specific). Therefore, the results of the analysis apply to SSES. Based on this the neutron flux monitoring capabilities are maintained by the use of the NMS. Furthermore, these capabilities are maintained even with a failure of the NMS as discussed in NEDO-31558.

At SSES Emergency Operating Procedures (EOP) were reviewed to assure that there is no plant specific role for neutron flux monitoring that differs from the evaluation in NEDO-31558. Our conclusion from this review is that the ex-core system is not in the SSES EOPs and that adequate procedural guidance exist to determine core power or the future response of core power.

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

The ex-core system at SSES was installed for the purposes of providing accident neutron flux monitoring capabilities in accordance with Regulatory Guide 1.97. The system provides indication and alarm functions only. As stated above, the NMS instrumentation will provide indications to ensure that post accident monitoring of neutron flux is available to the





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operators. These indications will also allow the operators to confirm that reactivity control functions have been accomplished.

The analysis documented in NEDO-31558 also concluded that even with a total failure of all NMS plant safety would not be compromised, since core power could be determined from other plant variables. Therefore, a failure of this system will not cause the operators to take unanalyzed actions, nor will it cause the operator to commit errors of commission or omission, and as such will not create the possibility of a new or different type of accident.

3. *This change does not involve a significant reduction in the margin of safety.*

Operating without the ex-core system does not reduce the margin of safety. The operators can determine neutron flux from the NMS instrumentation, such as the SRMs, IRMs, and APRMs. In the unlikely event that all of the NMS instrumentation were to fail, core power could be determined from other plant parameters, such as steam flow, reactor pressure and pressure trend, and number of open SRVs. Thus, this change of Applicability has been demonstrated to have no safety significance and will not result in a decrease to the margin of safety.

### ENVIRONMENTAL CONSEQUENCES

This request is consistent with the Susquehanna design basis, in that adequate controls exist to ensure accurate core power level indication during all Operational Conditions. Therefore, no environmental consequences that have not been previously considered are anticipated.

### COMPENSATORY ACTIONS

The primary compensations for loss of Ex-core Monitors are the primary and alternate means of available reactivity indication. However, three additional compensatory actions will be implemented:

1. Inventory and ensure on-site availability of parts that could potentially be required for corrective maintenance on the A channel.
2. Change as necessary alarm response and surveillance procedures for the ex-core monitoring system.
3. Conduct Operator Training ('Hot Box') on the current situation (inoperable B channel), and re-emphasize the availability of the alternate means of reactivity indication.

It should be noted, that at the time of this request for enforcement discretion, the A channel is OPERABLE.



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**JUSTIFICATION FOR DURATION OF PROPOSED REQUEST**

PP&L is proposing an Emergency Amendment under separate cover and is therefore requesting that this enforcement discretion remains in effect until the NRC acts on that submittal. The proposed amendment submittal will request permission to operate until the Unit 2 7th refueling and inspection outage (currently scheduled to begin on September 16, 1995) or until the next Unit shutdown which allows for primary containment entry of sufficient duration for thorough evaluation and appropriate corrective action of the impaired condition.

Investigation and corrective actions to date suggest that the problem exists within primary containment. PP&L has extensively investigated, tested, and replaced components and circuits outside of containment that could potentially be causing the condition. These efforts have not corrected the problem, and further physical activities will require entry into primary containment.

**REQUEST APPROVED BY FACILITY ORGANIZATION THAT NORMALLY  
REVIEWS SAFETY ISSUES**

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This proposed enforcement discretion has been reviewed and approved by the Susquehanna Plant Operations Review Committee (PORC Meeting #95-014).

**FOLLOW-UP LICENSE AMENDMENT**

The proposed Technical Specification change is indicated on the attached marked up Tech Spec pages.

Questions regarding this information should be directed to Mr. J. M. Kenny at (610) 774-7904.

Very truly yours,

  
R. G. Byram

cc: NRC Region I  
Ms. M. Banerjee, NRC Sr. Resident Inspector - SSES  
Mr. C. Poslusny, Jr., Sr. Project Manager - OWFN



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INSTRUMENTATION

ACCIDENT MONITORING INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

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3.3.7.5 The accident monitoring instrumentation channels shown in Table 3.3.7.5-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3.7.5-1.

ACTION:

With one or more accident monitoring channels inoperable, take the ACTION required by Table 3.3.7.5-1.

SURVEILLANCE REQUIREMENTS

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4.3.7.5 Each of the above required accident monitoring instrumentation channels shall be demonstrated OPERABLE by performance of the CHANNEL CHECK and CHANNEL CALIBRATION operations at the frequencies shown in Table 4.3.7.5-1.

TABLE 3.3.7.5-1

## ACCIDENT MONITORING INSTRUMENTATION

INSTRUMENT	REQUIRED NUMBER OF CHANNELS	MINIMUM CHANNELS OPERABLE	ACTION	APPLICABLE OPERATIONAL CONDITIONS
1. Reactor Vessel Steam Dome Pressure	2	1	80	1, 2
2. Reactor Vessel Water Level	2	1	80	1, 2
3. Suppression Chamber Water Level	2	1	80	1, 2
4. Suppression Chamber Water Temperature	8, 8 locations	8, 1/location	80	1, 2
5. Suppression Chamber Air Temperature	2	1	80	1, 2
6. Primary Containment Pressure	2/range	1/range	80	1, 2
7. Drywell Temperature	2	1	80	1, 2
8. Drywell Gaseous Analyzer				
a. Oxygen	2	1	80	1, 2#
b. Hydrogen	2	1	82	1, 2#
9. Safety/Relief Valve Position Indicators	1/valve <sup>*,##</sup>	1/valve <sup>*,##</sup>	80	1, 2
10. Containment High Radiation	2	1	81	1, 2
11. Noble gas monitors**				
a. Reactor Bldg. Vent	1	1	81	1, 2 and ***
b. SGTS Vent	1	1	81	1, 2 and ***
c. Turbine Bldg. Vent	1	1	81	1, 2
12. Primary Containment Isolation Valve Position	1/valve	1/valve	80	1, 2
13. Neutron Flux	21 <sup>###</sup>	20 <sup>###</sup>	80	1, 2
<ul style="list-style-type: none"> <li>* Acoustic monitor.</li> <li>** Mid-range and high-range channels.</li> <li>*** When moving irradiated fuel in the secondary containment.</li> <li># See Special Test Exception 3.10.1</li> <li>## Compliance with these requirements for the "S" SRV acoustic monitor is not required for the period beginning January 21, 1994, until the next unit shutdown of sufficient duration to allow for containment entry, not to exceed the sixth refueling and inspection outage.</li> </ul>				

<sup>###</sup> REVISION OF THE REQUIREMENTS FOR THE EX-CORE NEUTRON FLUX MONITOR IS REQUIRED FOR THE PERIOD BEGINNING FEBRUARY 6, 1995 UNTIL THE NEXT UNIT SHUTDOWN WHICH ALLOWS FOR CONTAINMENT ENTRY OF SUFFICIENT DURATION TO PROPERLY EVALUATE AND CORRECT THE IMPAIRED CONDITION, NOT TO EXCEED THE SEVENTH REFUELING AND INSPECTION OUTAGE.



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TABLE 3.3.7.5-1 (Continued)

ACCIDENT MONITORING INSTRUMENTATION

ACTION STATEMENTS

**ACTION 80 -**

- a. With the number of OPERABLE accident monitoring instrumentation channels less than the Required Number of Channels shown in Table 3.3.7.5-1, restore the inoperable channel(s) to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours.
- b. With the number of OPERABLE accident monitoring instrumentation channels less than the Minimum Channels OPERABLE requirements of Table 3.3.7.5-1, restore the inoperable channel(s) to OPERABLE status within 48 hours or be in at least HOT SHUTDOWN within the next 12 hours.

**ACTION 81 -** With the number of OPERABLE channels less than required by the Minimum Channels OPERABLE requirement, initiate the preplanned alternate method of monitoring the appropriate parameter(s) within 72 hours, and:

- 1) either restore the inoperable channel(s) to OPERABLE status within 7 days of the event, or
- 2) prepare and submit a Special Report to the Commission pursuant to Specification 6.9.2 within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status.

**ACTION 82 -**

- a. With the number of OPERABLE channels one less than the Required Number of Channels shown in Table 3.3.7.5-1, restore the inoperable channel to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours.
- b. With the number of OPERABLE channels less than the Minimum Channels OPERABLE requirements of Table 3.3.7.5-1, restore at least one channel to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours.



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**TABLE 4.3.7.5-1**

**ACCIDENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS**

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION
1. Reactor Vessel Steam Dome Pressure	M	R
2. Reactor Vessel Water Level	M	R
3. Suppression Chamber Water Level	M	R
4. Suppression Chamber Water Temperature	M	R
5. Suppression Chamber Air Temperature	M	R
6. Primary Containment Pressure	M	R
7. Drywell Temperature	M	R
8. Drywell Oxygen/Hydrogen Analyzer	M	Q*
9. Safety/Relief Valve Position Indicators	M <sup>#</sup>	R <sup>#</sup>
10. Containment High Radiation	M	R <sup>**</sup>
11. Noble Gas Monitors a. Reactor Bldg. Vent b. SGTS Vent c. Turbine Bldg. Vent	M M M	R R R
12. Primary Containment Isolation Valve Position	M	NA
13. Neutron Flux	M	R

- For hydrogen analyzer, use sample gas containing:
  - a. Nominal zero volume percent hydrogen, balance nitrogen.
  - b. Nominal thirty volume percent hydrogen, balance nitrogen.

•• CHANNEL CALIBRATION shall consist of an electronic calibration of the channel, not including the detector, for range decades above 10 R/hr and a one point calibration check of the detector below 10 R/hr with an installed or portable gamma source.

• Compliance with these requirements for the "S" SRV acoustic monitor is not required for the period beginning January 21, 1994, until the next unit shutdown of sufficient duration to allow for containment entry, not to exceed the sixth refueling and inspection outage.

