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SUBJECT: Forwards Relief Request RR-11 to ISI program, requesting relief from requirements of Section 4.3 of NUREG-0619 re performance of liquid penetrant exams & relaxation of requirements for ultrasonic exam of FW nozzles.

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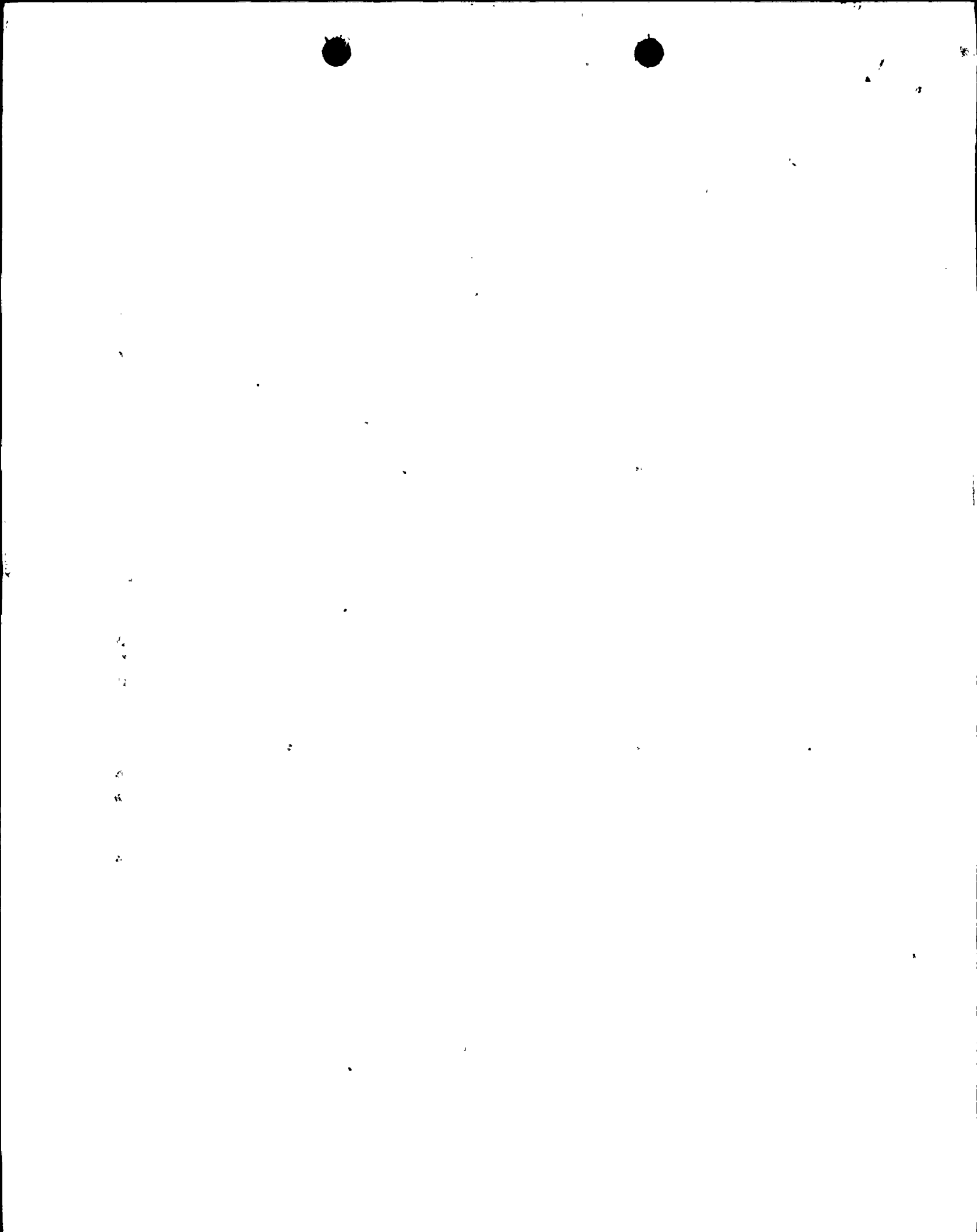
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**SUSQUEHANNA STEAM ELECTRIC STATION  
SECOND 10-YEAR INSERVICE INSPECTION  
INTERVAL PROGRAM RELIEF REQUEST  
RR-11: NUREG-0619, BWR FW NOZZLE AND  
CRD RETURN LINE NOZZLE CRACKING  
PLA-4376 FILE R41-2**

Docket Nos. 50-387  
and 50-388

Pennsylvania Power & Light Company requests approval of relief from the requirements of Section 4.3 of NUREG-0619. In accordance with Section 4.3 of NUREG-0619, for the feedwater nozzle thermal sleeve configuration, a liquid penetrant examination of the nozzle bore and inner radius areas is required every nine refueling cycles (or 135 startup/shutdown cycles).

The Unit 1 ninth cycle refueling outage is scheduled for the Fall of 1996. The hardships associated with performance of these examinations are a major concern to the industry, as well as PP&L. Experience gained with the prescribed fixes for feedwater nozzle cracking and advancements in ultrasonic inspection technology render the required liquid penetrant inspections unnecessary to ensure adequate plant safety margins. Moreover, the associated hardships [personnel dose, vessel drain down, extended plant downtime, potential RPV component damage, etc.] far outweigh the added assurance of safety provided by the liquid penetrant examinations. For these reasons, Relief Request RR-11 to the ISI Program has been generated to request relief from performance of the liquid penetrant examinations on both Susquehanna SES units.

In addition to the relief from the liquid penetrant examinations, Relief Request RR-11 also requests relaxation of the requirements for ultrasonic examination of the feedwater nozzles prescribed in the NUREG. For similar reasons for eliminating the liquid penetrant examinations, the extent and frequency of the required ultrasonic examinations can be relaxed with no reduction in plant safety margins.

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In addition to Relief Request RR-11, GE document GE-NE-C3100016-01, 'GERIS 2000 Ultrasonic Inspection of Feedwater Nozzles' is attached for the Staff's information and use in approving the relief request.

PP&L is submitting this request as a Cost Beneficial Licensing Action in accordance with NRC Administrative Letter 95-02. PP&L calculates a benefit from implementation of the requests in excess of \$830,000 over the remaining licensed life of the Susquehanna units.

Since the Unit 1 liquid penetrant examinations are required next outage (scheduled for September 1996), we request that Relief Request RR-11 be approved by February 1, 1996, in order to support the work to be done in the outage.

If you have any questions, please contact Mr. C. T. Coddington at (610) 774-7531.

Very truly yours,



R. G. Byram

Attachment

copy: NRC Region I

Ms. M. Banerjee, NRC Sr. Resident Inspector-SSES

Mr. C. Poslusny, Jr., NRC Sr. Project Manager-OWFN

## RELIEF REQUEST RR-11

### I. RELIEF REQUEST APPLICABILITY

- A. UNIT(S): 1 and 2
- B. CODE EXAMINATION CATEGORY: N/A
- C. CODE ITEM NUMBER: N/A
- D. REFERENCE: The Augmented Inservice Inspection Program - AUG3, NUREG-0619, "BWR Feedwater Nozzle And Control Rod Drive Return Line Nozzle Cracking"

### II. IDENTIFICATION OF COMPONENTS

SSES Units 1 and 2 RPV feedwater nozzles (N4A,B,C,D,E, and F, six nozzles per unit) subject to the examination requirements of NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking" are the components affected by this relief request.

### III. REQUIREMENTS FROM WHICH RELIEF IS REQUESTED

The SSES Units 1 and 2 feedwater nozzles are not clad and incorporate the triple sleeve, double piston ring thermal sleeve design. The augmented inservice inspection requirements for the SSES Units 1 and 2 feedwater nozzles, based on Section 4.3 of NUREG-0619 and the SSES Units 1 and 2 specific nozzle/thermal sleeve configuration, are as illustrated below:

Parts Examined	Type of Examination	Extent of Examination	Frequency
Nozzle Safe End	Ultrasonic (UT)	100% of the nozzle safe ends	every two (2) refueling cycles
Nozzle Bore	Ultrasonic (UT)	100% of the nozzle bores	every two (2) refueling cycles
	AND Penetrant (PT)	100% of the nozzle bores (one sparger removed)	every nine (9) refueling cycles OR 135 startup/shutdown cycles
Nozzle Inner Radii	Ultrasonic (UT)	100% of the nozzle inner radii	every two (2) refueling cycles
	AND Penetrant (PT)	100% of the nozzle inner radii (one sparger removed)	every nine (9) refueling cycles OR 135 startup/shutdown cycles
Sparger	Visual (VT-3)	100% of the spargers	every four (4) refueling cycles

Relief is requested from the aforementioned requirements:

- to eliminate the requirement for penetrant testing (PT) of the feedwater nozzle bore/inner radius every 9th refueling cycle (or every 135 startup/shutdown cycles), and
- to implement alternate inspection frequencies for ultrasonic examination (UT) of the nozzle safe end, bore, and inner radius.

Relief is requested to implement the alternate inspection requirements of IV. in lieu of the NUREG-0619 inspection requirements.

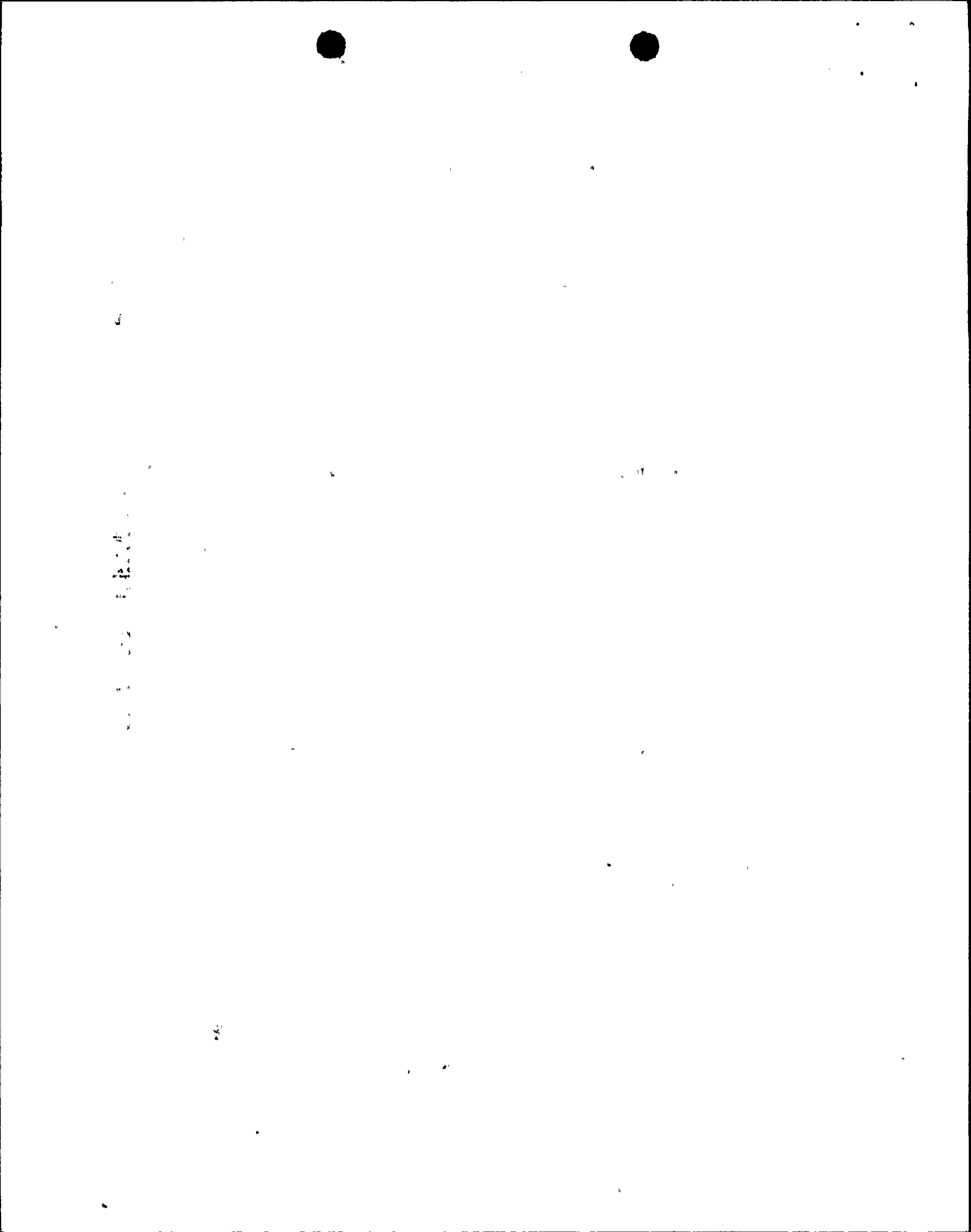
**IV. ALTERNATE INSPECTION REQUIREMENTS**

The alternate augmented inservice inspection requirements for the SSES Units 1 and 2 feedwater nozzles are as illustrated below:

Parts Examined	Type of Examination	Extent of Examination	Frequency
Nozzle Safe End	Ultrasonic (UT)	ASME Section XI (Nozzle-Safe End, Weld)	ASME Section XI
Nozzle Bore	Ultrasonic (UT)	100% of the nozzle bores (Zone 3)	once every ten years
Nozzle Inner Radius	Ultrasonic (UT)	100% of the nozzle inner radii (Zones 1 & 2)	once every ten years
Sparger	Visual (VT-3)	100% of the spargers	every four (4) refueling cycles

The ten year interval for examinations in accordance with these alternative examination requirements will commence at plant start up following the outage the last ultrasonic examinations were performed - the 8<sup>th</sup> refueling and inspection outage (Spring 1995) on Unit 1 and the 6<sup>th</sup> refueling and inspection outage (Spring 1994) on Unit 2. This will ensure the maximum inspection interval between examinations will not exceed ten years.

Since visual examinations of the feedwater spargers are not affected by this relief request, the inspection schedule already established for visual examinations will continue independent of the alternate inspection requirements petitioned for herein.





## V. BASIS FOR RELIEF

### A. BACKGROUND

NUREG-0619 was issued in 1980 by the USNRC to address the problem of feedwater nozzle fatigue cracking experienced by many boiling water reactor plants at that time. The NUREG discussed the cracking mechanism, prescribed fixes and plant system/operational modification recommendations, and established inspection requirements intended to ensure the continued, long term efficacy of the installed fixes. Due to uncertainties associated with the analysis performed and the limited capabilities demonstrated by the available ultrasonic examination systems in this application, the NUREG-required examinations included a combination of nondestructive examination methods to supplement the routine ultrasonic examination of the nozzle areas of concern. SSES Units 1 and 2 were under construction at the time of issuance of NUREG-0619; augmented inservice inspections of the SSES Units 1 and 2 feedwater nozzles in accordance with NUREG-0619 commenced during preservice inspection of both units, and have continued to date.

Today, almost fifteen years after the issuance of NUREG-0619, experience with the prescribed hardware and plant operational fixes has been favorable in mitigating the initiation and propagation of feedwater nozzle cracking. In addition, significant advances in the area of ultrasonic examination technology has provided automated ultrasonic examination systems capable of reliably detecting and sizing fatigue flaws in the feedwater nozzle areas of concern. Given the above, implementation of the alternative inspection requirements described in IV., in lieu of the inspection requirements of NUREG-0619 for SSES Units 1 and 2, is justified and petitioned for herein.

### B. BASIS FOR ELIMINATION OF PENETRANT TESTING

Periodic penetrant testing of the feedwater nozzle bore and inner radius was prescribed in NUREG-0619 to account for the lack of confidence in the then "state of the art" ultrasonic examination techniques for detecting fatigue cracking in nozzle configurations. Penetrant testing also served to ensure early detection of any new cracking, thereby limiting crack growth and maintaining adequate

structural margins to ensure reactor pressure vessel integrity. However, performance of penetrant testing of the feedwater nozzle bore/inner radius poses extreme hardship in terms of personnel exposure and extended plant down time since vessel drain down and sparger removal must be accomplished to facilitate penetrant examinations. In addition, feedwater sparger removal, due to the inherent tight interference fit of the thermal sleeve, may result in damage to the thermal sleeve and/or adjacent vessel components during removal, necessitating costly repairs and extended outage time. With the advent of advanced ultrasonic examination systems capable of detection and sizing of fatigue flaws, performance of penetrant testing is no longer necessary. Continued assurance of feedwater nozzle structural integrity may be effectively assessed solely through ultrasonic inspections; performance of NUREG-required penetrant testing poses undue hardship with little compensating increase in plant safety.

Relief from performance of routine penetrant examination of the feedwater nozzle bore/inner radius at the frequency specified in NUREG-0619 is justified for the following reasons:

- SSES Units 1 and 2 feedwater nozzles are not clad and incorporate the triple sleeve, double piston ring thermal sleeve design. This design, over the years, has been proven effective in mitigation of feedwater nozzle fatigue crack initiation/propagation.
- SSES Units 1 and 2 inspection history has provided no indication of cracking to date.
- Ultrasonic inspection is now a reliable alternate to penetrant testing in assessing feedwater nozzle structural integrity. For the next scheduled ultrasonic inspections of the SSES Units 1 and 2 feedwater nozzles, PP&L is planning to use the GERIS 2000 UT system (GE Reactor Inspection System 2000) with specialized techniques designed specifically for ultrasonic examinations of feedwater nozzles. General Electric report GE-NE-C3100016-01, "GERIS 2000 Ultrasonic Inspection of Feedwater Nozzles", by S.C. Mortenson dated August 23, 1994, describes the GERIS 2000 system's qualified capabilities in detection and sizing.

C. BASIS FOR ALTERNATE ULTRASONIC INSPECTION REQUIREMENTS

Advancements in ultrasonic examination techniques since the issuance of NUREG-0619 now provide for consistent, reliable detection of small flaws in feedwater nozzle configurations. These advancements warrant the use of ultrasonic inspections as the sole, primary means of inspection. In addition, coupled with data from a SSES plant-specific fracture mechanics analysis, the extent and frequency of ultrasonic inspection prescribed by NUREG-0619 may be shown as overly conservative. Relaxation of the ultrasonic inspection requirements is justified based on the following:

- SSES Units 1 and 2 feedwater nozzles are not clad and incorporate the triple sleeve, double piston ring thermal sleeve design. This design, over the years, has proven effective in mitigation of feedwater nozzle fatigue crack initiation/propagation.
- SSES Units 1 and 2 inspection history has provided no indication of cracking to date.
- An SSES plant-specific fracture mechanics analysis, based on utilization of the existing low flow controller and routing of the RWCU system to all feedwater lines, shows that stresses present in the feedwater nozzles will not result in the growth of an initial 0.25 inch crack to greater than 1 inch during the 40 year life of the plant.
- For the next scheduled ultrasonic inspections of the SSES Units 1 and 2 feedwater nozzles, PP&L is planning to use the GERIS 2000 UT system (GE Reactor Inspection System 2000) with specialized techniques designed specifically for ultrasonic examinations of feedwater nozzles. The GERIS 2000 system's capabilities in detection and sizing have been demonstrated and qualified, and are well documented by GE. Flaw location and depth can be reliably, quantitatively measured, including the 0.25" flaw that was the basis for the SSES plant-specific fracture mechanics evaluation.