10CFR50.55a

PECO NUCLEAR
A UNIT OF PECO ENERGY

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September 25, 1998

Docket Nos. 50-352
50-353

License Nos. NFP-39
NFP-85

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

Subject: Limerick Generating Station, Units 1 and 2
Response to Request for Additional Information
Inservice Inspection Program Relief Request RR-01

Dear Sir/Madam:

By letter dated January 30, 1998, PECO Energy submitted a number of relief requests in support of the implementation of the Inservice Inspection (ISI) Program at Limerick Generating Station (LGS), Units 1 and 2. PECO Energy submitted these relief requests in accordance with the requirements of 10CFR50.55a(3) requesting relief from certain American Society of Mechanical Engineers (ASME), Section XI, Code requirements.

Subsequently, by letter dated July 31, 1998, the NRC requested additional information concerning Relief Request RR-01, Revision 2, which was submitted with our January 30, 1998, letter. Relief Request RR-01 pertains to examination requirements for Class 1 pressure retaining circumferential and longitudinal shell welds in the reactor pressure vessel. During the NRC's review of this Relief Request, several issues were identified in which additional information was needed in order for the NRC to complete its review of this Relief Request.

Accordingly, Attachment 1 to this letter provides PECO Energy's response to the specific issues/questions identified by the NRC in its letter dated July 31, 1998. Based on discussion with the NRC Project Manager for Limerick, an extension to September 25, 1998, was agreed upon in order to fully respond to this request for additional information. The information in Attachment 1 contains a restatement of each specific issue/question followed by our response. Attachment 2 of this letter contains a revised copy of Relief Request RR-01 reflecting the changes made in response to NRC's request for additional information.

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If you have any questions or require additional information, please do not hesitate to contact us.

Very truly yours,

D. B. Helfer /FOR

G. D. Edwards
Director - Licensing

Attachment

cc: H. J. Miller, Administrator, Region I, USNRC (w/ attachments)
A. L. Burritt, USNRC Senior Resident Inspector, LGS (w/ attachments)

# ATTACHMENT 1

Limerick Generating Station, Units 1 and 2
Response to Request for Additional Information
Inservice Inspection (ISI) Program Relief Request RR-01, Revision 2

**Limerick Generating Station, Units 1 and 2**
**Response to Request for Additional Information**
**Inservice Inspection (ISI) Program Relief Request RR-01, Revision 2**

**Question A**

*To satisfy the augmented RPV requirements of 10CFR50.55a(g)(6)(ii)(A), essentially 100% of each RPV shell weld should have been examined during the first interval. It appears that the augmented RPV requirements for LGS, Unit 1 could not be met for Weld "AD". Submit a separate proposed alternative, specific to the augmented requirement, that will provide an acceptable level of quality and safety, as required by 10CFR50.55a(g)(6)(ii)(A)(5).*

**Response**

Relief Request No. RR-01, Revision 2, was prepared and submitted in our letter dated January 30, 1998, to address: 1) the ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell weld ISI examinations required by 10CFR50.55a(g)(4), and 2) the identical augmented examination requirements delineated in 10CFR50.55a(g)(6). The justification for relief, that demonstrates an acceptable level of quality and safety for the examinations performed during the First 10-Year Inspection Interval and the proposed alternative for the Second 10-Year Inspection Interval, are the same for both the ISI examinations required by 10CFR50.55a(g)(4) and the augmented examinations required by10CFR50.55a(g)(6). However, in order to provide additional clarification, Relief Request No. RR-01 has been revised to include the applicable references to the 10CFR50.55a(g)(6) augmented examination requirements. The revised Relief Request is included in Attachment 2 of this letter.

**Question B**

*The licensee seeks approval to use the proposed alternative (reduced coverages using the GERIS 2000 inspection tool from the inside diameter only) for the second interval ISI plan for LGS, Unit 1. Reducing examination coverage by eliminating the exterior manual examinations cannot be considered an acceptable alternate under 10CFR50.55a(a)(3)(i). In addition, the staff has not accepted BWRVIP-05. BWR Vessel and Internals Project, BWR, Reactor Pressure Vessel Shell Weld Inspection Recommendations, as an acceptable alternative for RPV shell welds. The licensee has discussed the burden associated with the second interval RPV examinations, but has not provided specific information to support the determination (e.g., estimated dose associated with manual examinations, permanent insulation removal). Review the regulations, identify the appropriate paragraph to be used for the second interval relief request (i.e., 10CFR50.55a(a)(3)(ii) or 10CFR50.55a(g)(6)(i)), and provide justification to support the regulatory basis.*

**Response**

In accordance with the requirements of 10CFR50.55a(g)(6)(ii)(A)(4) governing augmented examinations of the reactor pressure vessel shell welds, examinations were performed in conjunction with the ISI examinations over the course of the First 10-Year Inspection Interval. All examinations were performed from the vessel outside diameter using a composite of automated and supplemental manual examination techniques.

Supplemental manual examinations were performed on the LGS, Units 1 and 2, reactor vessels to achieve the required ISI and augmented examination coverage during the First 10-Year Inspection Interval without taking credit for automated examinations accessed from one side of the weld. These supplemental manual examinations resulted in radiation exposure in excess of 366.48 man-REM (for both units) to examination and support personnel. Additionally, reactor pressure vessel insulation had to be removed to allow access to perform the manual examinations. In many cases, the insulation was not designed to be removed. Regardless, the insulation was removed and, due to radiological issues, temporarily stored in the Drywell. Storage areas in the Drywell are very limited. This required the insulation to be 1) stored on platforms and grating used for personnel accessing near the manual examination area, or 2) temporarily supported adjacent to the manual examination area in the annulus region between the reactor pressure vessel and the biological shield. These temporary storage requirements presented an unnecessary industrial safety risk to personnel (e.g., manipulation of large sharp-edged sheet metal covered panels in confined areas, tripping hazards, overhead hazards from panels that could not be physically removed from the biological shield annulus, etc.). As a result of this work, there were a number of locations where the mirror insulation was damaged and required repair. This added to the level of personnel radiation exposure and industrial safety risks.

Based on the information provided in our January 30, 1998 submittal containing Relief Request RR-01, Revision 2, it can be determined that all First 10-Year Inspection Interval ISI and augmented examination requirements applicable to ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell welds have been met for both LGS, Units 1 and 2. However, there was one (1) exception. The LGS Unit 1 weld AD, was only partially examined in accordance with Code/augmented requirements. Supplemental manual examinations or re-examination with a newly developed miniature automated scanner would be required for as little as 2.1% (17.6 inches) of the length of LGS Unit 1 weld AD to achieve essentially 100% coverage. In order to achieve 100% coverage, we anticipate a radiation exposure to examination and support personnel in excess of 6 man-REM, as well as the industrial safety risks associated with performing the work. In addition, the costs that would be incurred for the mobilization of the NDE contractor to perform the work do not appear justified.

Recognizing that the 10CFR50.55a(g)(6) augmented examinations were required to be performed only once, and that with the exception of 2.1% (17.6 inches) of the length of LGS Unit 1 weld AD (in which relief is being requested), these examinations were considered essentially complete during the First 10-Year Inspection Interval pursuant to 10CFR50.55a(a)(3)(i). Our January 30, 1998 submittal of Relief Request No. RR-01, only proposed alternative provisions for the 10CFR50.55a(g)(4) ISI Examinations required during the Second Inspection Interval. In summary, we had planned to perform the following alternatives for the LGS, Units 1 and 2, ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell welds:

- Continue to perform 10CFR50.55a(g)(4) ISI examinations of both the circumferential and longitudinal welds from the reactor pressure vessel outside diameter using automated scanning techniques to the maximum extent practicable.

- Achieve ASME Code Section XI coverage for all subject reactor pressure vessel welds without resorting to supplemental manual examination techniques with the exception of both LGS, Units 1 and 2, circumferential weld AD, which would be examined for 100% of its length and would require relief for approximately 25% of the examined length where only partial ASME Code coverage would be achieved.

- The "Basis for Relief" section of Relief Request No. RR-01, Revision 2, provided information indicating that the ISI and Augmented Examinations were essentially complete and closure of the First Inspection Interval. The Alternative Provisions section was limited to the Second 10-Year Inspection Interval which would require additional review and approval for use during the Third Interval and subsequent Inspection Intervals in accordance with current regulation. Additional explanation is also provided in our response to Question C.

PECO Energy believes that, with the enhancements in ultrasonic scanning equipment utilized during the First 10-Year Inspection Interval, ASME Code coverage can be achieved with automated UT systems from the reactor pressure vessel outside diameter without the need for supplemental manual examinations. However, due to the limited experience with the improved scanners, Relief Request No. RR-01, Revision 2, Table RR-01-1 identified only the absolute minimum examination coverage that will be achieved. To clarify that we plan to achieve ASME Code coverage using only automated examination techniques, Table RR-01-1 (see Attachment 2) has been revised to identify both the maximum planned and minimum expected examination coverage. Based on our First 10-Year Inspection Interval experience, PECO Energy reiterates its intentions to keep dose to examination and support personnel as low as reasonably achievable (ALARA) and plans to discontinue the practice of performing supplemental manual examinations to achieve essentially 100% Code and regulatory coverage.

Subsequent to our January 30, 1998 letter, the NRC approved the BWR Vessel and Internals Project, BWR, Reactor Pressure Vessel Shell Weld Inspection Recommendations (i.e., BWRVIP-05), subject to limitations as documented in its letter dated July 28, 1998. In summary, for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell welds the following Alternative Provisions may be approved on a plant specific basis:

- BWR licensees may request relief from the ISI requirements of 10CFR50.55a(g), including both ISI and Augmented Examination requirements, for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, circumferential reactor pressure vessel shell welds by demonstrating: (1) at the expiration of their license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the SER and (2) they have implemented operator training and established procedures that limit the frequency of cold over pressure events to the amount specified in the SER.

- Both the 10CFR50.55a(g)(4) ISI Examination and the 10CFR50.55a(g)(6) Augmented Examination requirements of ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12 longitudinal (axial) reactor pressure vessel shell welds remain in effect.

- Re-inspection and scope expansion requirements were added for both circumferential and longitudinal reactor pressure vessel shell welds.

- Technically justified requests for relief, including proposed Alternative Provisions, submitted in accordance with 10CFR50.55a(a)(3)(i), 10CFR50.55a(a)(3)(ii) and 10CFR50.55a(g)(6)(ii)(A)(5) may be permanently approved for the remaining term of operation under the existing, initial, license.

PECO Energy has reviewed the information in the NRC's letter dated July 28, 1998, and has determined that the information contained in Relief Request No. RR-01, Revision 2, submitted by our letter dated January 30, 1998, appropriately addresses: (1) the limiting conditional failure probability for circumferential reactor pressure vessel shell welds at the expiration of the existing license and (2) controls for beyond design-basis events occurring during plant shutdown that could lead to cold overpressure events that could challenge reactor pressure vessel integrity. However, information contained in the "Alternative Provisions" section of Relief Request No. RR-01, Revision 2, submitted by our letter dated January 30, 1998, exceed the alternatives approved by the NRC in its letter dated July 28, 1998, and unnecessarily limit the term of applicability to the Second 10-Year Inspection Interval. As a result, Relief Request No. RR-01 has been revised to address only the ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell welds and the Alternative Provisions approved by the NRC as documented in its letter dated July 28, 1998. The revised Relief Request has been included in Attachment 2.

**Question 3**

*Relief requests are typically not granted for multiple intervals and must be resubmitted each inspection interval. It is unclear why LGS, Unit 2 is being included in this relief request since the augmemted RPV requirement has been satisfied for this unit. Considering that 2 years remain in the first interval for Unit 2, evaluation of second interval relief requests is premature. Clarify the scope of this relief request.*

*Unit 1 will be changing Code editions and rewriting its second interval program when Unit 2 starts the second interval. At that time, any previously approved relief requests will be reviewed and reconciled to the current Code edition. Does the examination schedule for the Unit 1 RPV require relief at this time? Will the schedule of examinations be altered when the Unit 1 program is updated? Discuss the relevancy of this relief request at this time.*

**Response**

Relief Request No. RR-01, Revision 2, was submitted within twelve (12) months of the completion of LGS Unit 1 First 10-Year Inspection Interval, as required by 10CFR50.55a(g)(5)(iv). The applicable regulation for LGS Unit 2 is considered to be 10CFR50.55a(g)(5)(iii). The version of LGS, Units 1 and 2, Technical Specifications (i.e., 3/4.0.5a) in effect at the time that Relief Request No. RR-01 was submitted was a major factor in the decision to address both LGS, Units 1 and 2, in our January 30, 1998 submittal. An apparent conflict between the cited regulation and the Technical Specifications regarding the time frame for approval of the request for relief was involved. However, this has subsequently been resolved as a result of License Amendments issued for LGS, Units 1 and 2, as documented in an NRC letter dated March 31, 1998.

Although permitted by the ASME Code Section XI and 10CFR50.55a(g)(6), neither the ISI or the Augmented Examinations of the circumferential or longitudinal reactor pressure vessel shell welds were deferred during the First 10-Year Inspection Interval, nor was schedular relief in accordance with Information Notice 97-63, "Status of NRC Staff's Review of BWRVIP-05," required. At this time, all LGS Units 1 and 2, First 10-year Inspection Interval requirements for circumferential and longitudinal reactor pressure vessel shell welds have been completed. Portions of these welds were examined periodically

over the course of the First 10-Year Inspection Interval until all required examinations were completed by the end of the Inspection Interval. The ISI Program scheduled the inspections in this manor primarily to levelize refuel outage work scope and to take advantage of the fact that the examinations could be performed from the vessel outside diameter. This practice is expected to continue during the Second 10-Year Inspection Interval for LGS Unit 1 (next examinations scheduled for the 2000 refuel outage - 1R08) and the Second 10-Year Inspection Interval for LGS Unit 2 (next examinations scheduled for either the 2001 refuel outage - 2R06 or the 2003 refuel outage -2R07).

PECO Energy has performed a review of the ASME Section XI Code Bases described in the LGS, Units 1 and 2, First and Second Inspection Interval ISI Programs to determine if NRC approval of requests for relief from certain Code requirements have been secured or the need for additional relief has been identified in accordance with the information contained in an NRC letter dated January 23, 1996. Information regarding LGS Unit 2 was included in our January 30, 1998 letter, in order to ensure compliance with Technical Specification 3/4.0.5a, the requirements in effect at the time of our submittal, and to facilitate consistency and commonality in the LGS, Units 1 and 2, ASME Section XI Programs.

In summary, the NRC has subsequently approved the BWRVIP-05 recommendations with some limitations, addressing both the 10CFR50.55a(g)(4) ISI Examinations and the 10CFR50.55a(g)(6) Augmented Examinations of circumferential and longitudinal reactor pressure vessel shell welds. The NRC has also issued License Amendments for LGS, Units 1 and 2, that revised the Technical Specifications to resolve the conflicts between the regulations and Technical Specifications, regarding the time frame for approval of requests for relief. PECO Energy has revised Relief Request No. RR-01 and is re-submitting this Relief Request in accordance with 10CFR50.55a(a)(3)(i), 10CFR50.55a(a)(3)(ii), and 10CFR50.55a(g)(6)(ii)(A)(5), and is requesting that the NRC grant relief for the duration of the current operating licenses for LGS, Units 1 and 2. The revised Relief Request is contained in Attachment 2 of this letter.

# ATTACHMENT 2

Limerick Generating Station, Units 1 and 2
Inservice Inspection (ISI) Program
Proposed Revised Relief Request RR-01

RELIEF REQUEST No. RR-01
Revision 2
(This is a complete rewrite)

I. IDENTIFICATION OF COMPONENTS

Class 1 pressure retaining circumferential and longitudinal shell welds in the reactor pressure vessel, Examination Category B-A, Item Numbers B1.11 and B1.12 respectively.

II. CODE AND REGULATORY REQUIREMENTS FROM WHICH RELIEF IS REQUESTED

ASME Section XI 1986 Edition, Examination Category B-A requires a volumetric examination of essentially 100% of the weld length of all circumferential and longitudinal shell welds during the First Inservice Inspection (ISI) Interval. The Limerick Generating Station ASME Section XI ISI Programs and later approved Editions of the ASME Section XI Code require that these same examinations be performed during successive (Second) Inspection Intervals. The ISI Examinations shall be performed in accordance with ASME Section XI Figures IWB-2500-1 and 2 (as applicable) and the nondestructive examination requirements of ASME Section V, Article 4, paragraph T-441.3.2. The ASME requirements are supplemented by Regulatory Guide 1.150, issued by the US Nuclear Regulatory Commission (USNRC).

The September 8, 1992 revision to the Code of Federal Regulations, 10CFR50.55a(g)(6)(ii)(A), requires a volumetric examination of reactor pressure vessel shell assembly welds, to be performed completely once, as an Augmented Examination requirement. This new rule revokes previously granted licensee relief requests regarding the extent of volumetric examination on ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell welds. The Augmented Examinations shall be performed using the procedures specified in the ASME Section XI Code Edition applicable to the Inspection Interval in which the Augmented Examinations are performed, i.e. in accordance with ASME Section XI Figures IWB-2500-1 and 2 (as applicable) and the nondestructive examination requirements of ASME Section V, Article 4, paragraph T-441.3.2. The Augmented Examination requirements are also supplemented by Regulatory Guide 1.150.

ASME Section XI requires "essentially 100%" of the weld length to be examined. ASME Code Case N-460 defines how the "essentially 100%" requirement is to be calculated. An additive limitation of up to 10% of the weld length is permitted. USNRC Regulatory Guide 1.147 approved Code Case N-460 for use by licensees. The 1992 rule making also defines "essentially 100%" as any amount greater than 90% of the examination volume of each weld. Pursuant to 10CFR50.55a(a)(3) and 10CFR50.55a(g)(6)(ii)(A)(5), submittal of information demonstrating an acceptable level of quality and safety and any proposed alternative examinations is required when the greater than 90% ISI or Augmented Examination requirements can not be met.

At Limerick, the volumetric examination of reactor pressure vessel shell assembly welds were performed from the vessel outside diameter using a composite of automated and supplemental manual Ultrasonic (UT) examination techniques. The LGS Units 1 and 2 reactor pressure vessel and containment bio-shield designs preclude examining 100% of the Weld and Required Volume (WRV) of some welds in accordance with 10CFR50.55a(g)(4), Inservice Inspection (ISI) and 10CFR50.55a(g)(6), Augmented Examination requirements. Complete coverage of these welds is not practical due to limitations imposed by component design and radiation exposure to examination personnel.

RELIEF REQUEST No. RR-01
Revision 2 cont'd

Relief is requested from the First Inspection Interval requirement for complete examination of LGS Unit 1 shell circumferential weld "AD" for which 87.9% (736 inches) of the weld length was completely examined while greater than 2.1% (17.6 inches) of the weld length was only partially examined in accordance with ASME Code Section XI ISI and Augmented Examination requirements. Further, PECO Energy requests permanent relief for the remaining term of operation under the existing licenses for LGS Units 1 and 2, from the inservice inspection requirements of 10CFR50.55a(g), including both the 10CFR50.55a(g)(4) ISI Examination and the 10CFR50.55a(g)(6) Augmented Examination requirements, for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, circumferential reactor pressure vessel shell welds.

III. BASIS FOR RELIEF

Complete examination of the subject welds is not practical due to scanning limitations and access restrictions from various reactor pressure vessel appurtenances and containment structures (such as adjacent RPV nozzles, integral attachments and the biological shield wall) and for ALARA considerations.

In accordance with the requirements of 10CFR50.55a(g)(6)(ii)(A)(4) governing augmented examinations of the reactor pressure vessel shell welds, examinations were performed in conjunction with the 10CFR50.55a(g)(4) ISI examinations over the course of the First 10-Year Inspection Interval. All examinations were performed from the vessel outside diameter using a composite of automated and supplemental manual examination techniques.

Supplemental manual examinations were performed on the LGS, Units 1 and 2, reactor pressure vessels to achieve the required ISI and Augmented Examination coverage during the First 10-Year Inspection Interval without taking credit for automated examinations accessed from one side of the weld. These supplemental manual examinations resulted in radiation exposure in excess of 366.48 man-REM (for both units) to examination and support personnel. Additionally, reactor pressure vessel insulation had to be removed to allow access to perform the manual examinations. In many cases, the insulation was not designed to be removed. Regardless, the insulation was removed and, due to radiological issues, temporarily stored in the Drywell. Storage areas in the Drywell are very limited. This required the insulation to be 1) stored on platforms and grating used for personnel accessing near the manual examination area, or 2) temporarily supported adjacent to the manual examination area in the annulus region between the reactor pressure vessel and the biological shield. These temporary storage requirements presented an unnecessary industrial safety risk to personnel (e.g., manipulation of large sharp-edged sheet metal covered panels in confined areas, tripping hazards, overhead hazards from panels that could not be physically removed from the biological shield annulus, etc.). As a result of this work, there were a number of locations where the mirror insulation was damaged and required repair. This added to the level of personnel radiation exposure and industrial safety risks.

All First 10-Year Inspection Interval ISI and Augmented Examination requirements applicable to ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.10 circumferential and longitudinal reactor pressure vessel shell welds have been met for both LGS, Units 1 and 2. However, there was one (1) exception. The LGS Unit 1 weld AD, was only partially examined in accordance with Code/augmented requirements. Supplemental manual examinations or re-examination with a newly developed miniature automated scanner would be required for as little as 2.1% (17.6 inches) of the length of LGS Unit 1 weld AD to achieve

RELIEF REQUEST No. RR-01
Revision 2 cont'd

"essentially 100%" coverage. In order to achieve 100% coverage, we anticipate additional radiation exposure to examination and support personnel in excess of 6 man-REM, as well as the industrial safety risks associated with performing the work. In addition, the costs that would be incurred for the mobilization of the NDE contractor to perform the work do not appear justified.

The technical bases for this request for inspection relief is documented in the report "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05)", dated September 1995 and in the USNRC SER, Evaluation by the Office of Nuclear Reactor Regulation Related to the Review of the Topical Report by the Boiling Water Reactor Vessel and Internals Project: BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations, BWRVIP-05 (TAC No. M93925), dated July 28, 1998.

The USNRC evaluation of BWRVIP-05 utilized the FAVOR code to perform a probabilistic fracture mechanics (PFM) analysis to estimate RPV failure probabilities. Three key assumptions in the PFM analysis are; 1)the neutron fluence was that estimated to be end-of-license mean fluence; 2)the chemistry values are mean values based on vessel types and; 3)the potential for beyond design basis events is considered. Although BWRVIP-05 provides the technical basis supporting the relief request, the following information is provided to show the conservatism of the USNRC analysis relative to the LGS Units 1 and 2 reactor pressure vessels.

LGS Units 1 and 2 are defined as ASTM E-185-73, Case "A" plants, since the vessels have a predicted shift in the reference nil-ductility temperature ($\Delta RT_{NDT}$) of less than 100°F and will be exposed to a neutron fluence of less than $5x10^{18}$ n/cm$^2$ over the design lifetime of the plant. The expected low RPV 1/4T 32 EFPY beltline fluence ($<<5x10^{18}$ n/cm$^2$) results in a low predicted shift in the reference nil-ductility temperature, $RT_{NDT}$ (<60°F at 32 EFPY).

The following table illustrates that the LGS Units 1 and 2 reactor pressure vessels have additional conservatism in comparison to Table 2.6-4 for the Limiting Plant-Specific Analyses (32 EFPY) of the USNRC's evaluation of BWRVIP-05. The chemistry factor, $\Delta RT_{NDT}$, $RT_{NDT(U)}$ and Mean $RT_{NDT}$ are determined in accordance with the guidelines of Regulatory Guide 1.99, Rev. 2 and ASME Code Section III, NB-2300, as applicable.

RELIEF REQUEST No. RR-01
Revision 2 cont'd

| Parameter Description | LGS Units 1 and 2 Comparative Parameters at 32 EFPY for the Bounding Circumferential Weld Wire Heat/Lot 640892/J424B27AE | USNRC Limiting Plant Specific Analyses Parameters at 32 EFPY SER Table 2.6-4 |
|---|---|---|
| Cu, wt% | 0.09 | 0.10 |
| Ni, wt% | 1.00 | 0.99 |
| CF | 122.0 | 109.5 |
| EOL ID Fluence, $x10^{19}$ n/cm$^2$ | 0.188 | 0.51 |
| $\Delta RT_{NDT}$, °F | 67.7 | 109.5 |
| $RT_{NDT(U)}$, °F | -60 | -65 |
| Mean $RT_{NDT}$, °F | 7.7 | 44.5 |

Although the chemistry factor for the LGS Units 1 and 2 limiting circumferential welds is higher than the USNRC's Limiting Plant-Specific Analyses (32 EFPY) the EOL fluence is significantly lower than the USNRC's parameter such that the resulting shift in reference temperature, $\Delta RT_{NDT}$, is bounded by the USNRC evaluation of BWRVIP-05 technical bases. Considering the expected shift in $RT_{NDT}$ ($\Delta RT_{NDT}$) is small and the excellent LGS Units 1 and 2 plate and weld chemistry, embrittlement due to fluence effects have a negligible affect on the LGS Units 1 and 2 reactor pressure vessel weld failure probabilities, which based on the above, are considered to be bounded by the conditional failure probability, P(FIE), in the USNRC's Limiting Plant-Specific Analyses (32 EFPY).

As provided in the following discussion, PECO Energy has in place procedures which monitor and control reactor pressure, temperature, and water inventory during all aspects of cold shutdown which would minimize the likelihood of a Low Temperature Over-Pressurization (LTOP) event from occurring. Additionally, these procedures are reinforced through operator training.

The Leakage Pressure Test and the Hydrostatic Pressure Test procedures which have been used at LGS, have sufficient procedural guidance to prevent a cold, over-pressurization event. The Leakage Pressure Test is performed at the conclusion of each outage, while the Hydrostatic Pressure Test is performed once every ten years. The leakage and hydrotests are infrequently-performed, complex tasks, and the test procedures are considered Plant Evolution / Special Tests. As such, a requirement is included in them for operations management to perform a "pre-briefing" with all essential personnel. This briefing details the anticipated testing evolution with special emphasis on- conservative decision making, plant safety awareness, lessons learned from similar in-house or industry operating experiences, the importance of open communications, and, finally, the process in which the test would be aborted if plant systems responded in an adverse manner. Vessel temperature and pressure are required to be monitored throughout these tests to ensure compliance with the Technical Specification pressure-temperature curve. Also, the

RELIEF REQUEST No. RR-01
Revision 2 cont'd

procedures require the designation of a Test Coordinator for the duration of the test who is a single point of accountability, responsible for the coordination of testing from initiation to closure, and maintaining Shift Management and line management cognizant of the status of the test.

Additionally, to ensure a controlled, deliberate pressure increase, the rate of pressure increase is administratively limited throughout the performance of the test. If the pressurization rate exceeds this limit, direction is provided to remove the CRD pumps, which are used for pressurization, from service.

With regard to inadvertent system injection resulting in an LTOP condition, the high pressure make-up systems (High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems, as well as the normal feedwater supply (via the Reactor Feedwater Pumps)) at LGS are all steam driven. During reactor cold shutdown conditions, no reactor steam is available for the operation of these systems. Therefore, it is not possible for these systems to contribute to an over-pressure event while the unit is in cold shutdown.

In the case of low pressure system initiation, the shutoff head for the LGS Core Spray and Residual Heat Removal Pumps are sufficiently low that the potential for an over-pressurization event which would significantly exceed the Tech Spec pressure-temperature limits, due to an inadvertent actuation of these systems, is very low.

Procedural control is also In place to respond to an unexpected or unexplained rise in reactor water level which could result from a spurious actuation of an injection system. Actions specified in this procedure include preventing condensate pump injection, securing ECCS system injection, tripping CRD pumps, terminating all other injection sources, and lowering RPV level via the RWCU system.

In addition to procedural barriers, Licensed Operator Training has been held which further reduces the possibility of the occurrence of LTOP events. Initial Licensed Operator Training and Simulator Training of plant heatup and cooldown includes performance of surveillance tests which ensure pressure-temperature curve compliance. In addition, operator training has been provided on the expectations for procedural compliance, as provided for in the Station's Operations Manual.

In addition to the above, continuous review of industry operating plant experiences is conducted to ensure that the PECO Energy procedures consider the impact of actual events, including LTOP events. Appropriate adjustments to the procedures and associated training are then implemented, to preclude similar situations from occurring at LGS.

Based upon the above, the probability of a cold over-pressure transient is considered to be less than or equal to that used in the USNRC evaluation.

Considering the documentation in BWRVIP-05, the integrated probabilistic assessment performed by the USNRC staff and the discussion above, PECO Energy believes that relief from the First Inspection Interval requirement for complete examination of LGS Unit 1 shell circumferential weld "AD" and approval to use the following proposed alternative provisions for LGS Units 1 and 2 Examination Category B-A welds as listed in Table RR-01-1, is justified.

RELIEF REQUEST No. RR-01
Revision 2 cont'd

IV. ALTERNATE PROVISIONS

Pursuant to 10CFR50.55a(a)(i), 10CFR50.55a(a)(ii) and 10CFR50.55a(g)(6)(ii)(A)(5), PECO Energy considers the following alternate provisions to be practical for the subject weld examinations. PECO Energy believes that, with the enhancements in ultrasonic scanning equipment that PECO Energy has supported during the First Inspection Interval, ASME Code coverage can be achieved with automated UT systems from the reactor pressure vessel outside diameter without the need for supplemental manual examinations. This percentage is identified in Table RR-01-1under the Maximum Planned Examination Coverage. However, due to the limited experience with the full compliment of improved scanners, Table RR-01-1 also identifies the Minimum Expected Examination Coverage percentage that will be achieved.

Inservice Inspection Scope

The failure frequency for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11 circumferential reactor pressure vessel shell welds is sufficiently low to justify elimination of the ISI and Augmented Examination requirements of 10CFR50.55a(g).

The ISI and Augmented Examination requirements of 10CFR50.55a(g) for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12 longitudinal (axial) reactor pressure vessel shell welds shall be performed for 100 percent of the welds, and shall include inspection of the circumferential welds only at the intersections of these welds with the axial welds, or approximately 2-3 percent of these welds.

The procedures for these examinations shall be qualified such that flaws relevant to reactor pressure vessel integrity can be reliably detected and sized, and the personnel implementing these procedures shall be qualified in the use of the procedures.

Successive Examinations of Flaws

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11 circumferential reactor pressure vessel shell welds, successive examinations per IWB-2420, are not required for non-threatening, flaws (e.g., such as embedded flaws from material manufacturing or vessel fabrication which experience negligible or no growth during the design life of the vessel), provided that the following conditions are met:

1. The flaw is characterized as subsurface in accordance with BWR Vessel and Internals Project Report, BWRVIP-05, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations.

2. The NDE technique and evaluation that detected and characterized the flaw as originating from material manufacture or vessel fabrication is documented in a flaw evaluation report,

3. The vessel containing the flaw is acceptable for continued service in accordance with IWB-3600 and the flaw is demonstrated acceptable for the intended service life of the vessel.

RELIEF REQUEST No. RR-01
Revision 2 cont'd

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12 longitudinal (axial) reactor pressure vessel shell welds, successive examinations of flaws shall be in accordance with IWB-2420. All flaws in longitudinal shell welds shall be reinspected at successive intervals consistent with the ASME Code and regulatory requirements.

Additional Examinations of Flaws

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11 circumferential reactor pressure vessel shell welds, additional examinations per IWB-2430, are not required for flaws provided that the following conditions are met:

1. If the detected flaw is characterized as subsurface, then no additional examinations are required.

2. If the flaw is not characterized as subsurface, then an engineering evaluation shall be performed, addressing the following (at a minimum):

   - A determination of the root cause of the flaw,
   - An evaluation of any potential failure mechanisms,
   - An evaluation of service conditions which could cause subsequent failure,
   - An evaluation per IWB-3600 demonstrating that the vessel is acceptable for continued service.

3. If the flaw meets the criteria of IWB-3600 for the intended service life of the vessel, then additional examinations may be limited to those welds subject to the same root cause conditions and failure mechanisms, up to the number of examinations required by IWB-2430(a). If the engineering evaluation concludes that there are no additional welds subject to the same root cause conditions, or if no failure mechanism exists, then no additional examinations are required.

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12 longitudinal (axial) reactor pressure vessel shell welds, additional examinations for flaws shall be in accordance with IWB-2430. All flaws in longitudinal shell welds shall require additional examinations consistent with the ASME Code and regulatory requirements.

Examination of the circumferential shell welds shall be performed if longitudinal (axial) weld examinations reveal an active, mechanistic mode of degradation exists.

SHELL CIRCUMFERENTIAL WELDS

| Weld ID | Code Item | Weld Length | Automated Coverage RPV OD | Manual Coverage RPV OD | First 10 Year Interval Actual Coverage | Successive Intervals Maximum Planned Examination Coverage | Successive Intervals Minimum Expected Examination Coverage |
|---|---|---|---|---|---|---|---|
| AA | B 1.11 | 835.3" | Unit 1: 56.2%<br>Unit 2: 89.5% | Unit 1: 43.8%<br>Unit 2: 10.5% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = 2-3% at Intersection with Longitudinal Welds | 0% |
| AB | B 1.11 | 835.3" | Unit 1: 97.7%<br>Unit 2: 96.1% | Unit 1: 0.0%<br>Unit 2: 0.0% | Unit 1: Composite = 97.7%<br>Unit 2: Composite = 96.1% | Automated = 2-3% at Intersection with Longitudinal Welds | 0% |
| AC | B 1.11 | 835.3" | Unit 1: 90.2%<br>Unit 2: 86.8% | Unit 1: 9.8%<br>Unit 2: 6.4% | Unit 1: Composite = 100%<br>Unit 2: Composite = 93.2% | Automated = 2-3% at Intersection with Longitudinal Welds | 0% |
| AD | B 1.11 | 837.3" | Unit 1: 59.6%<br>Unit 2: 77.0% | Unit 1: 28.3%<br>Unit 2: 18.9% | Unit 1: Composite = 87.9%<br>Unit 2: Composite = 95.9% | Automated = 2-3% at Intersection with Longitudinal Welds | 0% |
| AE | B 1.11 | 842.0" | Unit 1: 77.7%<br>Unit 2: 80.2% | Unit 1: 22.3%<br>Unit 2: 19.7% | Unit 1: Composite = 100%<br>Unit 2: Composite = 99.9% | Automated = 2-3% at Intersection with Longitudinal Welds | 0% |

SHELL LONGITUDINAL WELDS

| Weld ID | Code Item | Weld Length | Automated Coverage RPV OD | Manual Coverage RPV OD | First 10 Year Interval Actual Coverage | Successive Intervals Maximum Planned Examination Coverage | Successive Intervals Minimum Expected Examination Coverage |
|---|---|---|---|---|---|---|---|
| BA | B 1.12 | 137" | Unit 1: 85.4%<br>Unit 2: 85.8% | Unit 1: 14.6%<br>Unit 2: 14.2% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 85.8% |
| BB | B 1.12 | 137" | Unit 1: 85.2%<br>Unit 2: 84.9% | Unit 1: 14.8%<br>Unit 2: 15.1% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 85.2% |
| BC | B 1.12 | 137" | Unit 1: 72.8%<br>Unit 2: 70.3% | Unit 1: 27.2%<br>Unit 2: 29.7% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 72.8% |
| BD | B 1.12 | 137" | Unit 1: 100%<br>Unit 2: 100% | Unit 1: 0%<br>Unit 2: 0% | Unit 1: Automated = 100%<br>Unit 2: Automated = 100% | Automated = Essentially 100% of Weld Length | Automated = 100% |
| BE | B 1.12 | 137" | Unit 1: 100%<br>Unit 2: 100% | Unit 1: 0%<br>Unit 2: 0% | Unit 1: Automated = 100%<br>Unit 2: Automated = 100% | Automated = Essentially 100% of Weld Length | Automated = 100% |
| BF | B 1.12 | 103" | Unit 1: 77.2%<br>Unit 2: 89.8% | Unit 1: 22.8%<br>Unit 2: 10.2% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 89.8% |
| BG | B 1.12 | 137" | Unit 1: 85.9%<br>Unit 2: 81.7% | Unit 1: 14.1%<br>Unit 2: 16.1% | Unit 1: Composite = 100%<br>Unit 2: Composite = 97.8% | Automated = Essentially 100% of Weld Length | Automated = 81.7% |

SHELL LONGITUDINAL WELDS cont.

| Weld ID | Code Item | Weld Length | Automated Coverage RPV OD | Manual Coverage RPV OD | First 10 Year Interval Actual Coverage | Successive Intervals Maximum Planned Examination Coverage | Successive Intervals Minimum Expected Examination Coverage |
|---|---|---|---|---|---|---|---|
| BH | B 1.12 | 137" | Unit 1: 92.5%<br>Unit 2: 92.5% | Unit 1: 0%<br>Unit 2: 0% | Unit 1: Automated = 92.5%<br>Unit 2: Automated = 92.5% | Automated = Essentially 100% of Weld Length | Automated = 92.5% |
| BJ | B 1.12 | 137" | Unit 1: 90.4%<br>Unit 2: 96.4% | Unit 1: 9.6%<br>Unit 2: 0% | Unit 1: Composite = 100%<br>Unit 2: Automated = 96.4% | Automated = Essentially 100% of Weld Length | Automated = 96.4% |
| BK | B 1.12 | 86" | Unit 1: 51.3%<br>Unit 2: 28.3% | Unit 1: 48.7%<br>Unit 2: 71.7% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 51.3% |
| BM | B 1.12 | 86" | Unit 1: 50.0%<br>Unit 2: 28.0% | Unit 1: 50.0%<br>Unit 2: 72.0% | Unit 1: Composite = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 50.0% |
| BN | B 1.12 | 92.8" | Unit 1: 0%<br>Unit 2: 76.5% | Unit 1: 100%<br>Unit 2: 23.5% | Unit 1: Manual = 100%<br>Unit 2: Composite = 100% | Automated = Essentially 100% of Weld Length | Automated = 76.5% |
| BP | B 1.12 | 92.8" | Unit 1: 0%<br>Unit 2: 98.8% | Unit 1: 100%<br>Unit 2: 0% | Unit 1: Manual = 100%<br>Unit 2: Composite = 98.8% | Automated = Essentially 100% of Weld Length | Automated = 98.8% |