CP&L
A Progress Energy Company

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U. S. Nuclear Regulatory Commission
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BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION - REQUEST FOR LICENSE AMENDMENTS TO ADOPT ALTERNATIVE RADIOLOGICAL SOURCE TERM (NRC TAC NOS. MB2570 AND MB2571)

Ladies and Gentlemen:

On August 1, 2001 (Serial: BSEP 01-0063), Carolina Power & Light (CP&L) Company submitted a license amendment application to allow a full-scope implementation of an Alternative Radiological Source Term (AST) for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2. Subsequently, on December 11, 2001, the NRC provided an electronic version of a request for additional information (RAI) regarding the seismic ruggedness of the proposed alternate leakage treatment path. The response to this RAI is enclosed

Please refer any questions regarding this submittal to Mr. Leonard R. Beller, Manager - Regulatory Affairs, at (910) 457-2073.

Sincerely,

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A001

WRM/wrm

Enclosure: Response to Request For Additional Information (RAI) AST 3

John S. Keenan, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, and agents of Carolina Power & Light Company.

Dean S. Mason
Notary (Seal)

My commission expires: 8-29-04

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Response to Request For Additional Information (RAI) AST 3

Background

On August 1, 2001 (Serial: BSEP 01-0063), Carolina Power & Light (CP&L) Company submitted a license amendment application to allow a full-scope implementation of an Alternative Radiological Source Term (AST) for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2. Subsequently, on December 11, 2001, the NRC provided an electronic version of a RAI regarding the seismic ruggedness of the proposed alternate leakage treatment (ALT) pathway.

NRC Question 3-1

For Brunswick piping in Table 3-3, you identified "dead load span" as an outlier since it exceeds the B31.1 code specified span. In Tables 4-4 and 4-5, in comparing data on piping attributes you have not provided a comparison of the "piping span between supports" and piping configuration data from the plants in the seismic experience data base and those at the Brunswick plant. Provide these comparisons to justify your determination that the Brunswick piping in the alternate treatment path is bounded by the seismic experience data base, since the seismic response of piping depends to large extent on piping span and orientation between the supports.

CP&L Response

For piping span comparisons, refer to Section 3.1.1 of the enclosure to CP&L's submittal dated September 27, 2001 (Serial: BSEP 01-0112), which clarifies the walkdown requirements to review the design attributes of the BSEP piping with respect to United States American Standards (USAS) B31.1.0-1967 and the observations in the earthquake experience database. Briefly stated, the Seismic Walkdown reviewed the piping and tubing systems, and associated supports to ensure that the design attributes and conditions are consistent with good design and industry standard practices (i.e., as shown by the earthquake experience data). Furthermore, the systems were also screened to ensure that they are free from known seismic vulnerabilities identified from earthquake experience data.

Typical vertical support spacing, or "dead load spans," for various pipe sizes, as observed from the database sites, are shown in Figure 29 of NEDC-31858P-A, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems," Volume 1, which generally meet or exceed the USAS B31.1.0-1967 suggested pipe support spacing. The BSEP main steam isolation valve (MSIV) seismic verification walkdown of the ALT pathway piping conservatively used the USAS B31.1.0-1967 suggested pipe support spacing as screening guidelines for support spacing, thereby ensuring that plant piping spans are bounded by those typically found in the earthquake experience database.

Piping configurations and design attributes not meeting the seismic verification review guidelines were identified as outliers for further evaluations and subsequent resolution. These attributes include: piping with dead weight support spacing in excess of the USAS B31.1.0-1967 suggested spans, or tubing with excessive sagging; piping with heavy, unsupported in-line components; piping constructed of non-ductile materials such as cast iron or polyvinyl chloride (PVC); piping with non-standard fittings or unusual attachments that could cause excessive localized stresses; pipe supports that exhibit non-ductile behavior; and presence of severe corrosion.

NRC Question 3-2

In discussion under NRC limitation 2, you stated that the design attributes of the BSEP piping and supports were compared to the attributes of the database piping and supports as shown in Tables 4-3 through 4-6. The referenced tables do not show any comparison of design attributes of the database piping supports with the BSEP piping supports. Provide a comparison that was performed for piping support attributes. For the most critical pipe support, provide a basis for the selection of the governing support and summary of seismic load calculation, load combination, and method of analysis considered in the evaluation. Also, provide a summary of evaluation results including the maximum calculated stress, allowable stress, Code, and Code Edition used for evaluating the most critical components.

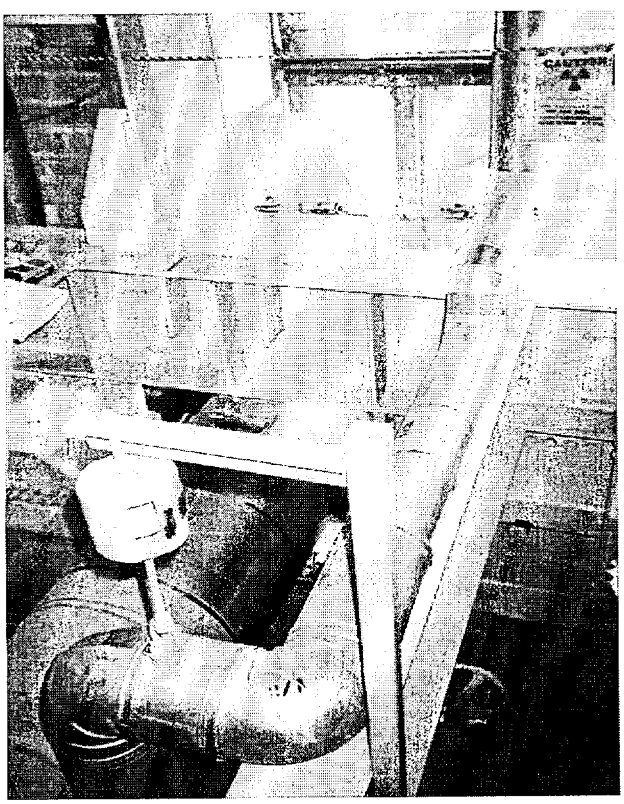
CP&L Response

For pipe support comparisons, refer to Section 4.3 of the enclosure to CP&L's submittal dated September 27, 2001 (Serial: BSEP 01-0112), which describes the earthquake experience-based approach to review the design attributes of the BSEP piping and related supports in order to demonstrate that they fall within the bounds of the experience database. Briefly stated, the Brunswick ALT piping systems consist of welded steel pipe and standard support components. Typical standard support components utilized at BSEP include single rod hangers or rod-hung trapezes, variable spring hangers, and welded steel angle trapezes or cantilever brackets with U-bolts. Some typical BSEP pipe support configurations are shown in the following figures.

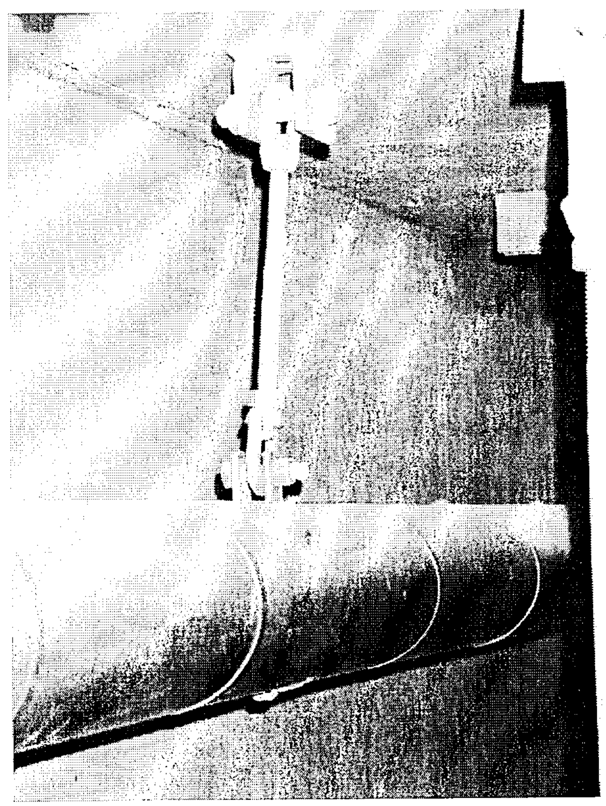
Section 4.2 of NEDC-31858P-A, Volume 2, Appendix D, provides a general description of pipe supports typically found in the database sites. As stated:

> Pipe support detailing was also reviewed. All systems appeared to be dead load supported in general conformance to the recommendations of the USAS B31.1-1967 code. Support hardware and detailing were characterized by component standard supports on all systems.

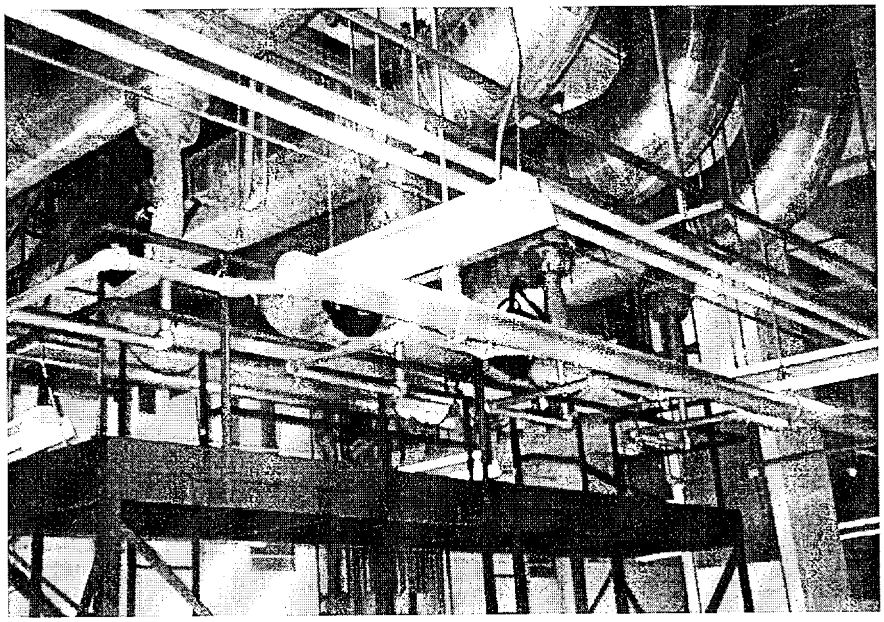
These standard support components are also shown in the accompanying figures within the referenced Appendix D. In addition, supplemental piping earthquake performance data are presented in NEDC-31858P-A, Volume 1, Tab 5, and also include the description and figures of typical pipe supports commonly found in these additional database sites. As shown, typical support configurations for the earthquake experience database sites consisted of mainly rod hangers, variable spring hangers, and rigid (i.e., U-bolt) type supports. Some typical database pipe support configurations are also shown in the following figures.



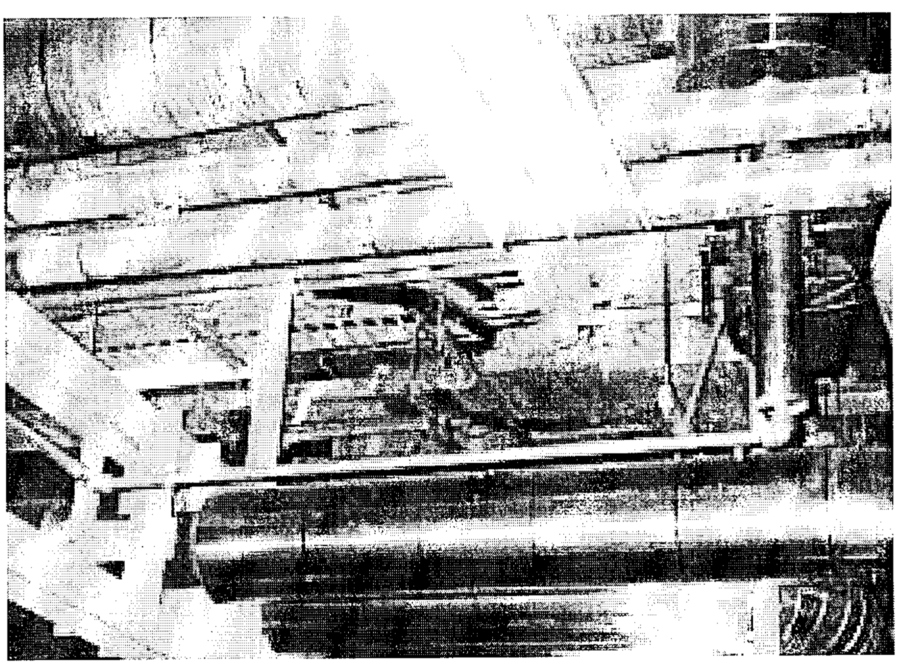
BSEP Unit 1: Main steam drain line and spring and strut supports in the Reactor Building MSIV pit.



BSEP Unit 1: Typical clevis and rod pipe support on the main steam drain line in the Turbine Building steam tunnel.



BSEP Unit 1: Rod hung small-diameter drain lines off the main steam drip legs and drain header to the condenser.



BSEP Unit 1: Rod hung and rigid supports for the main steam drain lines from the reheaters.

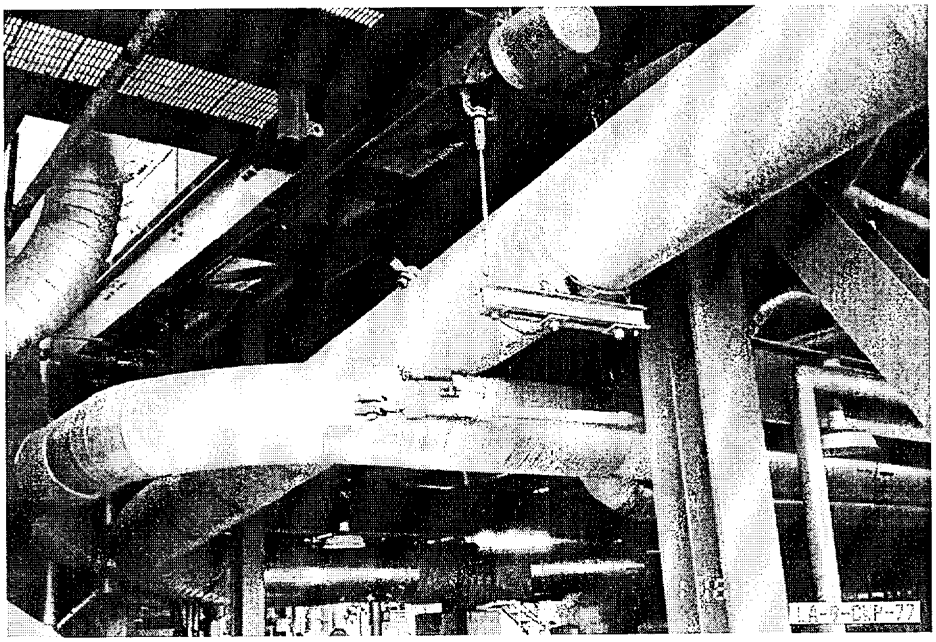
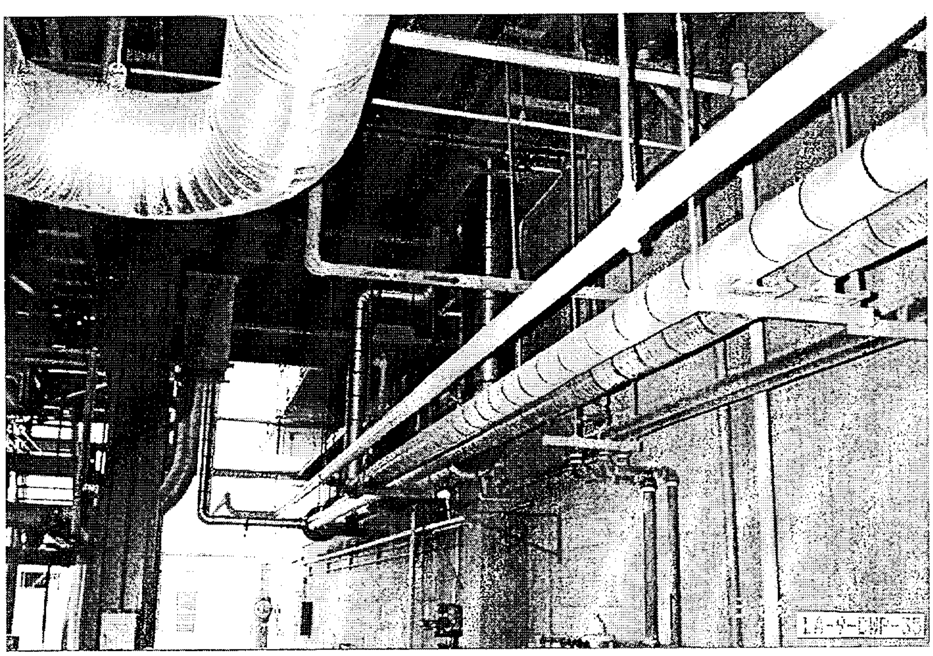


Figure 20 from NEDC-31858P-A, Volume 1: Typical pipe supports in Coolwater Units 1 and 2. Engineered supports for high energy, large bore piping are shown above, and field routed supports for low energy piping are shown below.



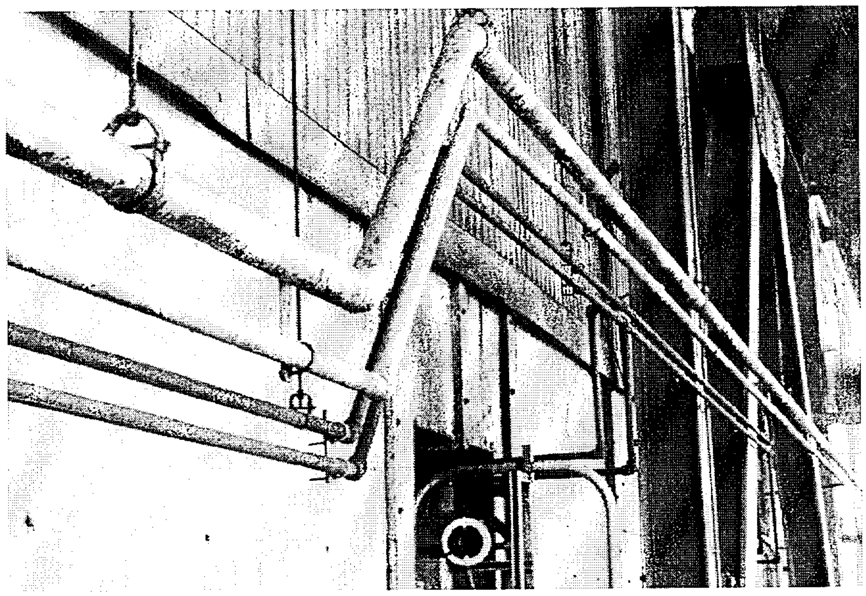
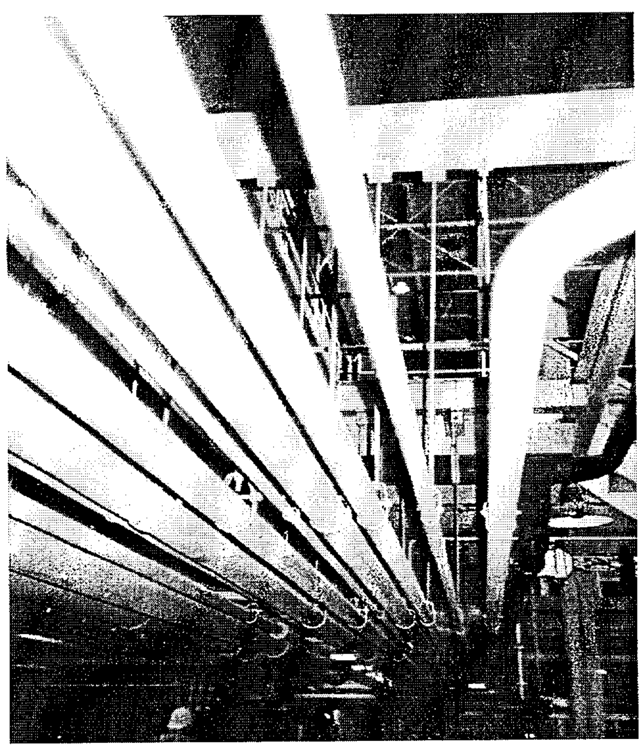


Figure 3-7 above and Figure 3-8 below from NEDC-31858P-A, Volume 2: Moss Landing Power Plant, 1989 Loma Prieta Earthquake. Undamaged small-diameter rod-hung piping systems.



Based on the above comparisons, it can be concluded that the BSEP pipe supports are similar to those typically found in the earthquake experience database sites.

For critical support evaluations, please refer to Section 4.3 of the enclosure to CP&L's submittal dated September 27, 2001 (Serial: BSEP 01-0112), which describes the basis for support evaluation. Briefly stated, supports and anchorages were evaluated using conservative deterministic methods by support type in groups. The selection of bounding support configurations was essentially based on grouping of similar types of supports; and with piping spans and support attachment locations expected to produce maximum loading conditions; and/or any unusual or poor design details. Seismic loads for supports were conservatively calculated using peak spectral accelerations that correspond to the respective response spectra of the support attachment locations. Section 4.1.1 of the enclosure to CP&L's submittal described the seismic demand or acceleration response spectra used for bounding support evaluations, and Section 4.1.2 described the loading combination and applicable code or guidelines to which the support components were evaluated. Evaluation results for the various types of supports considered are presented in Table 4-6 of the September 27, 2001, submittal, and are expanded below to include the maximum calculated stresses and corresponding allowable stress bases as requested. Please note that the reported stress ratios are essentially demand to capacity ratios, (i.e., maximum calculated stresses divided by the allowable stresses used in the evaluations).

Table 4-6 (Expanded)
Bounding Evaluations of Typical Support Configurations

Support Type	Critical Component	Stress Ratio	Maximum Calculated Stress	Allowable Stress Basis
Eccentric Floor Stanchions	Bending - Structural Member	0.99	36 ksi	1.7 S per Part 2 of the American Institute of Steel Construction (AISC)*
Cantilever Brackets	Fabricated Pipe Strap	0.83	30 ksi	1.7 S per Part 2 of AISC*
Cantilever Bracket - Rod Hangers	Weld	0.71	26 ksi	1.7 S per Part 2 of AISC*
* Manual of Steel Construction by the AISC, 8th Edition.				

NRC Question 3-3

For the non-seismic category I portion of the main steam system piping, including the associated supports which are utilized as an alternate leakage pathway, discuss the material involved and the methodologies used for their original design and installation.

CP&L Response

The material utilized for the main steam system piping is as follows:

SA-106 or A-106 Grade B or SA-333 or A-333 Grade 6

The materials utilized for the pipe supports are primarily carbon steel (e.g., A36). Various vendors (e.g., Bergen-Paterson or Grinnell) also supplied standard carbon steel components for the main steam system pipe supports.

Large bore piping (i.e., 2-1/2-inch diameter and larger) was designed and installed per USAS B31.1.0-1967. The supports for large bore piping were installed utilizing pipe support design drawings, which identified the specific support locations and design details. Small bore piping (i.e., 2-inch diameter and smaller) and the associated supports were field-installed using standard support spacing and typical designs.

NRC Question 3-4

Discuss the applicability of the ASME Code Section XI in service inspection program to the alternate leakage treatment path. Also, discuss how repairs and replacement of the piping will be performed if needed.

CP&L Response

To provide assurance for the continued reliability of the alternate leakage treatment pathways, CP&L will change the quality classification of the valves, lines, and supports in the pathways to indicate a special seismic qualification based on the Seismic Qualification Utility Group (SQUG) criterion used in the walkdowns. This quality classification will provide a reference to the design requirements for repair and/or replacement. The piping will be placed in an augmented inspection program, as described below, and will be periodically inspected to the SQUG seismic criterion by a SQUG-qualified Seismic Capability Engineer.

In addition to the inspection program required by the American Society of Mechanical Engineers (ASME) Code, Section XI, BSEP is committed to several augmented inservice inspection (ISI) examinations, some of which are not ASME Code classed components. The program for augmented ISI examinations is described and implemented by plant procedure 0ENP-16.2, "Administrative Control Of ASME Section XI Non-Destructive Examination Program." These augmented ISI programs are subject to the same auditing and self-assessment requirements as the ISI programs for ASME Code classed components. The alternate leakage treatment path and the backup treatment path will be placed in this augmented program.

NRC Question 3-5

Discuss the methodology for calculating stresses in condenser shell due to seismic DBE loads. Provide the maximum stress in the condenser shell for the design load combination. Also provide the Code, Code Edition, and allowable stress used for the evaluation. If different from the code of record, please justify and reconcile the differences.

CP&L Response

Condenser shell stresses were evaluated using conservative deterministic methods based on conventional engineering mechanics techniques. The condenser is considered to be relatively rigid, and the horizontal and vertical seismic loads were calculated using the rigid range design basis earthquake (DBE) acceleration (i.e., zero period acceleration) values of the respective directions at support level and combined with dead loads. The maximum shell stress due to combined axial and bending for dead loads plus seismic DBE loads is 2.23 ksi, which is small when compared to the AISC allowable stress of 18.0 ksi (i.e., 0.6 x 30 ksi). Maximum shear stress across the condenser shell is also small (i.e., 0.62 ksi).

For structural steel, the BSEP code of record for original design is the 7th Edition of the Manual of Steel Construction, published by the AISC, and 8th Edition for structural modifications. For this application, the 7th Edition contains similar provisions as in the subsequent editions of the AISC manual.