

**Portland General  
Electric**

*Trojan Nuclear Plant  
71760 Columbia River Hwy  
Rainier OR 97048  
(503) 556-3713*

August 13, 1998

VPN-040-98

Trojan Nuclear Plant  
Dockets 50-344, 71-9271  
License NPF-1

Director  
Office of Nuclear Materials Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Dear Sir:

Supplemental Response to NRC's Request for Additional Information (RAI)  
Regarding Transportation of the Trojan Reactor Vessel Package (RVP) for Disposal

By letter dated July 9, 1998, from Susan F. Shankman to Stephen M. Quennoz, the Nuclear Regulatory Commission (NRC) transmitted to Portland General Electric Company (PGE), "Trojan Reactor Vessel Package Request for Additional Information." By letter (VPN-037-98) dated August 8, 1998, from Stephen M. Quennoz to the Director, Office of Nuclear Materials Safety and Safeguards, PGE responded to the RAI. Prior to submittal of the response it was confirmed via telephone conversation with the NRC Project Manager for the application, Mr. John Cook, on August 7, 1998, that it was acceptable to submit separately a response to RAI Question 2-8. Analyses supporting an answer to the question were still in progress, and the response to the RAI would otherwise be ready for submittal on August 8, 1998. This unanswered question was then noted in PGE's letter of August 8, 1998, and PGE committed to provide a response to the question by August 14, 1998. This letter provides PGE's response to RAI Question 2-8 as Enclosure 1. An update to the RVP Safety Analysis Report (SAR) is provided as Enclosure 2.

For ease of review, it is recommended that the RVP SAR update first be incorporated per the insertion/deletion instructions provided with it. The response to RAI Question 2-8 provides a "road map" to where relevant information from the response was incorporated into the updated SAR. A review of the material being submitted with this letter identified no proprietary information. However, new SAR Appendix 2-2B, provided in Enclosure 2 to this letter, contains a copied work; specifically, Page 10 of the March 1979 revision of Welding Research Council Bulletin 107/August 1965, "Local Stresses in Spherical and Cylindrical Shells Due to External

YI  
Pool

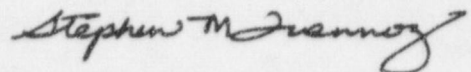
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August 13, 1998  
Page 2 of 2

Loadings." A review of this copied work determined that its use meets the "fair use" criteria provided in Title 17 of the United States Code, Section 107 (17 USC 107), "Limitations on exclusive rights: Fair use."

Please direct any questions regarding the information provided in this letter to Lanny Dusek at (503) 556-7409.

Sincerely,

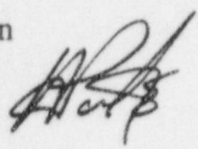


Stephen M. Quennoz  
Trojan Site Executive

Enclosures

c: S. F. Shankman, NRC, NMSS, SFPO (w/o)  
C. J. Haughney, NRC, NMSS, SFPO (w/o)  
E. P. Easton, NRC, NMSS, SFPO (w/o)  
G. Robertson, WDOH (w/o)  
E. Fordham, WDOH (w/o)  
B. Bede, US Ecology (w/o)

TO: Distribution

FROM: H. R. Pate 

DATE: August 13, 1998

SUBJECT: Transmittal of Revised Pages to PGE-1076,  
"Trojan Reactor Vessel Package Safety Analysis Report"

Enclosed are replacement pages for your Controlled Copy of PGE-1076, "Trojan Reactor Vessel Package Safety Analysis Report." The pages are to be inserted in accordance with the accompanying instruction sheet.

Please acknowledge receipt of your copy by completing the lower portion of this transmittal and returning it to the location given below.

Enclosure

8/13/98

#### ACKNOWLEDGMENT

Revised Pages to PGE-1076,  
"Trojan Reactor Vessel Package Safety Analysis Report"

I hereby acknowledge receipt of Controlled Copy number 18 of the subject document. All changes have been made in accordance with the instructions, and superseded pages have been destroyed.

\_\_\_\_\_  
Signature of Copy Holder

\_\_\_\_\_  
Date

Return to: Pat Schaffran/TCB-3  
Trojan Nuclear Plant  
71760 Columbia River Highway  
Rainier, Oregon 97048



**Supplemental Response to the NRC letter dated July 9, 1998,  
Request for Additional Information Concerning the  
Trojan Reactor Vessel Package**

**SAFETY ANALYSIS REPORT**

**2.0 STRUCTURAL EVALUATION**

- 2-8 *Provide an explanation that the RVP outlet nozzle's max. local stress intensity induced by the 10g longitudinal tie-down force was calculated as 40.88 ksi but the plot of local stress intensities for the outlet nozzle showed much higher stress intensities (Appendix 2-2).*

*During transport, the longitudinal restraint consists of a clamping assembly, that is built into the cradle support steel, to clamp two of the RVP outlet nozzles so that the package cannot move in the longitudinal direction. The plot of local stress intensities for the outlet nozzle showed stress intensities above material yield strength. 10 CFR 71.45(b) requires that the stress in any material of the package below the material yield strength.*

**PGE Response:**

- 2-8 Safety Analysis Report (SAR) Appendix 2-2, "Longitudinal Restraint and Tiedown Structural Analysis," was revised to use a refined finite element model for analysis of the subject restraint components. The overall approach is the same as was previously used (i.e., one half of the 10g load is applied to one of the nozzles since two nozzles restrain the total load), and the finite element analysis calculates the resultant local stresses in the nozzle and surrounding reactor vessel shell material. Refinements to the original model, which result in a more extensive and realistic analysis, include the following:
1. The volume of the reactor vessel surrounding the nozzle that is included in the revised model now extends up to and incorporates a portion of the reactor vessel head flange. Previously, the model provided restraint in closer proximity to the nozzle. Although the flange is massive in comparison to the vessel shell, the extended/additional volume of the shell reduces the strains of the shell in the area adjacent to the nozzle, thereby reducing the local stresses at the nozzle/shell junction.
  2. The revised model more accurately represents the vessel reinforcement around the nozzle opening, in particular the increased thickness associated with the nozzle-to-shell weld. Since the highest stresses are located in the weld reinforcement volume, the more accurate geometry led to reduced local stresses.

3. In the original model, the load was conservatively applied to the nozzle through only one of the two bearing plates that couple the nozzle to the rest of the longitudinal restraint system. The revised model applies the load through both bearing plates, and the distribution of the load depends upon the relative flexibility of the nozzle to the loaded contact area with each bearing plate. This model refinement redistributes, to some degree, the local stresses at the nozzle-to-shell junction and reduces their magnitude.

An illustration of the revised model boundary conditions is provided in Section VI.B of SAR Appendix 2-2. In addition, four views of the revised model's geometry, which show the details of the discussion above, are also provided as Pages 18 through 21 of SAR Appendix 2-2.

Based on the finite element analysis using the updated model, the Reactor Vessel Package (RVP) outlet nozzle's maximum principal stress and stress intensity induced by the 10g longitudinal tiedown force were calculated as 43.5 ksi and 42.2 ksi, respectively. Plots of stresses and stress intensities based on the finite element analysis are included in SAR Appendix 2-2, Section VI.B. None of the elements in these plots show stresses above the allowable values, based on Code values for RVP material yield strengths.

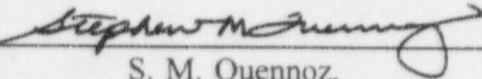
An alternative method was also used to calculate the stresses induced on the RVP shell and nozzles by the longitudinal restraint system, and the calculation was added to the SAR as new Appendix 2-2B. The results of this evaluation compare well with the finite element analysis and also demonstrate that nozzle stresses under a 10g longitudinal load to the RVP do not exceed material yield strengths. The evaluation compares the calculated stresses to the Code minimum yield strength ( $S_y = 50$  ksi) and to the actual yield strengths for the RVP materials. The actual material yield strengths, taken from test reports, exceed 60 ksi. Thus, a comparison to the actual yield strengths shows there is an even greater margin to yield.

In addition to revising the finite element analysis originally provided in SAR Appendix 2-2, an update was made to SAR Table 2-9 to incorporate the results from the revised analysis. Also, in addition to adding the alternative method calculation as SAR Appendix 2-2B, an update was made to SAR Section 2.5.2 to discuss that evaluation.

STATE OF OREGON, )  
)  
)  
COUNTY OF COLUMBIA )

I, S. M. Quennoz, being duly sworn, subscribe to and say that I am the Trojan Site Executive, for Portland General Electric Company, the licensee herein; that I have full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information, and belief the statements made in it are true.

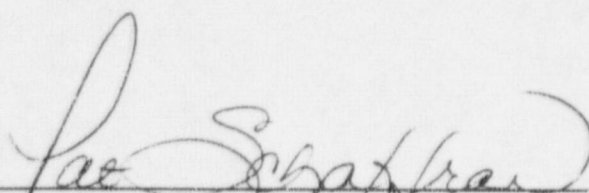
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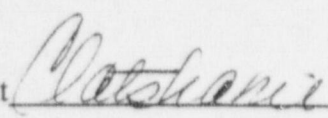
  
S. M. Quennoz,  
Trojan Site Executive  
Portland General Electric Company

On this day personally appeared before me, S. M. Quennoz; to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act.

GIVEN under my hand and seal this 13th day of August 1998.



  
Notary Public in and for the  
State of Oregon

Residing at 

My commission expires 7-27-99



UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )

PORTLAND GENERAL ELECTRIC COMPANY )  
THE CITY OF EUGENE, OREGON, AND )  
PACIFIC POWER & LIGHT COMPANY )  
(TROJAN NUCLEAR PLANT) )

Dockets 50-344, 71-9271  
License NPF-1

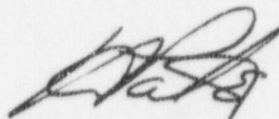
CERTIFICATE OF SERVICE

I hereby certify that copies of PGE's supplemental response (including an update to the Safety Analysis Report), dated August 13, 1998, to the NRC's July 9, 1998, request for additional information concerning PGE's March 31, 1997, application for approval of a one-time shipment of the Trojan reactor pressure vessel for disposal, has been served on the following by hand delivery or by deposit in the United States Mail, first class, this 13th day of August 1998:

State of Oregon  
Attn: David Stewart-Smith  
Oregon Office of Energy  
625 Marion Street NE  
Salem, OR 97310

State of Washington  
Attn: Mikel J. Elsen  
Washington Department of Health  
P.O. Box 47827  
Olympia, WA 98504

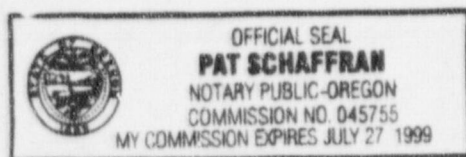
Chairman of County Commissioners  
Columbia County Courthouse  
St. Helens, Oregon 97051



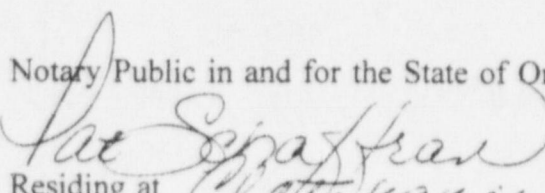
H. R. Pate  
Manager, Licensing, Compliance,  
and Commitment Management

On this day personally appeared before me H. R. Pate, to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act.

GIVEN under my hand and seal this 13th day of August 1998.



Notary Public in and for the State of Oregon

  
Residing at *Clatskanie*  
My commission expires *7-27-99*