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James Knubel
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February 16, 1999
IPN-99-018

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
Response to NRC Request for Additional Information Regarding Generic Letter 97-01, Degradation of Control Rod Drive Mechanism Nozzle And Other Vessel Closure Head Penetrations (TAC M98570)

References:
1. NRC letter, G. Wunder to J. Knubel dated November 24, 1998 regarding same subject.
2. NRC Generic Letter 97-01, "Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Closure Head Penetrations," dated April 1, 1997.
3. Nuclear Energy Institute letter, D. J. Modeen to G. C. Lainas (USNRC) dated December 11, 1998 regarding "Responses to NRC Request for Additional Information on Generic Letter 97-01."

Dear Sir:

The Authority's response to the NRC staff's request for additional information (Reference 1) regarding NRC Generic Letter 97-01 (Reference 2) is included as Attachment I. Due to the generic nature of the staff's questions, the Authority's responses are based on, in part, an NEI letter (Reference 3) prepared by the Alloy 600 Issue Task Group with input from the PWR Owners Groups and EPRI.

The Authority makes no new commitments in this letter. If you have any questions, please contact Ms. C. D. Faison.

Very truly yours,

J. Knubel
Senior Vice President and
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cc: Next page

cc: Regional Administrator
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Attachments:

I. Response to NRC Request for Additional Information Regarding Generic Letter 97-01, "Degradation of Control Rod Drive Mechanism Nozzle And Other Vessel Closure Head Penetrations," Indian Point 3

Attachment I to IPN-99-018

NEW YORK POWER AUTHORITY
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Response to NRC Request for Additional Information Regarding Generic Letter 97-01
Degradation of Control Rod Drive Mechanism Nozzle
And Other Vessel Closure Head Penetrations

ITEM 1

WEC and the WOG did not provide a description of the crack initiation and growth susceptibility model used for the assessment of WEC vessel head penetration (VHP) nozzles in plants endorsing WCAP-14902, Revision 0. Provide a description of the crack initiation and growth susceptibility model used for assessment of the VHP nozzles at Indian Point Unit No. 3 (IP3).

RESPONSE 1

Indian Point 3 uses the EPRI-RPV Head Nozzle Module (RHNM) as the predictive model for crack initiation and growth susceptibility. This model was originally developed by Dominion Engineering, Inc., for IP3 and was entitled at that time, "CRDM Nozzle PWSCC Inspection and Repair Strategic Evaluation (CIRSE) Program." Details on the EPRI-RHNM predictive model were provided in Enclosure 6 of Reference 3.

ITEM 2

In WCAP-14902, Revision 0, WEC did not provide any conclusions as to what the probabilistic failure model would lead the WOG to conclude with respect to the assessment of PWSCC in WEC-designed vessel head penetration (VHP) nozzles. With respect to the probabilistic susceptibility model (e.g., probabilistic failure model) provided in WCAP-14902, Revision 0:

a. Provide the susceptibility ranking of IP3 as compiled from the crack initiation and growth analysis of the VHP nozzles for your IP3 to that compiled for the other WOG member plants for which WCAP-14902, Revision 0, is applicable. Include the basis for establishing the ranking of IP3 relative to the others.

b. Describe how the probabilistic failure (crack initiation and growth) model is used for the assessment of the VHP nozzles at IP3 was bench-marked, and provide a list and discussion of the standards the model was bench-marked against.

c. Provide additional information regarding how the probabilistic failure (crack initiation and growth) models for the assessment of VHP nozzles at IP3 will be refined to allow the input of plant-specific data into the model's analysis methodology.

d. Describe how the variability in product forms, material specifications, and heat treatments used to fabricate each CRDM penetration nozzle at the WOG member utilities are addressed in the probabilistic crack initiation and growth models described or referenced in topical report No. WCAP-14902, Revision 0.

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RESPONSE 2a

For industry planning purposes, plants have been grouped into three categories based on the predicted time to reach the allowable flaw depth limit. These results were provided in the industry histogram provided as Enclosure 1 of Reference 3.

RESPONSE 2b

Benchmarking for crack initiation is performed using a "reference nozzle" concept. After each plant inspection is completed, the vessel head and nozzles are analyzed using the EPRI model to determine the time to 10% probability of cracking for a reference nozzle with a surface hoop stress level of 60 ksi and an operating temperature of 600°F which results in a 50% cumulative probability of the observed inspection results when corrections for differences in stress and temperature between the reference nozzle and the nozzles in the inspected plant are included. This information is then evaluated relative to the results of inspections for other plants to establish a time to 10% probability of crack initiation for each different group of nozzle materials.

Crack growth is benchmarked using reported crack growth rates obtained from controlled laboratory tests and field inspections corrected for differences in temperature and crack tip stress intensity. Please refer to the EPRI methodology description in Enclosure 6 of Reference 3 for additional information on how the EPRI model is benchmarked.

RESPONSE 2c

Plant specific inspection data are factored into the EPRI model predictions in two ways:

1. As each plant inspection is completed, the vessel head and nozzles are analyzed using the EPRI model to determine the time to 10% probability of cracking for a reference nozzle with a surface hoop stress level of 60 ksi and an operating temperature of 600°F which results in a 50% cumulative probability of the observed inspection results. These data are updated periodically and provided to users of the EPRI model software. If an inspection indicates a significant change in reference nozzle conditions, users are notified.
2. Once a plant has performed an inspection, the results of the plant-specific inspection, along with the results for other plants in the same nozzle material group, are used to establish a plant-specific reference for future predictions.

RESPONSE 2d

The EPRI model time-to-crack-initiation predictions for a subject plant are based on the results of inspections at plants which most closely resemble the subject plant in terms of material product form, material specification, material supplier, material heat treatment, and vessel head fabricator. This approach avoids the need for major corrections to reflect differences in material PWSCC susceptibility. Minor variations from nozzle to nozzle are accounted for statistically through the

Weibull slope parameter and by applying a triangular distribution to the reference time to 10% probability of cracking. At the present time, EPRI considers that sufficient laboratory or field inspection data are not available to more precisely define the effect of product form, material specification, and heat treatment on the crack initiation rates. If proven correlations become available in the future, they will be included in the EPRI model. EPRI model crack growth predictions are based on application of a log-triangular distribution to the available laboratory and field data corrected for temperature and stress intensity.

ITEM 3

Table 1-2 in WCAP-14902, Revision 0, provides a summary of the key tasks in WEC's vessel head penetration nozzle assessment program. The tables indicate that the tasks for: (1) Evaluation of PWSCC Mitigation Methods; (2) Crack Growth Data and Testing; and (3) Crack Initiation Characterization Studies have not been completed and are still in progress. In light of the fact that the probabilistic susceptibility models appear to be dependent in part on PWSCC crack initiation and growth estimates, provide your best estimate when these tasks will be completed by WEC, and describe how these activities relate to and will be used to update the probabilistic susceptibility assessment of VHP nozzles at IP3.

RESPONSE 3

The programs on crack growth testing and crack initiation have been essentially completed, and the program on mitigation is now underway and targeted for completion in mid-2000. These programs have thus far served to confirm the assumptions used in the original safety evaluations and models. As additional information becomes available from the referenced testing, the models will be reviewed and updated as necessary. No major changes are anticipated.

ITEM 4

In the NEI letters of January 29, 1998 (Reference 1), and April 1, 1998 (Reference 2), NEI indicated that inspection plans have been developed for the VHP nozzles at the Farley Unit 2 plant in the year 2002, and the Diablo Canyon Unit 2 plant in the year 2001, respectively. The staff has noted that although you have decided to apply an alternate probabilistic susceptibility model to the assessment of the VHP nozzles at IP3, other WOG member licensees, including the Southern Nuclear Operating Company and the Pacific Gas and Electric Company, the respective licensees for the Farley units and the Diablo Canyon units, have selected to apply the susceptibility model described in WCAP-14901, Revision 0, to the assessment of VHP nozzles at their plants. The WOG's proposal to inspect the CRDM penetration nozzles at Farley Unit 2 and Diablo Canyon Unit 2 appears to be based on the composite assessment of the VHP nozzles at all WOG member plants. Verify that such a composite ranking assessment has been applied to the evaluation of VHP nozzles at your IP3. If composite rankings of the VHP nozzles at WOG member plants have been obtained from the composite results of the two models, justify why application of the alternate

probabilistic susceptibility model being for the assessment of VHP nozzles at IP3 would yield the same comparable relative rankings as would application of the probabilistic susceptibility model used by the WOG member plants subscribing to the contents of WCAP-14901, Revision 0. Comment on the susceptibility rankings of the VHP nozzles at IP3 relative to the susceptibility rankings of the VHP nozzles at the Farley Unit 2 and Diablo Canyon Unit 2 plants.

RESPONSE 4

The announcement of inspection plans by individual WOG plants is the result of each individual plant's economic situation, along with their future operational plans. The individual plant results are all compared in the histogram in Enclosure 1 of Reference 3. An individual plant's category in the histogram is one of the many considerations, which must be evaluated in making inspection decisions.

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REFERENCES

1. Nuclear Energy Institute (NEI) letter, David J. Modeen to Gus C. Lainas (USNRC) dated January 29, 1998, untitled.
2. Nuclear Energy Institute (NEI) letter, David J. Modeen to Gus C. Lainas (USNRC) dated April 1, 1998 regarding Generic Letter 97-01, "Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Head Penetrations."
3. Nuclear Energy Institute letter, David J. Modeen to Gus C. Lainas (USNRC) dated December 11, 1998 regarding "Responses to NRC Requests for Additional Information on Generic Letter 97-01."
4. NRC Generic Letter 97-01, "Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Closure Head Penetrations," dated April 1, 1997.
5. NRC letter, G. Wunder to J. Knubel dated November 24, 1998 regarding request for Additional Information (GL) 97-01, "Degradation of CRDM/CEDM Nozzle and Other Vessel Closure Head Penetrations," Indian Point Unit 3, (TAC M98570).
6. NYPA letter, H. Salmon, Jr. to USNRC (IPN-97-055) dated April 29, 1997 regarding 30-day response to NRC Generic Letter 97-01.
7. NYPA letter, J. Knubel to USNRC (IPN-97-097) dated July 21, 1997 regarding 120-day response to NRC Generic Letter 97-01.
8. NYPA letter, J. Knubel to USNRC (IPN-97-126) dated September 17, 1997 regarding 120-day response to NRC Generic Letter 97-01, "Chemistry Records Reviewed for Evidence of Potential Resin Intrusion Events."