EM

Entergy

Entergy Nuclear Operations, Inc.
Vermont Yankee
320 Governor Hunt Rd
Vernon, VT 05354
Tel 802 257 7711

Michael J. Colomb
Site Vice President

FEB 14 A 10: 12
STATE OF VERMONT
DEPT OF PUBLIC SERVICE
MONTPELIER, VT.
05620-2601

BVY 11-012

February 8, 2011

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: License Renewal Application Supplemental Information
Vermont Yankee Nuclear Power Station
Docket No. 50-271
License No. DPR-28

REFERENCES: 1. Letter, Entergy to USNRC, "License Renewal Application," BVY 06-09, dated January 25, 2006

Dear Sir or Madam:

On January 25, 2006, Entergy Nuclear Operations, Inc. and Entergy Nuclear Vermont Yankee, LLC (Entergy) submitted the License Renewal Application (LRA) for the Vermont Yankee Nuclear Power Station (VYNPS) as indicated by Reference 1.

Attachment 1 of this letter provides supplemental information to the LRA to address questions discussed with the NRC staff on a teleconference held on January 26, 2011.

There are no new regulatory commitments made in this letter.

Should you have any questions or require additional information concerning this submittal, please contact Mr. Robert Wanczyk at 802-451-3166.

I declare under penalty of perjury, that the foregoing is true and correct.

Executed on February 8, 2011.

Sincerely,

[MJC/PLC]

Attachments: 1. License Renewal Application Supplemental Information

cc: Mr. Eric J. Leeds, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
One White Flint North 13H16M
11555 Rockville Pike
Rockville, MD 20852-2738

Mr. William M. Dean, Regional Administrator
U.S. Nuclear Regulatory Commission, Region 1
475 Allendale Road
King of Prussia, PA 19406-1415

Mr. Robert Kuntz, Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North 11F1
11555 Rockville Pike
Rockville, MD 20852-2738

Mr. James S. Kim, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop O8C2A
Washington, DC 20555

USNRC Resident Inspector
Entergy Nuclear Vermont Yankee
320 Governor Hunt Road
Vernon, Vermont 05354

Ms. Elizabeth Miller, Commissioner
VT Department of Public Service
112 State Street – Drawer 20
Montpelier, Vermont 05620-2601

Attachment 1

Vermont Yankee Nuclear Power Station
License No. DPR-28 (Docket No. 50-271)

License Renewal Application

Supplemental Information

Vermont Yankee Nuclear Power Station
License Renewal Application - Supplemental Information

Environmentally Assisted Fatigue

Background – Limiting Components for NUREG/CR-6260 Locations

Based on recent industry and regulatory correspondence and a teleconference held with NRC staff on January 26, 2011, Vermont Yankee Nuclear Power Station (VYNPS) is providing the following supplemental information regarding environmentally assisted fatigue to confirm and justify that the plant-specific locations listed in License Renewal Application (LRA) Table 4.3-3 are bounding for the generic NUREG/CR-6260 components.

Discussion

The environmentally assisted fatigue cumulative usage factor, CUF_{en}, values reported in LRA Table 4.3-3 were based on the design basis fatigue usage factors (or values from NUREG/CR-6260 for locations without a plant-specific fatigue analysis) multiplied by environmental fatigue life correction factors. Subsequent to LRA submittal, refined and subsequent confirmatory analyses were completed for the NUREG/CR-6260 components. In confirming that the locations evaluated for environmental effects are bounding for the generic NUREG/CR-6260 components, VYNPS considered cumulative usage factor, CUF, values and environmental fatigue life correction factors. For each NUREG/CR-6260 component, the combination of CUF and environmental fatigue life correction factor was evaluated for each constituent material to determine the most limiting, CUF_{en}. For example, the low alloy steel core spray nozzle was evaluated, as well as, the nickel alloy safe end and the stainless steel piping associated with the core spray nozzle. Consequently, the CUF_{en} values reported as results from the refined and confirmatory analyses for the VYNPS NUREG/CR-6260 components are bounding for the generic NUREG/CR-6260 locations.

The NRC staff reviewed the results of the refined and confirmatory analyses as documented in the Safety Evaluation Report (SER) and SER supplement dated May 21, 2009 for VYNPS license renewal.

Background – Limiting Locations for the Plant

Based on recent industry and regulatory correspondence and a teleconference held with NRC staff on January 26, 2011, VYNPS is providing the following supplemental information regarding environmentally assisted fatigue to demonstrate that the locations selected for environmentally assisted fatigue analyses in LRA Table 4.3-3 are the most limiting locations for the plant.

Discussion

Fatigue usage factors from Class 1 fatigue analyses were reported in Table 4.3-1 of the VYNPS LRA as amended in a letter dated January 4, 2007. VYNPS reviewed the design basis Class 1 fatigue analyses not already addressed as NUREG/CR-6260 components. Some of the values in the LRA table were based on extremely conservative assumptions. In some cases (e.g., main closure flange), the reported CUFs were at locations not exposed to the reactor coolant. Some locations exposed to reactor coolant with a CUF reported in Table 4.3-1 were determined exempt from fatigue analysis in accordance with the ASME Code of record.

To determine bounding locations, comparisons were based on CUFs from the analyses of record multiplied by bounding F_{en} values, weighted to account for differences in dissolved oxygen concentrations during the time period prior to and following implementation of hydrogen

water chemistry control. Environmental effects were evaluated for each material (low alloy steel, stainless steel, Alloy 600, etc) at the locations reviewed.

In the case of Alloy 600 materials, VYNPS used the NUREG/CR-6909 methodology to obtain CUF values and environmental fatigue life correction factors.

VYNPS did not apply an environmental fatigue life correction factor to the CUF for the main steam outlet nozzle since this location is exposed to dry steam and not reactor water when the plant is in operation. The only exposure to reactor water is during refueling outages. The results of the evaluation of the NUREG/CR-6260 components were reported in a letter from VYNPS to NRC dated September 17, 2007 and amended by letters dated January 30, 2008 (feedwater nozzle), and March 12, 2009 (core spray and recirculation outlet nozzles). The following table lists Class 1 components from LRA Table 4.3-1 that were not explicitly included in the evaluations of the NUREG/CR-6260 components.

Component	Material	CUF_{en}	Discussion
Closure flange	Low alloy steel	NA	Exempt per ASME Code Section III, Subsection N-415.1
Closure studs	NA	NA	Not exposed to reactor water
Core support structure (shroud support)	Low alloy steel	NA	Evaluated as part of the vessel shell and bottom head, which was a NUREG/CR-6260 evaluated component
Control rod drive (CRD) penetrations	SS A600	0.005 (F_{en} 8.36) 0.068 (F_{en} 2.92)	Considered in evaluation of other lower head locations. Other locations were determined more limiting.
CRD return nozzle	Low alloy steel	NA	Exempt per ASME Code Section III, Subsection N-415.1
Refueling bellows	NA	NA	Not exposed to reactor water
Shroud repair rod threaded ends	A600	0.377 (F_{en} 2.79)	Evaluated per NUREG/CR-6909
Shroud repair bracket ledge	SS	0.100 (F_{en} 9.86)	Evaluated per NUREG/CR-5704
Shroud support plate slotted holes	A600	0.586 (F_{en} 3.46)	Evaluated per NUREG/CR-6909
Steam outlet nozzle	Low alloy steel	NA	Not exposed to reactor water

Closure studs, refueling bellows and steam outlet nozzle

The closure studs and the refueling bellows are not exposed to the reactor water environment. The steam outlet nozzle is exposed only to a dry steam environment during operation. Therefore, these items are not evaluated for the effects of the reactor water environment on fatigue.

Closure flange and CRD return nozzle

The reactor vessel closure flange and the CRD return nozzle are exempt from fatigue analysis in accordance with ASME Code Section III, Subsection N-415.1. In addition, the CRD return nozzle safe end was removed and replaced with a cap in the 1979 time frame. The exemption from fatigue analysis was confirmed when this modification occurred. Consequently, these components are not limiting with respect to environmental effects on fatigue.

Core support structure and CRD penetrations

When evaluating the NUREG/CR-6260 component for reactor vessel shell and bottom head, the core support structure (shroud support) was the limiting item. The CUFs without environmental correction for the stainless steel CRD penetration housings and for the Alloy 600 CRD penetration stub tubes are both less than the CUF for the shroud support. In addition, the environmental fatigue life correction factors for both constituent materials of the CRD penetrations are less than the environmental fatigue life correction factor for the shroud support. Therefore, the CRD penetrations are less limiting than the core support structure (shroud support), which was evaluated as a NUREG/CR-6260 component.

Shroud repair hardware

The most limiting items of the shroud repair hardware are the Alloy 600 shroud repair rod threaded ends and the shroud support plate slotted holes. The stainless steel repair bracket was also evaluated. These items are not part of the reactor coolant pressure boundary. However, applying conservative environmental fatigue life correction factors still results in CUF_{en} values of less than 1.0.

Summary

In the evaluations, conservative bounding F_{en} values were used. CUFs were extrapolated for 60 years of plant operation based on VYNPS cycle projections and in no case did a CUF_{en} projected to 60 years exceed a value of 1.0. During evaluation of the NUREG/CR-6260 locations, refined and subsequent confirmatory analyses resulted in CUF_{en} values of less than 1.0. For example, NUREG/CR-6260 locations of core spray nozzle and recirculation outlet nozzle had original CUFs of 0.625 and 0.810, respectively. Subsequent analysis resulted in CUF_{en}s of 0.14 and 0.111. The highest CUF for the remaining locations listed in LRA Table 4.3-1 exposed to a reactor water environment was 0.39 for the CRD return nozzle, for which there is a fatigue exemption in the original design basis calculation. The next highest design CUF is at a support plate associated with the shroud repair with a design CUF of 0.23.

Based on the above information, VYNPS has confirmed that the NUREG/CR-6260 locations are bounding for the plant.

References:

1. Letter, Entergy to USNRC, "License Renewal Application, Amendment 23," BVY 07-003, dated January 4, 2007

2. Letter, Entergy to USNRC, "License Renewal Application, Amendment 31," BVY 07-066, dated September 17, 2007

3. Letter, Entergy to USNRC, "License Renewal Application, Amendment 34," BVY 08-002, dated January 30, 2008

4. Letter, Entergy to USNRC, "License Renewal Application, Amendment 38," BVY 09-019, dated March 12, 2009

5. NUREG-1907, "Safety Evaluation Report Related to the License Renewal of Vermont Yankee Nuclear Power Station," dated May 2008

6. NUREG-1907, Supplement 1 "Safety Evaluation Report Related to the License Renewal of Vermont Yankee Nuclear Power Station," dated September 2009