From: "Hamer, Mike" <mhamer@entergy.com>
To: "Jonathan Rowley" <JGR@nrc.gov>
Date: Wed, Sep 6, 2006 9:43 AM
Subject: VYNPS License Renewal RAI Responses

Jonathan,

Attached below is VYNPS LRA Amendment 12 that provides RAI responses for the following letters:

* NRC Letter dated 08/01/06; RAIs for the AMP, AMR, and TLAA audits at VYNPS.
* NRC Letter dated 08/03/06; RAIs for Section 2.4, "Scoping and Screening Results: Structures," of the VYNPS LRA.
* NRC Letter dated 08/03/06: RAIs for Section 2.5, "Scoping and Screening Results: EIC Systems," of the VYNPS LRA.

<<BVY 06-083 - VY LR RAI Responses - LRA Am. 12.PDF>>
Please call me if you have any questions, or require additional information.

Mike Hamer
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Subject: VYNPS License Renewal RAI Responses
Creation Date Wed, Sep 6, 2006 9:43 AM
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Entergy

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September 5, 2006

Docket No. 50-271
BVY 06-083
TAC No. MC 9668

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

Reference:
1. Letter, Entergy to USNRC, "Vermont Yankee Nuclear Power Station, License No. DPR-28, License Renewal Application," BVY 06-009, dated January 25, 2006.
2. Letter, USNRC to VYNPS, "Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application", NVY 06-102, dated August 1, 2006.
3. Letter, USNRC to VYNPS, "Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application", NVY 06-103, dated August 3, 2006.
4. Letter, USNRC to VYNPS, "Requests for Additional Information for the Review of Vermont Yankee Nuclear Power Station License Renewal Application", NVY 06-104, dated August 3, 2006.

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
License Renewal Application, Amendment 12

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. Attachments 1, 2, and 3 respond to References 2, 3 and 4, respectively.

Should you have any questions concerning this letter, please contact Mr. James DeVincentis at (802) 258-4236.

I declare under penalty of perjury that the foregoing is true and correct, executed on September 5, 2006.

Sincerely,

for TAS

Ted A. Sullivan
Site Vice President
Vermont Yankee Nuclear Power Station

Attachments 1, 2 and 3
cc: See next page

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BVY 06-083
Docket No. 50-271

Attachment 1

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 12

Aging Management Program, Aging Management Review and Time-limited Aging Analyses Audits

RAI Responses

RAI 3.5.1-53-W-1
RAI 3.3.1-22-K-01
RAI 3.3.1-68-K-03
RAI 4.3-H-01
RAI 4.3-H-02
RAI 4.3-H-03
RAI 3.1.1-17-P-01

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
RESPONSE TO REQUESTS FOR ADDITIONAL INFORMATION (RAIs)
ATTACHMENT 1

RAI 3.5.1-53-W-1

In Table 3.5.2-1 (Primary Containment, page 3.5-54) of the Vermont Yankee Nuclear Power Station (VYNPS) license renewal application (LRA), it states that the vent header support component, made of carbon steel material in an exposed fluid environment, has an aging effect of loss of material. The Generic Aging Lessons Learned (GALL) Report line item shown is III.B1.1-13 and the Table 1 reference is 3.5.1-53. The aging management program (AMP) shown for this line item is Inservice Inspection-IWF. GALL Report line item III.B1.1-13 is for an indoor uncontrolled air or outdoor air environment. Please explain why GALL Report line item III.B1.1-11 (treated water environment) and Table 1 Reference 3.5.1-49 are not associated with this aging management review (AMR) line item and the VYNPS Water Chemistry Control - BWR Program also shown with the Inservice Inspection-IWF AMP.

RAI 3.5.1-53-W-1 Response

Since portions of the carbon steel vent header supports are below the water level in the torus, GALL line item III.B1.1-11 is appropriate for this component.

Therefore, the Table 3.5.2-1 line item is changed to the following.

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Vent header support	SSR	Carbon steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI-IWF	III.B1.1-11 (TP-10)	3.5.1-49	A

RAI 3.3.1-22-K-01

Please confirm that no auxiliary components have elastomer linings or stainless steel cladding. If there are such components, please provide a list of these components. Also, provide additional justification for the determination that pitting and crevice corrosion do not require aging management.

RAI 3.3.1-22-K-01 Response

As stated in LRA Section 3.3.2.2.3.2, "There are no auxiliary system components at VYNPS with stainless steel cladding."

As stated in LRA Section 3.3.2.2.10.1, elastomer linings are conservatively not credited to prevent loss of material of underlying carbon steel material in auxiliary systems. Therefore, the aging management review did not identify which components included elastomer linings.

Pitting and crevice corrosion are mechanisms that cause loss of material. As stated in LRA section 3.3.2.2.7, loss of material due to general, pitting, and crevice corrosion in carbon steel piping and components in auxiliary systems exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection

Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

RAI 3.3.1-68-K-03

Beginning on Page 3.3-206 of the VYNPS LRA, loss of material from carbon steel components is managed using One-Time Inspection (OTI). Please justify the use of OTI for carbon steel exposed to raw water as opposed to a periodic inspection.

RAI 3.3.1-68-K-03 Response

The components assumed in question are in the potable water system, radwaste system, and equipment retired in place system with untreated water as an environment.

The "untreated water" environment for the carbon steel potable water system components in LRA Table 3.3.2-13-29 is not "raw water"; it is actually treated water. Water for this system comes from onsite wells and is monitored and treated to meet the regulations of the state of Vermont. It was labeled "untreated water" because conductivity and dissolved oxygen are not monitored. Carbon steel is not expected to experience significant aging effects in this treated water environment. As indicated in NUREG-1801, a one-time inspection may also be used to provide additional assurance that ...aging is so insignificant that an aging management program is not warranted. As indicated in the LRA, a One-Time Inspection of carbon steel potable water system components exposed to "untreated water" will be performed to confirm the absence of significant aging effects. If the One-Time Inspection Program identifies significant aging effects, the corrective action program will ensure that appropriate follow-up actions are implemented including periodic inspections, if necessary.

The "untreated water" environment for the carbon steel and copper alloy radwaste system components in LRA Table 3.3.2-13-32 is originally treated water that may now contain contaminants. Therefore, the aging management program has been changed[1] from One-Time Inspection to Periodic Surveillance and Preventive Maintenance for managing loss of material for carbon steel and copper alloy components in the radwaste system exposed to untreated water (LRA Table 3.3.2-13-32).

The "untreated water" environment for the equipment retired in place system carbon steel piping component in LRA Table 3.3.2-13-35 should be listed as Air – indoor (int) and will be changed as follows:

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	One-Time Inspection	V.D2-16 (E-29)	3.2.1-32	E

[1] Letter, Entergy to USNRC, "Vermont Yankee Nuclear Power Station, License No. DPR-28, License Renewal Application, Amendment 5," BVY 06-076, dated July 14, 2006.

VERMONT YANKEE NUCLEAR POWER STATION
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ATTACHMENT 1

RAI 4.3-H-01

Table 4.3-2 on Page 4.3-4 of the VYNPS LRA indicates that the design transient of reactor startup/shutdown cycles has bounded all other transients for the reactor coolant system (RCS).

Please describe all the transients bounded and demonstrate this bounding transient encompasses all other RCS transients (e.g. transient curves for pressure and temperature cycles). Please demonstrate that the cumulative usage factors (CUFs) are still within the limit of this revised bounding transient.

RAI 4.3-H-01 Response

The original fatigue analyses were based on 18 transients. Those transients are listed below.

	Design Transient
1	Closure Flange Bolting
2	Closure Flange Unbolting
3	System Pressure Tests at 1000 psi
4	Heatup
5	Cooldown
6	Daily Reduction to 75% power
7	Weekly Reduction to 50% power
8	Control Rod Worth Test
9	Loss of Feedwater heaters due to turbine trip
10	Loss of Feedwater heaters due to bypass
11	Scram including loss of feedwater pumps and closed isolation valves.
12	Scram with turbine trip, feedwater on, isolation valves open
13	Scram (delayed) with reactor overpressure, feedwater on, isolation valves open
14	Scram with single relief valve or safety valve blowdown
15	All other Scrams
16	Improper start of cold recirculation loop
17	Sudden start of pump in cold recirculation loop
18	Hydrostatic test at 1563 psig

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To improve the process of tracking design transients, VYNPS combined some transients, split some transients, and eliminated one transient (control rod worth tests). The resulting list of 13 transients is presented below.

	Design Transient
1	Heatup/Cooldown
2	Bolt/Unbolt
3	Cold Hydrostatic Tests at 1000 psi
4	Code Hydrostatic Test at 1563 psi
5	Reduction to 75% power
6	Reduction to 50% power
7	Startup/Shutdown
8	Loss of Feedwater heating
9	Recirculation Loop Cold Start
10	Relief or Safety valve blowdown
11	Scram
12	HPCI
13	SLC Injection

During development of the revised list of transients, VYNPS also raised several of the analyzed numbers of design cycles to values well above the projected numbers of cycles for all transients. CUFs for vessel subcomponents were calculated based on these 13 transients.

Transient monitoring was simplified by only requiring operations to count heatup, cooldown, bolt, unbolt, and system hydros at 1000 psi as they happened. Engineering reviews the remaining transients based on actual operating data at the end of the cycle, and compares actual plant transients to the design transients. VYNPS summarized this engineering review with a placeholder that represented the remaining transients; it was not a defined transient that bounded these transients. The allowable values for this placeholder are determined by engineering based on their review.

Reviewing plant data after the fact is justified by the large margin to any analyzed number of design cycles. The engineering evaluation of the data assures that the numbers of all design transients will remain below the analyzed numbers through the subsequent operating cycle.

The list of design cycles from the plant procedure is provided in LRA Table 4.3-2. Note that the highest projected transients will use less than 60% of the analyzed number of design cycles through the first 60 years of operation (57% for heatup is the highest).

Based on the reviews of transients to date, VYNPS has shown that all plant transients are less than the analyzed numbers of design transients; therefore, the CUFs calculated based on those transients remain below their calculated values.

The VYNPS Fatigue Monitoring Program assures that the analyzed numbers of transient cycles are not exceeded. The program requires corrective action if transient cycle limits are approached. Consequently, the TLAA (fatigue analyses) based on those transients will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Additional fatigue analyses will be completed to include the effects of the reactor coolant environment on fatigue for the NUREG-6260 locations, per License Renewal Commitment #27. These analyses may require modification of the allowable design cycle numbers to keep CUFs below 1.0. Prior to the period of extended operation, VYNPS has committed (License Renewal Commitments #5 and #7) to establish the allowable number of analyzed transients for each monitored transient, and to update the plant procedure accordingly. The revised plant procedure will include individual transients with allowable numbers of cycles from the updated analyses done per License Renewal Commitment #27.

RAI 4.3-H-02

Does the revised feedwater nozzle analysis (Table 4.3-3) include the unanticipated leakage bypass transient which was described in NUREG-0619? If this actual transient was not considered in the CUF evaluation, please provide justification for excluding it.

RAI 4.3-H-02 Response

As discussed in NUREG-0619, leakage past the feedwater nozzle thermal sleeve stresses the nozzle in two ways. The first is the cold feedwater leakage past the thermal sleeve as it contacts the nozzle throat behind the thermal sleeve. The second is the rapid movement of the hot/cold interface on the nozzle inner blend radius caused by the mixing of the leakage flow with the hot water in the annulus region. This second effect is commonly referred to as "rapid mixing" or "rapid thermal cycling" which results in high cycle fatigue.

(1) The calculated CUFs for the feedwater nozzle (shown in LRA Tables 4.3-1 and 4.3-3) include the effect of the feedwater leakage past the thermal sleeve contacting the nozzle bore. These CUFs do not include the rapid thermal cycling in the nozzle inner blend radius. The CUFs in these tables represent the highest CUFs for the feedwater nozzle safe end and nozzle throat areas.

(2) Rapid thermal cycling affects the CUF of the feedwater nozzle inner blend radius; however, this effect is not included in the calculation of the CUF for the nozzle inner blend radius.

    VYNPS has conservatively assumed that fatigue cracks may be present in the clad. Subsequent system cycling could cause these surface cracks to grow into the nozzle base metal. VYNPS manages this cracking by performing periodic inspections that were implemented in response to Generic Letter 80-095 and NUREG-0619. The inspection frequency is based on a calculated fatigue crack growth rate of a postulated flaw in the nozzle inner blend radius. The NRC has previously reviewed and approved this approach to handling FW nozzle inner blend radius cracking. (Letter D.H. Dorman (USNRC) to D.A Reid (VYNPC), Subject: Evaluation of Request for Relief from NUREG-0619 for VYNPS dated 2/6/95, (TAC No. M88803))

    The VYNPS flaw growth calculation uses methods in compliance with GE BWR Owners Group Topical Report "Alternate BWR Feedwater Nozzle Inspection

Requirements", GE-NE-523-A71-0594, Revision 1, August 1999, and the NRC Final Safety Evaluation (TAC No. MA6787) dated March 10, 2000. The feedwater nozzle inspection interval is based on 20% of the time required for a postulated 0.25 inch flaw in the base metal to grow to 10% of the nozzle wall thickness, or a maximum of 6 years (4 operating cycles).

Rapid thermal mixing has some effect on the base metal of the feedwater nozzle; however, the associated temperature changes are so rapid that they do not propagate deeply into the base metal. In fact NUREG-0619, Section 2.2, states "From analysis and from experience in repairing feedwater nozzles, it is known that high cycle thermal fatigue cracks propagate to a depth of about 1/4 inch before the cyclic thermal stress amplitude attenuates to a an insignificant level." Unlike many BWRs, VYNPS has not removed the 3/16 inch stainless steel cladding from the inner blend radius. The effect of the rapid thermal cycling is largely in the cladding, affecting approximately 1/16 inch of the base metal (not an exact value because of the different heat transfer properties of the clad and the base metal). While NUREG-0619 documents that the cladding is more likely to crack than the unclad base metal, the cladding does keep the thermal stresses from penetrating as deeply into the base metal.

RAI 4.3-H-03

In the basis document of the Fatigue Monitoring Program, 100°F/hour heatup/cooldown rate was identified for the normal transient conditions. The actual operating condition for heatup and cooldown rate is 100°F when averaged over any one hour period. Therefore, the actual operating condition may indicate much higher rate than 100°F/hour. For example, a 60°F temperature change for the 0.1 hour period represents a 600°F/hour rate. Physically, thermal stress is a function of rate of temperature difference, the higher the rate, the higher the stress. Please provide a description to ensure that VYNPS's automatic cycle counting program will adequately define the transients and cycle numbers. Please provide a description to ensure the fatigue cumulative usage factor and thermal stresses are evaluated in accordance with the actual transients or encompassed by the actual transients.

RAI 4.3-H-03 Response

(1) VYNPS's automatic cycle counting program will adequately define the transients and cycle numbers.

The VYNPS automatic cycle counting system (VYNPS License Renewal Commitment 6) will monitor the cycles as defined by the revised fatigue analyses (VYNPS License Renewal Commitment 27), and count them accordingly. The fatigue monitoring system will be designed by the same people who perform the revised fatigue analyses, and the fatigue monitoring system will be designed to effectively monitor and count the transients needed to validate the assumptions of the revised fatigue analyses.

(2) The actual transients experienced at VYNPS are enveloped by the analyzed transients in the fatigue analysis.

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LICENSE RENEWAL APPLICATION
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Although the heatup/cooldown transients are assumed to occur at 100 °F/hr, the analysis also assumes a rapid blowdown transient that cools down at greater than 1000 °F/hr for the first ten minutes (175 °F in 10 minutes), then continues at 100 °F/hr. Stresses are typically more severe for cooldowns than for heatups, and the analyses conservatively used the rapid blowdown transient to bound cooldowns. Consequently, the stresses assumed for cooldowns include a temperature change of 1000 °F/hr for ten minutes.

VYNPS reviewed plant vessel thermal cycle experience. Eight cooldown events occurring from 1972 through 1976 where the recorded rate of temperature change exceeds 100 °F/hour. However, these events applied to a limited time and a limited temperature range within the cooldown event. Only one of these events resulted in exceeding a 100 °F change in a one hour period. None of these events approached 1000 °F/hr and none of them involved temperature changes in excess of the analyzed 175 °F in one hour.

The conclusion from this review of the fatigue analysis and the plant operating history is that VYNPS operating history remains within the assumptions of the fatigue analyses.

RAI 3.1.1-17-P-01

According to USNRC Regulatory Guide 1.190, "Calculation and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence", analytic uncertainty (Section 1.4.1) is to be considered in the calculation of fluence. As noted by the staff, in GE-NE-000-0007-2342-R1- NP (dated July 2003), "Entergy Northeast Vermont Yankee Neutron Flux Evaluation", flux variations of up to but less than 19% was considered. In response to staff AMR audit question #202, the applicant provided extrapolated data to determine if the top of the recirculation inlet nozzles (located at a "104R940" height of 202 inches) might experience an extended power uprate fluence of >1XE17.

Was a maximum flux variation of ~19%, considered in this "extrapolated data"? If not, what calculated fluence level would be experienced by the top of the recirculation inlet nozzles when the applicant considers a maximum flux variation of just less than 19%?

RAI 3.1.1-17-P-01 Response

19% uncertainty was not added to the fluence value in determining whether the nozzle (nozzle to vessel weld) would exceed 1×10^{17} n/cm^2 (e>1mev). The fluence was extrapolated to determine the height at which fluence would equal 1×10^{17} n/cm^2 rather than to specifically estimate the fluence at the nozzle.

The projected fluence in this region changes rapidly with elevation. The projected ¼ T fluence at the bottom of the active fuel is 0.985×10^{17} n/cm^2, and 5.5 inches lower, at the nozzle to vessel weld, the estimated fluence is 0.66×10^{17} n/cm^2.

If the fluence is increased by 19% to cover possible error in the analysis, the fluence at the nozzle to vessel weld will be 0.792×10^{17} n/cm^2. Therefore, the recirculation injection nozzles, and their welds, remain below the 1×10^{17} n/cm^2 threshold for the period of extended operation.

BVY 06-064
Docket No. 50-271

Attachment 2

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 12

Section 2.4 - Scoping and Screening Structures

RAI Responses

RAI 2.4.3-1
RAI 2.4.4-1
RAI 2.4.5-1
RAI 2.4.6-1

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAIs)
ATTACHMENT 2

RAI 2.4.3-1

Table 2.4.3 does not include the sluice gate, roller gates, trash racks, stop log guides, traveling screens, and fine screen guides within the intake structure, and the concrete pipe that connects the intake structure to the discharge structure. The staff requests that the applicant provide justification for not including them in the scope of license renewal.

RAI 2.4.3-1 Response

Sluice gates and roller gates

The roller gates isolate the circulating water bays from the river and have no license renewal intended function. The sluice gate is used for deicing. De-icing supports normal plant operation and is not credited for emergency operation, since warm circulating water flow would not be available with a loss of offsite power. The gates have no license renewal intended function and are not included in LRA Table 2.4-3.

Trash racks and traveling screens

The trash racks and traveling screens remove debris from the circulating and service water system flow path to prevent plugging of the condenser water box inlets and loss of service water flow. The circulating water bays and the service water bays have separate flow paths sharing a common wall. The trash racks prevent the high circulating water velocity from drawing large debris into the circulating water bays during normal plant operation. However, during emergency operations, the circulating water pumps are unnecessary and, in fact, may be unavailable due to a loss of offsite power. For normal and emergency operations the service water pumps draw a much lower volume of water through the service water bays. The lower flow rates of the service water system are insufficient to transport large debris that could prevent the traveling screens from passing adequate flow to the service water pumps to allow for safe shutdown. Therefore, trash racks do not provide a license renewal intended function as defined in 10CFR 54.4(a)(1), (2) or (3).

The structural supports for the traveling screens are part of the screen-house structure, which is in scope for license renewal and subject to aging management review. The traveling screens themselves perform their function with moving parts and a change in configuration and are therefore, not subject to aging management review in accordance with 10 CFR 54.21(a)(1)(i), and are not included in LRA Table 2.4-3.

Stop log guides and fine screen guides

The stop log guides and fine screen guides do not perform a license renewal intended function. The purpose of the stop log guides is to hold temporary stop logs in place to allow inspections or maintenance. The fine screen guides do not perform a license renewal intended function because a fine screen is not utilized at VYNPS. Therefore, the stop log and fine screen guides do not provide a license renewal intended function as defined in 10CFR 54.4(a)(1), (2) or (3).

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAIs)
ATTACHMENT 2

Concrete pipe

The concrete pipe connecting the intake structure to the discharge structure provides recirculation of warm condenser circulating water to keep the circulating water intake bays and service water bays free of ice. De-icing supports normal plant operation and is not credited for emergency operation, since warm circulating water flow would not be available with a loss of offsite power. Therefore, the concrete pipe does not provide a license renewal intended function as defined in 10CFR 54.4(a)(1), (2) or (3).

RAI 2.4.4-1

Table 2.4.4 lists "Structural steel" as a component, and "Structural steel: beams, columns, plates" as another component. The staff requests that the applicant provide clarification for the two different components.

RAI 2.4.4-1 Response

Table 2.4.4 lists these two different components.

"Structural steel: beams, columns, plates" is defined as:

- substructure or superstructure steel that is part of the primary structural support function of a building or structure, such as structural columns, support girders, beams, plates, connections, roofing joists, purlins, and wind bracing.

"Structural steel" is defined as:

- steel which does not perform a primary structural integrity function for a building but does provide secondary structural support for equipment or components within the building, or it may provide protection around openings in floors or walls and metal decking on the bottom of reinforced concrete floor slabs. Structural steel includes items such as grating, grating supports, embedded channels, angles, frames, and embedded inserts such as Unistrut™.

RAI 2.4.5-1

Table 2.4.5 lists "Vernon Dam external walls above/below grade" as a component, and "Vernon Dam external walls, floor slabs and interior walls" as another component. The staff requests that the applicant provide clarification for the two different components.

RAI 2.4.5-1 Response

In Table 2.4.5, item "Vernon Dam external walls above/below grade" refers to outside surface of the exterior walls and the second line item "Vernon Dam external walls, floor slabs and interior walls" refers to interior surface of the exterior walls along with floors and interior walls. This distinction is consistent with treatment of each of these as having separate environments as shown in Table 3.5.2-5.

VERMONT YANKEE NUCLEAR POWER STATION
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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAIs)
ATTACHMENT 2

RAI 2.4.6-1

Table 2.4.6 lists "Flood curbs" as a component with intended functions for flood barrier and shelter or protection, and another component "Flood curbs" with an intended function for flood barrier. The staff requests that the applicant provide clarification for the two different components.

RAI 2.4.6-1 Response

For VYNPS, flood curbs constructed of either concrete or steel perform the same intended function, which is to provide shelter or protection by serving as flood barriers. In essence, flood barrier and shelter or protection, are the same function and both entries for flood curbs fulfill the same function.

BVY 06-064
Docket No. 50-271

Attachment 3

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 12

Section 2.5 - Scoping and Screening
Electrical and Instrumentation and Control Systems

RAI Responses

RAI 2.5-1
RAI 2.5-2
RAI 2.5-3
RAI 2.5-4

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
RESPONSE TO REQUESTS FOR ADDITIONAL INFORMATION (RAIs)
ATTACHMENT 3

RAI 2.5-1

The Electrical and Instrumentation and Control Systems within the scope of license renewal are listed in Table 2.2-1b of the license renewal application (LRA). Please provide brief descriptions of the systems explaining how each system serves one or more functions listed in 10 *Code of Federal Regulations* (CFR) 54.4(a).

RAI 2.5-1 Response

As described in LRA Section 2.5, all plant Electrical and Instrumentation and Control (EIC) systems are included in the scope of license renewal. EIC equipment in mechanical systems is included in the scope of license renewal, regardless of whether the mechanical system is included in scope.

In addition to the plant electrical systems, certain EIC equipment associated with the Vernon Hydroelectric Station (VHS) and certain switchyard components were included. VHS EIC equipment is that necessary to deliver AC power to the Vernon tie for the credited alternate AC source required for compliance with 10 CFR 50.63. The included switchyard components are those required for two alternate paths for recovery of offsite power following a station blackout (SBO).

Including components beyond those actually required is referred to as an encompassing review. This method eliminates the need for unique identification of each system and its specific function. This assures components are not improperly excluded from the scope of license renewal.

RAI 2.5-2

In Section 2.5 (Page 2.5-2) of the LRA, it is stated that the Vermont Yankee Nuclear Power Station uses the Vernon Hydroelectric Station as an alternate alternating current (AAC) source to satisfy the requirements of 10 CFR 50.63 for response to a station blackout. Please provide a sketch similar to Figure 2.5-1 in the LRA illustrating the AAC source and explain which parts of the AAC source are subject to an aging managing review (AMR) based on 10 CFR 54.4(a)(3). Also, describe the offsite power recovery paths from switchyard to the onsite distribution system which are in the license renewal scope.

RAI 2.5-2 Response

The parts of the AAC source that are subject to an aging managing review (AMR) were explained in the response to RAI 3.6.2.2-N-08.

The offsite power recovery paths from switchyard to the onsite distribution system which are in the license renewal scope are the source fed through the start-up transformers and a delayed access circuit from the 345kV switchyard through the main and auxiliary transformers via the isophase bus. *Specifically, the start-up transformer path includes; the 115 kV switchyard circuit* breaker feeding the start-up transformers, the start-up transformers, the circuit breaker-to-transformers and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures. The delayed access circuit is made available by opening the generator no-load disconnect switch and establishing a feed from the 345kV switchyard through the main and auxiliary transformers via the isophase bus.

RAI 2.5-3

In Section 2.5 (Page 2.5-3) of the LRA, it is stated that commodity groups of metal enclosed bus connections, enclosure assemblies, and insulators were evaluated and do not support a license renewal function. Please provide brief descriptions of these commodity groups, and explain why an AMR is not necessary for these commodity groups providing reference to 10 CFR 54.21(a).

RAI 2.5-3 Response

The delayed access circuit from the 345KV switchyard through the main generator step-up transformer and unit aux transformer uses the isophase bus for connection and is in the scope of license renewal. The VYNPS Metal-Enclosed Bus Program will manage the effects of aging on the isophase bus and will be consistent with GALL XI.E4. The VYNPS Metal-Enclosed Bus Program includes visual inspection of the internal portions of the bus for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. Internal bus supports will be inspected for structural integrity and signs of cracks. Enclosure assemblies will be inspected for evidence of loss of material and elastomers will be inspected to manage cracking and change in material properties. The first inspection will be completed before the period of extended operation and every five years thereafter. This is license renewal Commitment 32 in letter BVY 06-058, July 6, 2006.

RAI 2.5-4

Generic Aging Lessens Learned (GALL) Report aging management program XI.E6, "Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements," recommends an aging managing program for cable connections (metallic portion). Please provide justification, in detail, why there are no aging effects requiring management for cable connections.

RAI 2.5-4 Response

Generic Aging Lessens Learned (GALL) aging management program XI.E6 identifies mechanisms that can cause the effects of aging on the metallic portion of cable connections. Those mechanisms are thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation.

Metallic parts of electrical cable connections that are exposed to thermal cycling and ohmic heating are those carrying significant current in power supply circuits. VYNPS power cables are in a continuous run from the supply to the load. The connections to the supply and to the load are parts of active components that are not subject to aging management review in accordance with 10 CFR 54.21. As discussed in the statement of considerations for the license renewal rule, maintenance rule activities are credited with managing the effects of aging on active components.

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The fast action of circuit protective devices at high currents mitigates stresses associated with electrical faults and transients. In addition, mechanical stress associated with electrical faults is not a credible aging mechanism because of the low frequency of occurrence for electrical faults. Therefore, electrical transients are not aging mechanisms.

Metallic parts of electrical cable connections exposed to vibration are those associated with active components that cause vibration. Active components are not subject to aging management review in accordance with 10 CFR 54.21. As discussed in the statement of considerations for the license renewal rule, maintenance rule activities are credited with managing the effects of aging on active components.

Corrosive chemicals are not stored in most areas of the plant. Routine releases of corrosive chemicals to areas inside plant buildings do not occur during plant operation and corrosive chemicals are not a normal environment for electrical connections. Contamination of electrical connections causes rapid degradation independent of the age of the connection components. Corrosion due to contamination is due to the contamination event rather than aging. Therefore, chemical contamination is not an aging mechanism for electrical connections.

Corrosion and oxidation occur in the presence of moisture or contamination such as industrial pollutants and salt deposits. Enclosures and splice materials protect metal connections from moisture and contamination. Therefore, oxidation and corrosion are not applicable aging mechanisms.

Electrical cable connections at VYNPS are inspected under the maintenance rule program as directed by plant procedures. The maintenance rule program, based on industry guidance provided in NUMARC 93-01 and Reg. Guide 1.160, complies with 10 CFR 50.65.

The maintenance rule program includes performance monitoring and trending. Monitoring and trending includes normal plant maintenance activities. Maintenance includes activities associated with identifying and correcting actual or potential degraded conditions (e.g., repair, surveillance, diagnostic examinations, and preventive measures).

Thermography is used to detect potential degraded conditions. Thermography can detect "hot spots" in cable connections that are indicative of a high resistance connection.

As a part of the maintenance rule program, periodic assessments are performed. A periodic assessment is performed to evaluate the effectiveness of maintenance activities. This assessment is performed at least every operating cycle, not to exceed 24 months.

Plant operating experience has shown that the maintenance rule program has been effective at detecting, evaluating and repairing electrical cable connection degradation.

The maintenance rule program includes scoping, performance monitoring, trending and periodic assessments. This program provides reasonable assurance that electrical cable connections will remain capable of performing their intended functions through the period of extended operation. No aging management program (AMP) for license renewal is required at VYNPS since the regulatory mandated maintenance rule program effectively maintains electrical cable connections.