Entergy

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January 4, 2007
Docket No. 50-271
BVY 07-003
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 Entergy, "Summary of a Telephone Call Held on September 19, 2006, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc. concerning Information Pertaining to the Vermont Yankee Nuclear Power Station License Renewal Application," NVY 06-145, dated October 12, 2006.

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
License Renewal Application, Amendment 23

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. This letter contains seven attachments to address questions listed in Reference 2 and to provide NRC Requests for Additional Information (RAI) response clarification.

This submittal also contains an attachment providing the VYNPS License Renewal Commitment List, Revision 5. Commitments 27 and 29 have been modified as requested by the NRC License Renewal Project Manager. Commitments 32 and 34 have been changed to add reference information. Commitment 42 was added per clarification provided in Attachment 7.

Should you have any questions concerning this letter, please contact Mr. Dave Mannai at (802) 451-3304. I declare under penalty of perjury that the foregoing is true and correct, executed on January 4, 2007.

Sincerely,

FOR TAS PER TELECON

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

cc: See next page
enc: List of Attachments, page 3 of 3.

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List of Attachments

Attachment 1: VYNPS License Renewal Commitment List, Revision 5

Attachment 2: VYNPS LRA Amendment List, Revision 2. – Audit Item 38 Changes

Attachment 3: RAI 3.6.2.2-N-08-1 Clarification – Vernon Hydro-Electric Station - Structural

Attachment 4: RAI 3.6.2.2-N-08-2 and 3.6.2.2-N-08-4 Response Clarification – Vernon Hydro-Electric Station - Switchyard Electrical Components

Attachment 5: Bolting Integrity Program Clarification

Attachment 6: Follow-up Information for RAI 4.3-H-01 and 4.3-H-03

Attachment 7: RAI 3.6.2.2-N-01 Response Clarification

Attachment 8: RAI 2.5-4 Response Clarification

Attachment 1

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

VYNPS License Renewal Commitment List, Revision 5

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL COMMITMENT LIST
REVISION 5

During the development and review of the Vermont Yankee Nuclear Power Station License Renewal Application, Entergy made commitments to provide aging management programs to manage the effects of aging on structures and components during the extended period of operation. The following table lists these license renewal commitments, along with the implementation schedule and the source of the commitment.

ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
1	Guidance for performing examinations of buried piping will be enhanced to specify that coating degradation and corrosion are attributes to be evaluated.	March 21, 2012	BVY 06-009	B.1.1/Audit Items 5 & 130
2	Fifteen (15) percent of the top guide locations will be inspected using enhanced visual inspection technique, EVT-1, within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first 6 years and at least two-thirds within the first 12 years of the period of extended operation. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.	As stated in the commitment	BVY 06-009	B.1.7/Audit Item 14
3	The Diesel Fuel Monitoring Program will be enhanced to ensure ultrasonic thickness measurement of the fuel oil storage tank bottom surface will be performed every 10 years during tank cleaning and inspection.	March 21, 2012	BVY 06-009	B.1.9
4	The Diesel Fuel Monitoring Program will be enhanced to specify UT measurements of the fuel oil storage tank bottom surface will have acceptance criterion ≥ 60% Tnom.	March 21, 2012	BVY 06-009	B.1.9
5	The Fatigue Monitoring Program will be modified to require periodic update of cumulative fatigue usage factors (CUFs), or to require update of CUFs if the number of accumulated cycles approaches the number assumed in the design calculation.	March 21, 2012	BVY 06-009	B.1.11
6	A computerized monitoring program (e.g., FatiguePro) will be used to directly determine cumulative fatigue usage factors (CUFs) for locations of interest.	March 21, 2012	BVY 06-009	B.1.11
7	The allowable number of effective transients will be established for monitored transients. This will allow quantitative projection of future margin.	March 21, 2012	BVY 06-009	B.1.11

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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
8	Procedures will be enhanced to specify that fire damper frames in fire barriers will be inspected for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.	March 21, 2012	BVY 06-009	B.1.12.1/Audit Items 35, 151, 152, 153 and 159
9	Procedures will be enhanced to state that the diesel engine sub-systems (including the fuel supply line) will be observed while the pump is running. Acceptance criteria will be enhanced to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage.	March 21, 2012	BVY 06-009	B.1.12.1/Audit Items 33, 150 & 155
10	Fire Water System Program procedures will be enhanced to specify that in accordance with NFPA 25 (2002 edition), Section 5.3.1.1.1, when sprinklers have been in place for 50 years a representative sample of sprinkler heads will be submitted to a recognized testing laboratory for field service testing. This sampling will be repeated every 10 years.	March 21, 2012	BVY 06-009	B.1.12.2
11	The Fire Water System Program will be enhanced to specify that wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.	March 21, 2012	BVY 06-009	B.1.12.2/Audit Items 37 & 41
12	Implement the Heat Exchanger Monitoring Program as described in LRA Section B.1.14.	March 21, 2012	BVY 06-009	B.1.14
13	Implement the Non-EQ Inaccessible Medium-Voltage Cable Program as described in LRA Section B.1.17.	March 21, 2012	BVY 06-009	B.1.17
14	Implement the Non-EQ Instrumentation Circuits Test Review Program as described in LRA Section B.1.18.	March 21, 2012	BVY 06-009	B.1.18
15	Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section B.1.19.	March 21, 2012	BVY 06-009	B.1.19

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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
16	Implement the One-Time Inspection Program as described in LRA Section B.1.21. Include destructive or non-destructive examination of one (1) socket welded connection using techniques proven by past industry experience to be effective for the identification of cracking in small bore socket welds. Should an inspection opportunity not occur (e.g., socket weld failure or socket weld replacement), a susceptible small-bore socket weld will be examined either destructively or non-destructively prior to entering the period of extended operation.	March 21, 2012	BVY 06-009	B.1.21 Audit Items 239, 240, 330, 331
17	Enhance the Periodic Surveillance and Preventive Maintenance Program to assure that the effects of aging will be managed as described in LRA Section B.1.22.	March 21, 2012	BVY 06-009	B.1.22 Audit Item 377
18	Enhance the Reactor Vessel Surveillance Program to proceduralize the data analysis, acceptance criteria, and corrective actions described in the program description in LRA Section B.1.24.	March 21, 2012	BVY 06-009	B.1.24
19	Implement the Selective Leaching Program as described in LRA Section B.1.25.	March 21, 2012	BVY 06-009	B.1.25
20	Enhance the Structures Monitoring Program to specify that process facility crane rails and girders, condensate storage tank (CST) enclosure, CO_2 tank enclosure, N_2 tank enclosure and restraining wall, CST pipe trench, diesel generator cable trench, fuel oil pump house, service water pipe trench, man-way seals and gaskets, and hatch seals and gaskets are included in the program.	March 21, 2012	BVY 06-009	B.1.27.2 Audit Item 377
21	Guidance for performing structural examinations of wood to identify loss of material, cracking, and change in material properties will be added to the Structures Monitoring Program.	March 21, 2012	BVY 06-009	B.1.27.2
22	Guidance for performing structural examinations of elastomers (seals and gaskets) to identify cracking and change in material properties (cracking when manually flexed) will be enhanced in the Structures Monitoring Program procedure.	March 21, 2012	BVY 06-009	B.1.27.2

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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
23	Guidance for performing structural examinations of PVC cooling tower fill to identify cracking and change in material properties will be added to the Structures Monitoring Program procedure.	March 21, 2012	BVY 06-009	B.1.27.2
24	System walkdown guidance documents will be enhanced to perform periodic system engineer inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject system will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(2).	March 21, 2012	BVY 06-009	B.1.28 Audit Items 187, 188 & 190
25	Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.1.29.	March 21, 2012	BVY 06-009	B.1.29
26	Procedures will be enhanced to flush the John Deere Diesel Generator cooling water system and replace the coolant and coolant conditioner every three years.	March 21, 2012	BVY 06-009	B.1.30.1 Audit Items 84 & 164

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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
27	At least 2 years prior to entering the period of extended operation, for the locations identified inNUREG/CR-6260 for BWRs of the VY vintage, VY will implement one or more of the following: (1) Refine the fatigue analyses to determine valid CUFs less than 1 when accounting for the effects of reactor water environment. This includes applying the appropriate Fen factors to valid CUFs determined in accordance with one of the following: 1. For locations, including NUREG/CR-6260 locations, with existing fatigue analysis valid for the period of extended operation, use the existing CUF to determine the environmentally adjusted CUF. 2. More limiting VY-specific locations with a valid CUF may be added in addition to the NUREG/CR-6260 locations. 3. Representative CUF values from other plants, adjusted to or enveloping the VY plant specific external loads may be used if demonstrated applicable to VY. 4. An analysis using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) may be performed to determine a valid CUF. (2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic nondestructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC). (3) Repair or replace the affected locations before exceeding a CUF of 1.0. Should VY select the option to manage the aging effects due to environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.	March 21, 2012 March 21, 2010 for performing a fatigue analysis that addresses the effects of reactor coolant environment on fatigue (in accordance with an NRC approved version of the ASME Code)	BVY-06-058	4.3.3 Audit Items 29, 107 & 318

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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
28	Revise program procedures to indicate that the Instrument Air Program will maintain instrument air quality in accordance with ISA S7.3	March 21, 2012	BVY 06-009	B.1.16 Audit Item 47
29	VYNPS will perform one of the following: 1. Install core plate wedges, or, 2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate hold down bolting in accordance with BWRVIP-25 and submit the inspection plan and analysis to the NRC two years prior to the period of extended operation for NRC review and approval.	March 21, 2012	BVY 06-009	B.1.7/ Audit Item 9
30	Revise System Walkdown Program to specify CO2 system inspections every 6 months.	March 21, 2012	BVY 06-009	B.1.28 Audit Items 30, 141, 146 & 298
31	Revise Fire Water System Program to specify annual fire hydrant gasket inspections and flow tests.	March 21, 2012	BVY 06-009	B.1.12.2 Audit Items 39 & 40
32	Implement the Metal Enclosed Bus Program. Details are provided in a LRA Amendment 16, Attachment 3 and LRA Amendment 23, 7.	March 21, 2012	BVY 06-058 BVY 07-003	Audit Item 97
33	Include within the Structures Monitoring Program provisions that will ensure an engineering evaluation is made on a periodic basis (at least once every five years) of groundwater samples to assess aggressiveness of groundwater to concrete. Samples will be monitored for sulfates, pH and chlorides.	March 21, 2012	BVY 06-009	B.1.27 Audit Item 77 RAI 3.5-7
34	Implement the Bolting Integrity Program. Details are provided in a LRA Amendment 16, Attachment 2 and LRA Amendment 23, Attachment 5.	March 21, 2012	BVY 06-058 BVY 07-003	Audit Items 198, 216, 218, 237, 331 & 333
35	Provide within the System Walkdown Training Program a process to document biennial refresher training of Engineers to demonstrate inclusion of the methodology for aging management of plant equipment as described in EPRI Aging Assessment Field Guide or comparable instructional guide.	March 21, 2012	BVY 06-058	Audit Item 384

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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
36	If technology to inspect the hidden jet pump thermal sleeve and core spray thermal sleeve welds has not been developed and approved by the NRC at least two years prior to the period of extended operation, VYNPS will initiate plant-specific action to resolve this issue. That plant specific action may be justification that the welds do not require inspection.	March 21, 2010	BVY06-058	Audit Item 12
37	Continue inspections in accordance with the Steam Dryer Monitoring Program, Revision 3 in the event that the BWRVIP-139 is not approved prior to the period of extended operation.	March 21, 2010	BVY 06-079	Audit Item 204
38	"The BWRVIP-116 report which was approved by the Staff will be implemented at VYNPS with the conditions documented in Sections 3 and 4 of the Staff's final SE dated March 1, 2006, for the BWRVIP-116 report."	March 21, 2012	BVY 06-088	Response to RAI B.1.24-1
39	"If the VYNPS standby capsule is removed form the reactor vessel without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation, if necessary."	March 21, 2012	BVY 06-088	Response to RAI B.1.24-2
40	If the Vernon Tie ever becomes unavailable, due to unavailability of the VHS or other reasons, the reactor must be shut down within 15 days unless the Vernon Tie is returned to service or a basis for maintaining continued operation is written and approved. If the Vernon Tie cannot be returned to service within 15 days, within the next 24 hours VYNPS must submit a report to the NRC in accordance with 10CFR50.4 outlining the reason for the unavailability, corrective actions in place to provide AC power for Appendix R alternate shutdown fire scenarios, and the time required to make the Vernon Tie available.	March 21, 2012	BVY 06-096 BVY 07-003	Response to RAI 3.6.2.2-N-08-2

VERMONT YANKEE NUCLEAR POWER STATION
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ITEM	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	Related LRA Section No./ Comments
41	VYNPS will monitor the availability of the VHS to ensure continued capability to perform its license renewal intended function, that is, conformance with the availability specified in NUMARC 87-00 for meeting the requirements of the SBO Rule. If availability falls below the acceptable level, VYNPS will respond to the condition through the corrective action program. The corrective action program requires evaluation and appropriate corrective action to correct the nonconforming condition.	March 21, 2012	BVY 06-096	Response to RAI 3.6.2.2-N-08-2
42	Implement the Bolted Cable Connections Program. Details are provided in LRA Amendment 23, Attachment 7.	March 21, 2012	BVY 07-003	Response to: RAI 3.6.2.2-N-01 LRA Sections: 3.6.2.1 A.2.1.39 B.1.33 Table 3.6.1 Table 3.6.2-1

Attachment 2

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

VYNPS LRA Amendment List, Revision 2

Audit Item 38 Changes

ATTACHMENT 2
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST, Revision 2

Audit item 11: LRA Section B.1.7 is revised as follows.

1. Delete the exception to the BWR vessel internals program related to the core shroud (page B-27).
2. Delete exception Note #1 on page B- 29.

Audit item 26: Add the following text to LRA Section B.1.10 to include the "EQ Component Reanalysis Attributes" specified in NUREG-1801 Vol. 2 Section X.E1.

EQ Component Re-analysis Attributes

The re-analysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of an EQ program. While a component life limiting condition may be due to thermal, radiation, or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The re-analysis of an aging evaluation is documented according to the station's quality assurance program requirements that require the verification of assumptions and conclusions. As already noted, important attributes of a re-analysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods

The analytical models used in the re-analysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). The result is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods

Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a re-analysis. Temperature data used in an aging evaluation is to be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways, including monitors used for Technical Specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors (while the motor is not running). A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an

aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as; (a) directly applying the plant temperature data in the evaluation, or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a re-analysis are to be justified on a plant-specific basis. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions

EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken that may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Actions

The re-analysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by re-analysis, the component is to be refurbished, replaced, or re-qualified prior to exceeding the period for which the current qualification remains valid. A re-analysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or re-qualify the component if the re-analysis is unsuccessful).

Audit items 30, 141, 146 and 298: LRA Section B.1.28 is revised to include an enhancement to perform CO2 system inspections every 6 months under the System Walkdown Program. The required inspections will be initiated prior to the period of extended operation. Commitment 30.

Audit item 38: The first paragraph of the detection of aging effects exception in LRA Section B.1.12.2 is hereby revised as follows (strike-outs deleted, underlined words added).

> NUREG-1801 specifies annual fire hydrant hose hydrostatic tests. ~~Under the VYNPS program, hydrostatic test of outside hoses occurs once per 24 months; and hydrostatic test of inside hoses occurs once per 3 years.~~ Fire hydrant hose hydrostatic tests are not part of the VYNPS program.[2]

Also, the following exception note is added.

2. Per NUREG-1800, Table 2.1-3, fire hoses are consumables not subject to aging management review. An aging management program is not required to address components that are not subject to aging management review.

Audit item 39: LRA Section B.1.12.2 is revised to delete the exception to the annual fire hydrant gasket inspections. Commitment 31.

Audit item 40: LRA Section B.1.12.2 is revised to delete the exception to the annual fire hydrant flow tests. Commitment 31.

ATTACHMENT 2
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST, Revision 2

Audit item 48: LRA Section B.1.17 is revised as follows. "VYNPS inspection for water accumulation in manholes is conducted in accordance with a plant procedure. An evaluation per the Corrective Action Process will be used to determine the need to revise manhole inspection frequency based on inspection results."

Audit item 51: LRA Section B.1.18 is revised as follows. "The first test of neutron monitoring system cables that are disconnected during instrument calibrations shall be completed before the period of extended operation and subsequent tests will occur at least once every 10 years. In accordance with the corrective action program, an engineering evaluation will be performed when test acceptance criteria are not met and corrective actions, including modified inspection frequency, will be implemented to ensure that the intended functions of the cables can be maintained consistent with the current licensing basis for the period of extended operation."

Audit item 53: To clarify the technical basis for sampling, the sampling discussion in LRA Section B.1.19 for the Non-EQ Insulated Cables and Connections Program is revised to read as follows. "Most cables and connections installed in adverse localized environments are accessible. This program is a sampling program. Selected cables and connections from accessible areas will be inspected and represent, with reasonable assurance, all cables and connections in the adverse localized environments. If an unacceptable condition or situation is identified for a cable or connection in the inspection sample, a determination will be made as to whether the same condition or situation is applicable to other accessible cables or connections. The sample size will be increased based on an evaluation per the Corrective Action Process."

Audit items 76, 80, 81, 243, 266, and 270: Aging effects on the drywell moisture barrier will be managed under the Containment Inservice Inspection Program instead of the Structures Monitoring Program. In support of this, the LRA is revised as follows.

1. In the LRA Table 3.5.2-1 line item for "Drywell floor liner seal" change the aging management program from "Structures Monitoring" to "CII-IWE". For clarification, change "drywell floor liner seal" to "drywell shell to floor seal (moisture barrier)." The clarification of this terminology also applies to Table 2.4-1 and Section B.1.27.2.
2. In LRA Table 3.5.1 line Item 3.5.1-16 the Discussion column is revised to read: "The aging effects cited in the NUREG-1801 item are loss of sealing and leakage. Loss of sealing is a consequence of the aging effects "cracking" and "change in material properties." For VYNPS, the Containment Leak Rate Program manages cracking and changes in material properties for the primary containment seal and gaskets. The Inservice Inspection -IWE Program manages cracking and changes in material properties for the drywell shell to floor seal (moisture barrier)."
3. In LRA Table 3.5.1, Line Item 3.5.1-5, the Discussion column last paragraph is revised to read "The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program."
4. LRA Section 3.5.2.2.1.4 is revised to delete from the end of the first paragraph, the phrase "and Structures Monitoring Program". The drywell to floor moisture barrier will be inspected under the Containment Inservice Inspection (IWE) Program only. The Structures Monitoring Program is not used.

Audit item 77: LRA Section B.1.27.2 for the Structures Monitoring Program is revised to include an enhancement to perform at least once every five years an engineering evaluation of groundwater samples to assess for groundwater being aggressive to concrete. Commitment 33.

Audit items 85, 86, 87, 166, 200, 227, 232, 233, 239, 240, 295, 297, 310, 312, 313, and 359: The effectiveness of the Water Chemistry Control – Auxiliary Systems, BWR, and Closed Cooling Water programs is confirmed by the One-Time Inspection program. To provide further clarification, LRA Appendix A is revised for these three water chemistry control programs to include the sentence "The One-Time Inspection Program will confirm the effectiveness of the program".

Audit item 93: In order to address transmission connections, in LRA Table 3.6.2-1, change line item Transmission conductors to Transmission conductors and connections. Revise Section 3.6.2.2.3 to include the following text after the second paragraph.

> The aging effects for transmission conductors evident in industry operating experience are loss of conductor strength and loss of material (wear).
>
> The prevalent mechanism contributing to loss of conductor strength of an aluminum conductor steel reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. Corrosion in ACSR conductors is a very slow acting mechanism, and the corrosion rates depend on air quality, which includes suspended particles chemistry, SO2 concentration in air, precipitation, fog chemistry and meteorological conditions. Air quality in rural areas generally contains low concentrations of suspended particles and SO2, which keeps the corrosion rate to a minimum. Tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80 year old ACSR conductor due to corrosion.
>
> VYNPS transmission conductors include ACSR and aluminum conductor alloy reinforced (ACAR) conductors. ACAR conductors are aluminum conductors reinforced with alloy steel. ACAR conductors are more resistant to loss of conductor strength since the core of the conductor is a more corrosion resistant alloy steel. AMR conclusions regarding ACSR conductors conservatively bound ACAR conductors.
>
> The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind and temperature. These requirements are reviewed concerning the specific conductors included in scope at VYNPS.
>
> The 4/0 ACSR conductors have the lowest initial design margin of any transmission conductors included in the AMR. The Ontario Hydro test and the NESC requirements illustrate with reasonable assurance that transmission conductors will have ample strength through the period of extended operation.
>
> Therefore, loss of conductor strength due to corrosion of the transmission conductors in not an aging effect requiring management for the period of extended operation.

Loss of material due to mechanical wear can be an aging effect for strain and suspension insulators that are subject to movement caused by transmission conductor vibration or sway from wind loading. Design and installation standards for transmission conductors consider sway caused by wind loading. Experience has shown that transmission conductors do not normally swing and that when they do swing because of substantial wind, they do not continue to swing for very long once the wind has subsided. Wear has not been identified during routine inspection; therefore, loss of material due to wear in not an aging effect requiring management.

Audit item 97: The VYNPS Metal-Enclosed Bus program ten element comparison to NUREG-1801 (excerpt from the Aging Management Program Evaluation Report LRPD-02) will be provided in later correspondence along with associated revisions to the LRA.

Audit item 118: LRA Section B.1.17 is revised to replace the last sentence in the Program Description with; "The specific type of test to be performed will be determined prior to the initial test and is to be a proven test for detecting deterioration of the insulation system due to wetting as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed."

Audit item 120: LRA Section B.1.17 Program Description is revised to state that medium-voltage cables include cables with operating voltage level from 2kV to 35kV.

Audit item 124: LRA Section B.1.19 Program Description is revised to include the following. "The program applies to accessible electrical cables and connections within the scope of license renewal that are installed in adverse localized environments caused by heat or radiation in the presence of oxygen."

Audit Item 159: LRA Section B.1.12.1 is revised to add fire dampers to the list of components in the Program Description that require a periodic visual inspection.

Audit item 165: Line Items 3.3.1-50 and 3.3.1-51 in LRA Table 3.3.1 are revised to replace the Water Chemistry Control – Auxiliary Systems program in the Discussion column with the Water Chemistry Control – BWR Program

Audit item 187: LRA section B.1.28 is revised to add the following enhancements. The System Walkdown Program implementing procedure will be enhanced to specify that systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 50.54 (a)(1) and (a)(3) shall be inspected. In addition, the implementing procedure will be enhanced to provide guidance to inspect nearby systems with the potential for spatial interaction. These enhancements will be implemented as shown in Commitment 24.

Audit item 198, 216, 218, 237, 331 and 333: The VYNPS Bolting Integrity Program ten element comparison to NUREG-1801 (excerpt from the Aging Management Program Evaluation Report LRPD-02) will be provided in later correspondence along with associated changes to the LRA. The Bolting Integrity Program will be implemented prior to the period of extended operation in accordance with Commitment 34.

Audit item 203: LRA Table 3.1.2-3 is revised to indicate that with the exception of the head seal leak detection line, the Inservice Inspection Program applies to all component types of Piping

and fittings < 4" NPS with an aging effect of cracking in addition to the Water Chemistry Control – BWR and One-Time Inspection Programs.

Audit Item 209 and 291: LRA Table 3.1.2-1 on page 3.1-52 is revised to remove all the line items for the component type of Thermal Sleeves Feedwater Inlets (N4). The thermal sleeves are not subject to aging management review since they perform no intended function for license renewal. The sleeves are installed with an interference fit rather than welded so they have no impact on the reactor coolant pressure boundary.

Audit items 224, 225, 226, 229, 293, 294, 315, and 369: LRA Section B.1.21 and the associated table are revised to state that the One-Time Inspection program will verify effectiveness of the Oil Analysis and Diesel Fuel Monitoring programs by confirming the absence of loss of material, cracking and fouling, where applicable.

Audit item 235: In LRA Table 3.3.2-10 for the NUREG-1801 Vol. 2 Item for component types "humidifier housing" and "piping", change item VIII.F1-8 to item VII.F1-8. The incorrect number was entered due to a typographical error.

Audit item 242: LRA Table 3.5.2-1 is revised to delete line items for "Bellows (reactor vessel and drywell)". Also the corresponding line item in Table 2.4-1 is deleted.

Audit item 244: LRA Table 3.5.2-6 is revised to indicate that Note "A" applies to component seals and gaskets (doors, man-ways and hatches) with the aging management program of Structures Monitoring Program.

Audit item 248: LRA Table 3.5.2-6 is revised to change Note "A" to Note "C" for electrical and instrument panels and enclosures with a material of galvanized steel in a protected from weather environment. Aging effect and associated aging management program are unchanged.

Audit item 249: LRA Table 3.5.2-6 is revised to change Note "A" to Note "C" for flood curb with a material of galvanized steel in a protected from weather environment. Aging effect and associated aging management program are unchanged.

Audit item 250: LRA Table 3.5.2-1 is revised to change Note "E" to Note "A" for torus shell with an aging effect of cracking-fatigue. Aging effect and associated aging management program are unchanged.

Audit items 255, 257, 258, 259, 263, and 278: The LRA is revised to indicate loss of material as an aging effect requiring management with the Structures Monitoring Program as the aging management program and the NUREG-1801 Vol. 2 Item as III.B4-7 with a Note C in the following cases.

1. Table 3.5.2-5 for transmission towers with a material of galvanized steel in an exposed to weather environment
2. Table 3.5.2-6 for conduit with a material of galvanized steel in an exposed to weather environment
3. Table 3.5.2-6 for conduit support with a material of galvanized steel in an exposed to weather environment

4. Table 3.5.2-6 for electrical and instrument panels and enclosures with a material of galvanized steel in an exposed to weather environment
5. Table 3.5.2-6 for structural bolting with a material of galvanized steel in an exposed to weather environment

LRA Table 3.5.1, item 3.5.1-50 is revised to include the following in the Discussion column: "Consistent with NUREG-1801 for galvanized steel components in outdoor air. The Structures Monitoring Program will manage loss of material."

Audit item 267:

LRA Table 3.5.2-1 is revised to add the following line.

Torus mechanical penetrations	PB, SSR	Carbon steel	Protected from weather	Cracking (fatigue)	TLAA-metal fatigue	II.B4-4 (C-13)	3.5.1-9	A

LRA Table 3.5.2-1 is revised to delete the following line.

Drywell to torus vent system	PB, SSR	Carbon steel	Protected from weather	Cracking (fatigue)	TLAA-metal fatigue	II.B1.1-4 (C-21)	3.5.1-8	A

The Discussion column for LRA Table 3.5.1 item 3.5.1-8 is revised to read as follows. "Fatigue analysis is a TLAA for the torus shell. Fatigue of the torus to drywell vent system is event driven and the analysis is not a TLAA. See Section 3.5.2.2.1.6.

The Discussion column of LRA Table 3.5.1 item 3.5.1-9 is revised to read as follows. "Fatigue analysis is a TLAA for the torus penetrations. See Section 3.5.2.2.1.6.

The Discussion column of LRA Section 3.5.2.2.1.6 is revised to read as follows. "TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs for the torus and associated penetrations are evaluated and documented in Section 4.6.

LRA Section 3.5.2.3, Time-Limited Aging Analyses, is revised to read as follows. "TLAA identified for structural components and commodities include fatigue analyses for the torus and torus penetrations. These topics are discussed in Section 4.6."

Audit items 268 and 269: The LRA is revised as follows.

1. For clarification, the Discussion column of Table 3.5.1, line items 3.5.1-12 and 3.5.1-13 is revised to add the following statement at the end of the existing information. "See Section 3.5.2.2.1.8".
2. LRA Section 3.5.2.2.1.8 is revised to read as follows. "Cyclic loading can lead to cracking of steel and stainless steel penetration bellows, and dissimilar metal welds of BWR containments and BWR suppression pool shell and downcomers. Cracking due to cyclic loading is not expected to occur in the drywell, torus and associated penetration bellows, penetration sleeves, un-braced downcomers, and dissimilar

metal welds. A review of plant operating experience did not identify cracking of the components, and primary containment leakage has not been identified as a concern. Nonetheless the existing Containment Leak Rate Program with augmented ultrasonic exams and Containment Inservice Inspection – IWE, will continue to be used to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment Inservice Inspection – IWE and Containment Leak Rate programs are described in Appendix B."

Audit item 279: For clarification, LRA Table 3.5.1, Item 3.5.1-52 discussion is revised to read as follows. "Loss of mechanical function due to the listed mechanisms is not considered an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to cyclic thermal loads are rare for structural supports due to their relatively low temperatures."

Audit item 280: For clarification, LRA Table 3.5.1, Item 3.5.1-54 discussion is revised as follows. "Loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory, and cyclic thermal loads is not considered an aging effect requiring management. Such failures typically result from inadequate design or events rather than the effects of aging. Loss of material due to corrosion, which could cause loss of mechanical function, is addressed under Item 3.5.1-53 for Groups B1.1, B1.2, and B1.3 support members."

Audit item 282: For clarification, LRA Table 3.5.1, Line Item 3.5.1-34 discussion is revised to add "See Section 3.5.2.2.2.4(1)".

Audit item 283: LRA Table 3.5.1, Item 3.5.1-35 discussion is revised to replace ACI 301 with ACI 318 and add "See Section 3.5.2.2.2.4(2)" at the end of the existing discussion.

Audit item 284: LRA Table 3.5.1, Line item Number 3.5.1-36 discussion column is revised as follows. "Reaction with aggregates is not an applicable aging mechanism for VYNPS concrete components. See Section 3.5.2.2.2.1(5) (although for Groups 1-5, 7, 9 this discussion is also applicable for Group 6). See Section 3.5.2.2.2.4(3) additional discussion. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components."

To correct an administrative error, the heading of LRA Section 3.5.2.2.2.4 (3) is revised to begin with "Cracking Due to Expansion, Reaction with Aggregates...". The term stress corrosion cracking is deleted from the heading as it does not apply to this section.

Audit item 285: The Discussion column of LRA Table 3.5.1, Item Number 3.5.1-37, is revised to state the following. "Not applicable. Nonetheless the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components. See Section 3.5.2.2.2.4(3)".

Audit item 286: For clarification, LRA Table 3.5.1, Item Number 3.5.1-40 discussion column is revised to add "See Section 3.5.2.2.2.6(1)".

Audit Item 300 and 304: LRA Table 3.3.2.13-32 is revised to replace the aging management program of One-Time Inspection with Periodic Surveillance and Preventive Maintenance for all line items containing carbon steel and copper alloy with an environment of untreated water.

ATTACHMENT 2
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST, Revision 2

Audit item 309 and 321: LRA Section 3.1, 3.2, 3.3 and 3.4 tables will be revised to remove "TLAA-metal fatigue" from all line items for which Section 4 does not discuss evaluation of a TLAA. Line by line changes to the tables are provided in Attachment 3 to BVY 06-079.

Audit item 318: LRA Table 4.3-1 is revised to remove the NUREG/CR-6260 values for core spray safe end, feedwater piping, RHR return piping, and RR piping tee and replace them with N/A. Commitment 27 requires an analysis that addresses the effects of reactor coolant environment on fatigue performed to an NRC-approved version (year) of the ASME code.

Audit item 319: The last paragraph of LRA Section 4.3.1.1 is replaced with the following. "The VYNPS Fatigue Monitoring Program will assure that the allowed number of transient cycles is 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). However, when the effects of reactor coolant environment on fatigue are considered in the existing fatigue analyses, several locations have a projected cumulative usage factor in excess of 1.0. See Section 4.3.3 for further discussion of the effects of reactor water environment on fatigue."

Audit item 320: LRA Reference 4.3.1 on page 4.3-9 is revised as follows; "4.3-1 Sojka, R. E. (VYNPS), to USNRC Document Control Desk, "Response to Request for Additional Information Regarding Vermont Yankee Core Shroud Modification," BVY 96-96, letter dated August 7, 1996."

Audit item 322: LRA Section 4.3.1.3 is replaced with the following.

> "VYNPS replaced reactor recirculation (RR) system piping in 1986. Also replaced were connecting portions of the residual heat removal (RHR) system piping. The new piping was designed and analyzed to ANSI B31.1 but was inspected and tested to ASME Section III requirements. Stress analyses for the reactor recirculation system were performed to B31.1 requirements. B31.1 does not require a detailed fatigue analysis that calculates a CUF, but allows up to 7000 cycles with a stress reduction factor of 1.0 in the stress analyses. The 7000 thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, the pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
>
> There are no TLAA for Class 1 non-piping components other than the reactor vessel as none of them are designed to codes that require fatigue analyses.
>
> UFSAR Section 4.6.3 states that the main steam isolation valves are designed for 40 years based on 100 cycles of operation the first year and 50 cycles of operation per year thereafter. This statement may be interpreted to imply a TLAA. This TLAA will remain valid through the period of extended operation per 10 CFR 54.21(c)(1)(i). The MSIVs will not exceed 2050 cycles in 60 years (34 cycles per year)."

In addition LRA section 4.3.2 is replaced with the following.

> "The design of safety class 2 and 3 piping systems incorporates the Code stress reduction factor for determining acceptability of piping design with respect to thermal stresses. The design of ASME B31.1 Code piping also incorporates stress reduction factors based upon an assumed number of thermal cycles. In general, 7000 thermal

cycles are assumed, leading to a stress reduction factor of 1.0 in the stress analyses. VYNPS evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the 7000 thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, the pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

There are no TLAA for any non-Class 1, non-piping components as they are not built to codes that require fatigue analyses.

Some applicants for license renewal have estimated that piping in the primary sampling system will have more than 7000 thermal cycles before the end of the period of extended operation. The sampling system is used to take reactor coolant samples every 96 hours during normal operation. However, the normal samples are taken from the RWCU filter influent, where the water has already been cooled. Thus normal sampling does not cause a thermal cycle. Alternate samples may be taken directly from the B discharge header of the reactor recirculation system via containment penetration X-41; however, this is an infrequently performed procedure and this piping, designed to ASME B31.1, will not exceed 7000 cycles prior to 60 years of operation."

Audit item 335: LRA Table 3.5.2-6 lists the aging effects for component Penetration sealant, material elastomer in a protected from weather environment as "cracking" and "change in material properties." For clarification, the LRA is revised to separate this component line item into two line items as follows:

1. Delete line item:

Penetration sealant (fire, flood, radiation)	EN, FB, FLB, PB, SNS	Elastomer	Protected from weather	Cracking, Change in material properties	Fire protection, Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

2. Add line item:

Penetration sealant (fire)	EN, FB, PB, SNS	Elastomer	Protected from weather	Cracking, Change in material properties	Fire protection	VII.G-1 (A-19)	3.3.1-61	B

3. Add line item:

Penetration sealant (flood, radiation)	EN, FLB, PB, SNS	Elastomer	Protected from weather	Cracking, Change in material properties	Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

ATTACHMENT 2
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST, Revision 2

Audit item 336: LRA Table 3.5.2-6 lists the aging effects for the Seismic isolation joint, with a material of elastomer in a protected from weather environment as "cracking" and "change in material properties." For clarification, the LRA is revised to make the following changes.

1. Note C is changed to Note E for this line item.
2. The discussion in Table 3.3.1 line Item 3.3.1-61, Page 3.3-49 is revised to read as follows. "This line item was not used in the auxiliary systems tables. Fire barrier seals are evaluated as structural components in Section 3.5. Cracking and change in material properties of elastomer seals, including seismic isolation joints located in fire barriers, are managed by the Fire Protection Program."
3. An additional line item is added to read as follows.

Seismic isolation joint	SSR	Elastomer	Protected from weather	Cracking, Change in material properties	Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

Audit item 337: LRA Table 3.5.2-6 lists the aging effect for Fire doors, with a material of carbon steel in a protected from weather environment as "loss of material." For clarification, the LRA is revised to change 'Note C' to 'Note B' for this line item.

Audit Item 342: LRA Section 3.3.2.2.13 Loss of Material due to Wear is revised to state the following:

"Wear is the loss of surface layers due to relative motion between two surfaces. At VYNPS, in the auxiliary systems, this specific aging effect is not applicable because the heating, ventilation, and air conditioning elastomer coated fiberglass duct flexible connections are fixed at both ends, precluding wear. This item is not applicable to VYNPS auxiliary systems."

Audit item 345: LRA Table 3.3.2-13 lists the aging effect for component type of bolting, with a material of stainless steel in an air - outdoor (ext) environment as "none." The LRA is revised to identify loss of material as an aging effect for this line item as shown below.

Bolting	Pressure boundary	Stainless steel	Air - outdoor	Loss of material	System walkdown			G

Audit item 350: LRA Section A.2.1.31 Structures Monitoring-Vernon Dam FERC Program is replaced with the following. "The Vernon dam is subject to the Federal Energy Regulatory Commission (FERC) inspection program. This program consists of visual inspections in accordance with FERC guidelines and complies with Title 18 of the Code of Federal Regulations, Conservation of Power and Water Resources, Part 12 (Safety of Water Power Projects and Project Works) and Division of Dam Safety and Inspections Operating Manual. The operation inspection frequency for licensed and exempt low hazard potential dams is biennially. As indicated in NUREG-1801 for water control structures, NRC has found that FERC

/ US Army Corp of Engineers dam inspections and maintenance programs are acceptable for aging management. "

Audit item 354: The LRA is revised to delete Sections 4.7.2.5, 4.7.2.6, A.2.2.7 and A.2.2.8. Also the component type of vessel ID attachment welds and instrument penetrations in LRA Table 4.1-1 is deleted. The items discussed in these sections do not meet the definition of time-limited aging analyses.

In LRA table 3.1.2-1 (page 3.1-54) for the component type of internals attachments the line with the aging effect of cracking-fatigue and TLAA-metal fatigue as the aging management program is deleted. Cracking managed by the BWR Vessel ID Attachment Welds Program remains in the table.

In LRA table 3.1.2-1 (page 3.1-44) for the component type of nozzles, instrumentation, N11 and N12, the line item with the aging effect of cracking-fatigue and TLAA-metal fatigue as the aging management program is deleted. Cracking managed by the BWR Penetrations Program remains in the table.

Audit item 371: LRA Section B.1.11 is revised as follows. "The VYNPS Fatigue Monitoring Program includes counting of the cycles incurred by the plant. Five transients are monitored by plant operations and recorded as they occur. It is projected that less 60% of the design cycles for these five transients will be used through the first 60 years of operation, including the period of extended operation. The remaining transients are monitored by plant engineering based on review of operating data at the end of each fuel cycle. These remaining transients are summarized in the Fatigue Monitoring Program as the sixth transient (reactor startups and shutdowns). Engineering evaluates these transients and advises operations if the number of design cycles is being approached."

Audit item 373: LRA Section 3.3.2.2.13 Loss of Material due to Wear is revised to state, "Wear is the removal of surface layers due to relative motion between two surfaces. At VYNPS, in the auxiliary systems, this specific aging effect is not applicable because the heating, ventilation, and air conditioning elastomer coated fiberglass duct flexible connections are fixed at both ends, precluding wear. This item is not applicable to VYNPS auxiliary systems."

Audit item 376: LRA Table 3.3.1 line item 3.3.1-69 is revised to remove the reference to the One-Time Inspection Program.

Audit item 379: LRA Table 3.5.1 line item 3.5.1-16 discussion is revised to add the following paragraph. "For reactor building seals and gaskets, the Periodic Surveillance and Preventive Maintenance Program manages cracking and change in material properties for the railroad inner and outer lock doors elastomer seals."

Audit item 382: The operating experience discussion in LRA Appendices B.1.17, B.1.18, and B.1.19 is replaced with the following.

"This program is a new aging management program. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description. VYNPS plant-specific operating experience has been reviewed against the industry operating experience identified in NUREG-1801. Although VYNPS has not

experienced all of the aging effects listed in NUREG-1801, the VYNPS program will manage all of the aging effects identified in the Operating Experience section of NUREG-1801.

The program is based on the program description in NUREG-1801, which in turn is based on relevant industry operating experience. As such, this program will provide reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. As additional operating experience is obtained, lessons learned can be used to adjust the program, as needed."

Attachment 3

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

RAI 3.6.2.2-N-08-1 Clarification

Vernon Hydro-Electric Station

Structural

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
ATTACHMENT 3

RAI 3.6.2.2-N-08-1 Response Clarification

As stated in the response to RAI 3.6.2.2-N-08-1 provided in Amendment 17, Entergy, consistent with the Grimes letter and the Peach Bottom license renewal precedent, credited the FERC dam inspection program to manage the effects of aging on civil and structural elements of the Vernon Hydroelectric Station (VHS).

Since the inspections are not part of a VYNPS aging management program but are conducted by the owner of the dam under FERC oversight, the license renewal application is clarified as follows.

Section 3.5.2.1.5

Delete "Vernon Dam FERC Inspection" under Aging Management Programs.

Table 3.5.1, Item 3.5.1-43

Delete "The Vernon Dam FERC Inspection Program manages masonry wall cracking at the Vernon Dam facility." from the Discussion column.

Table 3.5.1, Items 3.5.1-45 and 3.5.1-47

Delete "Loss of material of structural steel components of the Vernon Dam are managed by the Vernon Dam FERC Inspection Program." from the discussion column.

Notes for Table 3.5.2-1 through 3.5.2-6

Add plant-specific note, 505.

The Vernon dam is subject to the Federal Energy Regulatory Commission (FERC) inspection program. This program consists of inspections in accordance with FERC guidelines and complies with Title 18 of the Code of Federal Regulations, Conservation of Power and Water Resources, Part 12 (Safety of Water Power Projects and Project Works) and Division of Dam Safety and Inspections Operating Manual. In accordance with FERC regulations, the owner has been granted an exemption from Part 12, Subpart D. As indicated in NUREG-1801 for water control structures, NRC has found that FERC / US Army Corp of Engineers dam inspections and maintenance programs are acceptable for aging management. In addition, Vernon dam personnel conduct a daily visual inspection of all the project facilities. An operations crew attends the plant daily. Vernon Dam engineering staff performs an annual inspection of all the project structures and divers make a thorough inspection once every five years on both upstream and downstream sides.

Table 3.5.2-5

Revise line items as shown below (strike-outs = deleted, underlined = text added).

Vernon Dam structural steel	SRE	Carbon steel	Exposed to weather	Loss of material	~~Vernon Dam FERC Inspection~~ See Note 505	III.A6-11 (T-21)	3.5.1-47	~~E~~ A, 505
Vernon Dam structural steel	SRE	Carbon steel	Protected from weather	Loss of material	~~Vernon Dam FERC Inspection~~ See Note 505	III.A6-11 (T-21)	3.5.1-47	~~E~~ A, 505
Vernon Dam structural steel	SRE	Carbon steel	Exposed to fluid environment	Loss of material	~~Vernon Dam FERC Inspection~~ See Note 505	III.A6-11 (T-21)	3.5.1-47	~~E~~ A, 505
Vernon Dam external walls above/below grade	SRE	Concrete	Exposed to fluid environment	Loss of material	~~Vernon Dam FERC Inspection~~ See Note 505	III.A6-7 (T-20)	3.5.1-45	~~E~~ A, 505
Vernon Dam external walls, floor slabs and interior walls	SRE	Concrete	Protected from weather	None	~~Vernon Dam FERC Inspection~~ See Note 505			I, ~~501~~ 505
Vernon Dam masonry walls	SRE	Concrete block	Exposed to weather	Cracking	~~Vernon Dam FERC Inspection~~ See Note 505	III.A6-10 (T-12)	3.5.1-43	E, 505

Section A.2.1.31

Replace title, "Structures Monitoring—Vernon Dam FERC Program" with "Section intentionally blank."
Delete paragraph.

Tables B-1, B-2 and B-3

Delete line items for Structures Monitoring – Vernon Dam FERC Inspection.

Section B.1.27

Delete subsection B.1.27.3, Vernon Dam FERC Inspection.

Attachment 4

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

RAI 3.6.2.2-N-08-2 and 3.6.2.2-N-08-4 Response Clarification

Vernon Hydro-Electric Station

Switchyard Electrical Components

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
ATTACHMENT 4

RAI 3.6.2.2-N-08-2 and 3.6.2.2-N-08-4 Response Clarification

In the VYNPS response to RAI 3.6.2.2-N-08-2 provided in LRA Amendment 17 [BVY 06-096, dated 10/20/06], Entergy made the following statements associated with managing the effects of aging on the electrical elements of the Vernon Hydroelectric Station (VHS) switchyard.

> Additionally, the following ongoing activities provide additional assurance that the SBO alternate AC source remains capable of performing its license renewal intended function.
>
> 1. The VHS owner plans to replace the medium-voltage underground cable from the VHS powerhouse to the switchyard. This work is scheduled to be performed in the coming year. Only 26 years of operation remain for VYNPS between now and the end of the period of extended operation. Though not formally qualified, modern underground cables are expected to have a service life of greater than 26 years.

In the response to RAI 3.6.2.2-N-08-4 provided in Amendment 17, Entergy made the following statements associated with managing the effects of aging on the electrical elements of the VHS switchyard.

> Normal operation confirms these components remain capable of performing their intended functions. In addition, because of the two independent power transmission circuits, the effects of aging will not result in loss of the intended function of the VHS. Failure of a cable due to aging will be detected and repaired during normal operation without impacting the ability of the VHS to perform its intended function. Note that the design incorporates redundancy beyond that required for alternate AC sources. The SBO rule does not require redundancy of the alternate AC source. Because of this unique configuration, the fact that the generators and associated electrical circuits are operating is verification that they remain capable of performing their license renewal intended functions under CLB conditions.
>
> The switchyard owner utilizes thermography on a periodic basis to provide additional assurance of continued reliable switchyard performance.

The response to RAI 3.6.2.2-N-08-3 identified the medium-voltage underground cables for VYNPS, which included the cables from the VHS generators to the VHS switchyard. The license renewal application is clarified as follows to describe how aging effects on these VHS cables will be managed during the period of extended operation.

> The design of the VHS underground medium-voltage cables consist of two independent power circuits, that can each supply 100% output of the VHS generators to the step-up transformers in the VHS switchyard. During normal operation, both circuits are energized and loaded. Failure of one of the circuits does not impact the ability of the VHS to perform its intended function.

As stated in LRA Section 2.5, VYNPS uses the VHS as an alternate AC source to satisfy the requirements of 10 CFR 50.63 for response to a Station Black-Out (SBO). Section 2.5 lists the electrical commodity groups that are subject to aging management review, and non-environmentally qualified (EQ) inaccessible medium-voltage cables are included.

Section 3.6 of the LRA provides the results of the aging management review. Moisture and voltage stress is an applicable environment, and the "Non-EQ Inaccessible Medium-Voltage Cable" program manages the aging effect "reduced insulation resistance."

Previous RAI and audit question responses stated that the VHS underground medium-voltage cables do not have aging effects that require management.

Reduced insulation resistance due to moisture and voltage stress is an aging effect for underground medium-voltage cables, but is not significant enough to cause a loss of intended function. The underground cables in the VHS switchyard are exposed to similar environments as the VYNPS underground cables. The VHS underground medium-voltage cable is scheduled to be replaced by National Grid (TransCanada) in 2007.

The cable planned for installation between the VHS generator and the VHS switchyard is similar to the VYNPS Startup Transformer to 4160 V switchgear cable.

a. Both have ethylene-propylene rubber (EPR) insulation at a 133% insulation level.

b. The VHS cable has specified a chloro-sulfonated polyethylene jacket. Per NEI 06-05 April 2006, "Medium Voltage Underground Cable White Paper," these jackets provide excellent moisture barriers. This jacket material is equal to or better than the VYNPS cable jacket.

c. Both cables are installed in buried conduit, with a similar physical configuration (e.g. start at an elevated external connection, vertical conduit to the underground conduit, which is a sloped horizontal conduit that penetrates the connecting building).

d. VHS and VYNPS are located approximately one-quarter of a mile to each other, so they experience identical environmental conditions. Even though the VHS switchyard is closer to the river and lower in elevation than VYNPS, because the VHS switchyard is located downstream of the VHS the water table is at a similar level to VYNPS.

e. Both cables utilize red or pink EPR insulation, as black EPR production ended in the 1970's. The newer EPR insulation has treated clay fillers to preclude water absorption making the insulation less prone to water degradation than the older black EPR formulations. NEI 06-05 April 2006, "Medium Voltage Underground Cable White Paper" indicates strong performance of red EPR and notes that early red EPR failures were due to installation practices.

f. Considering:

   ii. VHS will install this cable next year.

   iii. The period of extended operation ends in 25 years (March 2032)

The observed good performance of red EPR cable to date for the industry indicates at least 25 to 30 years of cable life, which will extend beyond the VYNPS license renewal period of extended operation.

Based on the similarities of the cables, VYNPS proposed to credit testing of startup transformer cables (which are already in-scope) as an alternate method for verifying the VHS cable will

continue to perform its intended function during the period of extended operation. This is considered equal or more stringent because of the following:

a. The VYNPS cable will have been installed for 3 years longer than the VHS cable providing a leading indicator for the VHS cable.

b. The startup transformer cable is loaded intermittently, and the VHS cable is continuously loaded. As such, the VHS cable insulation heating is more even and changes slowly, and therefore dries the cable insulation with fewer electrical transients. Therefore the startup transformer environment is more severe from this perspective.

c. NEI 06-05, April 2006, "Medium Voltage Underground Cable White Paper," Page 1 noted that ethylene-propylene rubber tends to have a long service life (> 25 years) in wet applications and an even longer service life in dry environments.

d. If an issue is found during testing of the VYNPS cables, VYNPS will document and address the condition through the Entergy Corrective Action Program. Corrective actions will include an evaluation to determine the appropriate actions to ensure the VHS cables remain capable of performing their intended function.

The above discussion addresses the VHS cable from an aging management perspective. However, from a "defense in depth" perspective, the VHS has multiple circuits beyond station blackout regulatory requirements. There are two circuits going out to the switchyard each capable of 100% generator capacity, that are supported by two black-start water turbines (which will be upgraded to four black-start water turbines of higher capacity). These circuits are in continuous (versus standby) operation. The VHS grid system is independent from the VYNPS grid system and has high reliability, for example; power from the VHS dam was available during the 2004 blackout. Regulatory requirements for stations blackout do not require single-failure proof alternate AC sources. NUMARC 87-00 specifies availability of 95% or greater. Only an extremely unlikely or hypothetical failure of multiple cables for an extended period would result in the VHS being unable to fulfill its intended function of providing an alternate AC source with the specified availability.

The VYNPS aging management program for the underground medium-voltage from the VHS generators to the VHS switchyard will be similar to the NUREG-1801, XI.E3 program, but will have an exception. The XI.E3 program provides for 100% testing of all cables included in the program. The exception for the VHS cables will use a representative sample, and the sample population will include the VYNPS cables. The VYNPS cables will act as a surrogate to indicate the condition of the VHS cables. The cables in the two circuits will be included in the XI.E3 program, but the program will use the test results of similar VYNPS cables installed between the startup transformer and the station 4160 kV switchgear to indicate any potential degradation of the VHS cables.

Notes for Table 3.6.2-1
Add plant-specific note, 602. Based on information obtained from the VHS owner, the medium-voltage cables from the VHS switchyard to the VHS generators have the following specifications, which are equal to or better than the equivalent VYNPS cables.

- EPR insulation at 133% insulation level
- Chloro-sulfonated polyethylene jacket
- Installed in buried conduit, with no manhole openings
- Cable is 3 years newer than equivalent VYNPS cables

Table 3.6.2-1
Add line items as shown below (strike-outs = deleted, underlined = text added).

Component Type	Intended Function	Material	Environment	AERM	AMP	NUREG-1801, Vol.2 Item	Table 1 Item	Notes
Vernon Dam inaccessible medium-voltage cable	CE	Insulation material – various organic polymers	Moisture and voltage stress	Reduced Insulation Resistance (IR)	Non-EQ Inaccessible Medium-Voltage Cable	VI.A-4	3.6.1-4	B, 602

Appendix B.1.17

NON-EQ INACCESSIBLE MEDIUM-VOLTAGE CABLE

Exceptions to NUREG-1801

The Non-EQ Inaccessible Medium-Voltage Cable Program at VYNPS is consistent with the program described in NUREG-1801, Section XI.E3, Inaccessible Medium-voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements, with the following exceptions.

Attributes Affected	Exceptions
3. Parameters Monitored/Inspected	NUREG-1801 implies that all of the cables included in this program will be tested. The VYNPS program will test 100% of the applicable VYNPS cables. The program for the applicable VHS cables will use a representative sample, and the sample population will include the VYNPS cables. The similar VYNPS cables will serve as a surrogate to indicate potential degradation of the VHS cables.

RAI 3.6.2.2-N-08-2 Response Clarification for Component Preventative Maintenance

As stated in the response to RAI 3.6.2.2-N-08-2 provided in VYNPS letter number BVY 06-096, LRA Amendment 17 on 10/20/2006, Entergy made the following statements associated with managing the effects of aging on the electrical elements of the Vernon Hydroelectric Station (VHS) switchyard.

> Additionally, the following ongoing activities provide additional assurance that the SBO alternate AC source remains capable of performing its license renewal intended function.
>
> 2. The switchyard owner utilizes thermography on a periodic basis to ensure continued reliable switchyard performance.

To further address the electrical components from the tie breaker to VHS generators, the following describes how aging effects on the VHS switchyard electrical components will be managed during the period of extended operation.

> The design of the transmission conductor and switchyard bus bolted connections precludes the aging effect increased connection resistance due to torque relaxation. The typical design of switchyard bolted connections includes Bellville washers and no-ox coating. The type of bolting plate and the use of Bellville washers is the industry standard. Combined with the proper sizing of the conductors, this virtually eliminates the need to consider this aging effect. The switchyard owner performs infrared inspection of the VHS switchyard connections at least annually. Based on this information, increased connection resistance due to torque relaxation of transmission connections is not a significant aging effect. Therefore, increased connection resistance of VHS switchyard connections does not require an aging management program at VYNPS.
>
> Thermal infrared inspections were performed at the VHS substation on 10/06/06 and there were no abnormalities found. These inspections meet the intent of the one-time inspection discussed during the November 30 NRC/NEI meeting on aging management for electrical connections.
>
> Loss of material due to corrosion of connections or surface oxidation is an applicable aging effect, but is not significant enough to cause a loss of intended function. The components in the VHS switchyard are exposed to precipitation, but these components do not experience any appreciable aging effects in this environment, except for minor oxidation, which does not impact the ability of the connections to perform their intended function. The VHS switchyard connection surfaces are coated with an anti-oxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections thus reducing the chances of corrosion. Based on industry operating experience, the method of installation has been shown to provide a corrosion resistant low electrical resistance connection. In addition, the infrared inspection of the VHS switchyard verifies that this is not a significant aging effect for VYNPS. Therefore, it is concluded that general corrosion resulting from oxidation of VHS switchyard connection surface metals is not an aging effect requiring management at VYNPS.

Notes for Table 3.6.2-1

Add plant-specific note, 601. The Vernon switchyard is subject to the following routine periodic maintenance.

- Thermal infrared inspections on all bus connections, disconnects, insulators, compression fittings, capacitive coupled voltage transformers (CCVT), circuit breakers, transformers, etc., are preformed at least once a year
- Visual & operational (V&O) inspections for each transmission and distribution substation are performed at least once a year per the owner's electrical operating procedures (EOP). Typical items checked include air, hydraulic and gas pressures, operation counters, oil levels and temperatures, and visual condition.
- Equipment diagnostic, mechanism and internal inspections are performed at intervals set by the owner's electrical operating procedures based on time (e.g. months), normal operations and fault operations.

Table 3.6.2-1

Add line items as shown below (strike-outs = deleted, underlined = text added).

Component Type	Intended Function	Material	Environment	AERM	AMP	NUREG-1801, Vol.2 Item	Table 1 Item	Notes
Vernon Dam high voltage insulators	IN	Porcelain, cement	Outdoor Weather	None	None			I, 601
Vernon Dam switchyard components (bus connections, disconnects, compression fittings, capacitive coupled voltage transformers (CCVT), circuit breakers, transformers)	CE	Aluminum, steel, steel alloy, copper	Outdoor Weather	None	None			I, 601

Attachment 5

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

Bolting Integrity Program Clarification

Clarification of Bolting Integrity Program Applicability

LRA Amendment 16, Attachment 2 [Ref: VYNPS Letter to NRC BVY 06- 091, dated 10/17/06] provided additions to LRA Appendices A.2.1.37 and B.1.31 to describe the Bolting Integrity Program. The program basis document that provides a ten-element comparison to NUREG-1801 was also included. The introductory paragraph stated that this program applies to all bolting exposed to air with aging effects requiring management except reactor vessel closure studs.

This statement is hereby clarified by replacing it with the following statement from the scope of program attribute in the program basis document.

> The Bolting Integrity Program applies to bolting and torqueing practices of safety-related and non-safety related bolting for pressure retaining components, NSSS support components, and structural joints. The program addresses all bolting regardless of size (except the reactor vessel closure studs which are addressed by the Reactor Vessel Closure Studs Program).

Attachment 6

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

Follow-Up Information for

RAI 4.3-H-01 and RAI 4.3-H-03

Follow-up question for 4.3-H-01: Additional information requested on tabulation of actual vessel cycles vs. design cycles for all 13 or 18 transients and current fatigue usage status at VYNPS.

Cumulative usage factors (CUFs) for fatigue are calculated for specific locations on the vessel such as nozzles, geometry transitions on the vessel shell and discontinuities. An operating event may or may not have an impact on the CUF at a specific location. To assist operations in tracking events, the original 18 transients were simplified to a shorter list of 13 transients which were determined to be significant to vessel fatigue. Some events were combined, some eliminated and some different events were added. The resulting 13 events include all the original 18 events, but made the revised list more closely reflect actual operating events and made tracking of the events easier.

Reduction to 13 vs. 18 Transient Events

The reactor head bolt/unbolt events were combined into one cycle for tracking. The heat-up and cool-down events were combined into a single heat-up/cool-down cycle for tracking.

The Control Rod Worth Test (rod pattern change) event was eliminated since there was no change in reactor pressure or temperature associated with this event. The rod pattern changes only produce changes in the flow and temperatures in the feedwater nozzles. These changes at the feedwater nozzles are the same as for the Daily Reduction to 75% Power event and would be tracked under this event.

The Loss of Feedwater heaters due to turbine trip and Loss of Feedwater heaters due to bypass were combined into a single Loss of Feedwater heating category. Scram events were combined and the relief or safety valve blowdown was made into its own category.

Improper start of a cold recirculation loop and the sudden start of a pump in a cold recirculation loop were combined.

The added transient events to be tracked were; (7) Startup/Shutdown, (12) HPCI, and (13) SLC Injection. The Startup/Shutdown and HPCI transients are controlled by the feedwater nozzle. SLC injection was added to the list.

The following table summarizes the simplification of the original 18 transient events.

Table Showing Mapping Of Original 18 Transient Events To The Simplified List Of 13 Events

Original Transient Event Number	Design Transient	Simplification	Simplified Event Number
1	Closure Flange Bolting	Combined with Flange Unbolting, Event 2	2
2	Closure Flange Unbolting	Combined with Flange Bolting, Event 1	2
3	System Pressure Tests at 1000 psi	Same	3
4	Heat-up	Combined with Cool-Down, Event 5	1
5	Cool-down	Combined with Heat-up, Event 4	1
6	Daily Reduction to 75% power	Same	5
7	Weekly Reduction to 50% power	Same	6
8	Control Rod Worth Test	Separate tracking of this event was eliminated. Essentially the same as 75% power reduction original, Event 6.	5
9	Loss of Feedwater heaters due to turbine trip	Combined with LOF due to bypass, Event 10	8
10	Loss of Feedwater heaters due to bypass	Combined with LOF due to turbine trip, Event 9	8
11	Scram including loss of feedwater pumps and closed isolation valves.	Combined with Scram Events (11 to 13, & 15)	11
12	Scram with turbine trip, feedwater on, isolation valves open	Combined with Scram Events (11 to 13 & 15)	11
13	Scram (delayed) with reactor overpressure, feedwater on, isolation valves open	Combined with Scram Events (11 to 13 & 15)	11
14	Scram with single relief valve or safety valve blow-down	Scram with relief valve or safety valve blow down became the new item 10	10
15	All other Scrams	Combined with Scram, Events (11 to 13, & 15)	11
16	Improper start of cold recirculation loop	Combined with Sudden start of pump in cold recirculation loop, Event 17	9
17	Sudden start of pump in cold recirculation loop	Combined with Improper start of cold recirculation loop, Event 16	9
18	Hydrostatic test at 1563 psig	Same	4
NA		Startup/Shutdown	7
NA		HPCI	12
NA		Standby Liquid Control Injection	13

VERMONT YANKEE NUCLEAR POWER STATION
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A tabulation of design cycles from the original plant design reports, the design basis calculation for cyclic transient events, and the current cycle status for RFO 25 follows:

Simplified List of Design Transients / Events
Cycle Status to RFO 25 (October 2005)

No.	Transient/Event	Number of Events in Original Design Specification	Number of Events provided by GE for Cycle Tracking (1)	Cycle Limit from Calc. VYC-378 Rev.0 (2)	Current Cycles RFO 25 (October 05)
1	Heatup / Cooldown	200 **(3)**	120 / 118	300	93
2	Bolt / Unbolt	120	123	200	33
3	Cold Hydrostatic Tests at 1000 psi.	120	120	300	33
4	Code Hydrostatic Test at 1563 psi.	3	3	3	1
5	Reduction to 75% power	Not included	10000	10000	N/A
6	Reduction to 50% power	Not included	2000	2000	N/A
7	Startup/Shutdown	1500 for Feedwater Nozzle	Not included	1500	235**(6)**
8	Loss of Feedwater Heating	Included in Start Up/Shutdown cycles for Feedwater Nozzle	80	80	0
9	Recirculation Loop Cold Start	5	5	5	0
10	Relief or Safety valve blowdown	1	2 **(4)**	1	0
11	Scram	Included in Start Up/Shutdown cycles for FDW nozzle	200	300	130**(5)**
12	HPCI	Not explicitly identified. Included in Start Up/Shutdown cycles for Feedwater Nozzle	200	200	12
13	SLC Injection	10	10	10	0

Notes :

1. Provided by GE for original FSAR, ref. Memo ME 172/74 dated September 13, 1974.
2. From Table 1, VYC-378 Revision 0, Pg 11.
3. 200 Heat-ups at 100F/hr. 199 Cool-downs at 100F/hr. 1 RV / SV blow-down at 1000F/hr.
4. Included in Scram Events
5. All scram events are recorded whether or not a post scram heat-up / cool-down cycle occurred. This number is intended to bound all scram events.
6. Applies to feedwater nozzle transients.

The vessel cycle monitoring procedure was subsequently simplified by only requiring Operations to count heat-up/cool-down, bolt/unbolt and system hydro tests as they occur. Engineering reviews the remaining transients based on actual operation data at the end of each cycle and compares actual plant transient data to the design transients. This list is the same as presented in Table 4.3-2 of the License Renewal Application.

The power reduction events to 75% and 50% rated power do not affect vessel temperatures and pressures. Only the flows and temperatures in the feedwater nozzles are affected. Thermal fatigue effects from these power reductions were determined to be insignificant, as demonstrated with approximately 10^6 allowable cycles. Not all scram events result in temperature changes which affect fatigue usage. The effects of each scram event are evaluated at specific component locations.

The CUFs shown in Table 4.3-1 of the License Renewal Application are bounding values based on the existing design analyses available at the time of the application. The following table summaries; 40 Year Design CUFs including changes resulting from power uprate, projections of the 40Year CUFs for 60 years, and a conservative estimate of CUFs current to October 2005. The current CUF estimates for October 2005 shown in the table below are calculated assuming each event has the same severity as a design cycle (i.e. more conservative temperature changes and rates of change are used than for the actual operating events).

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ATTACHMENT 6

Summary of Reactor Vessel ASME III Cumulative Usage Factors

Location	40 Yr Design Analysis CUF	60 Yr Projection for Design Analysis CUF	Current CUF October 2005	Comments
Top head, Closure Flange & Studs	0.62	0.931	0.273	Stud Fatigue Governs Note 1
Bottom Head and Support Skirt Junction	0.400	0.600	0.186	Note 2
Main Shell and Shroud support	0.064	0.096	0.018	Note 2
Core spray nozzle	0.625	0.938	0.221	Note 1
CRD penetration	0.128	0.192	0.077	Note 2
Feedwater nozzle	0.535	0.842	0.142	Updated Feedwater Nozzle Stress and Fatigue analysis. Note 3
Feedwater nozzle (safe end)	0.451	0.832	0.098	Updated Feedwater Nozzle Stress and Fatigue analysis. Note 3
RR inlet nozzle	0.037	0.055	0.016	Note 2
RR inlet nozzle (safe end)	0.117	0.135	0.029	GE23A4292 sh.62 Note 4
RR outlet nozzle	0.481 / 0.650	0.722 / 0.975	0.170	GE23A4316 / CB&I Note 2
RR outlet nozzle (safe end)	0.807	0.928	0.085	GE23A4316 Note 4
Steam outlet nozzle	0.167	0.251	0.080	Note 2
Refueling bellows	0.667	0.867	0.310	Note 5

Notes:
1. 40 Design and 60 Year Projection CUFs from VY-RPT-05-00100 (includes EPU effects).
2. 60 Yr Design CUF based on linear projection.
3. 60 Yr Design CUF calculated 30yr. at OLTP & 30yr. at EPU with 1.5(1500) = 2250 design transient cycles.
4. Replaced in 1986. 60 Yr Design CUF based on linear projection (46yrs /40 yrs) = 1.15
5. 60 Yr Design CUF estimated by projecting 3 HU/CU cycles/year though period of extended operation.

Follow-up question for 4.3-H-03: Clarification of Heat-up and Cool-down Rates used in VY Reactor Vessel Design Stress Analysis and whether or not the 1000 degree per hour cool-down rate applies to every cool-down.

Design temperature transients are defined in Attachment D of the VY Reactor Vessel Purchase Specification 21A1115, Rev.4 October 23,1969. Design heat-up & cool-down transients for the vessel closure flanges and adjacent shell, the bottom head and the support skirt region of the shell are as follows:

Vessel Part	Transient	No. of Cycles	HU/CD	Fluid Temp Rate (°F/Hr.)	Fluid Start Temp (°F)	Fluid End Temp (°F)
Closure Flanges & Adjacent Shell	Normal Start-up	200	HU	100	100	546
	Normal Shutdown	199	CD	100 Flooding with 100	546 water at 330°F 300	350 Followed by Followed by 150
	Rapid Cool-down (SV/RV Blow-down)	1	CD	1000 100	546 375	370 Followed by 100
Bottom Head & Support Skirt	Normal Start-up	200	HU	100	100	546
	Normal Shutdown	199	CD	100 300 100	546 375 330	375 Followed by 330 Followed by 100
	Rapid Cool-down (SV/RV Blow-down)	1	CD	1000 100	546 370	370 Followed by 100

For the main closure flanges and adjacent vessel shell, the original design analysis included a thermal analysis of both the normal shutdown and rapid cool-down transients. The analysis of the normal shutdown transient has higher temperature gradients than the rapid cool-down transient. This is due to the high heat transfer coefficients associated with the flood up (1000 °F/Hr for 3 minutes) to the flange area modeled in the normal shutdown thermal analysis. Stresses from the normal cool-down transient envelop the stresses from the rapid cool-down transient which includes a 1000°F/Hr. temperature drop for a period of 10 minutes. The enveloping transient effectively evaluates the flange bolts and adjacent shell areas for 200 Normal Heat-up then Rapid Cool-down cycles.

During shutdown cooling the reactor water level does not rise to the head or flange level during a normal cool-down. In addition the reactor head spray piping has been removed which eliminates the capacity for quenching steam in the upper region of the vessel.

For the skirt to bottom head junction and the adjacent areas of the vessel shell, the original design analysis identified the ten minute rapid blow down transient as a more severe transient than the normal cool-down. The only cool-down transient evaluated was the rapid cool-down transient. The skirt to bottom head junction and the adjacent areas of the vessel shell were evaluated for 200 Normal Heat-up then Rapid Cool-down cycles.

In summary, the vessel shell has been analyzed for 200 heat-up / cool-down cycles in which the cool-down transient includes a 1000 °F/Hr. temperature change.

Attachment 7

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

RAI 3.6.2.2-N-01 Response Clarification

RAI 3.6.2.2-N-01 Response Clarification

In the VYNPS response to RAI 3.6.2.2-N-01 provided in LRA Amendment 4, [BVY 06-063, dated 07/14/06] Entergy stated that an XI.E6 program was not required. Based on the November 30, 2006 NEI meeting with the NRC, an alternate XI.E6 program, which will be a one-time inspection of a representative sample of cable connections subject to aging management review, will be used at VYNPS.

Basis for Clarification

Based on the November 30, 2006 NEI meeting with the NRC, the revised or alternate XI.E6 program will be a one-time inspection of a representative sample of cable connections subject to aging management review.

The LR project identified connections to include in the aging management program (AMP) by evaluating the VYNPS non-environmentally qualified (EQ) bolted cable connections. Switchyard connections are not addressed in this program. Since these connections operate at a much higher voltage (>35KV); they are addressed separately as part of the switchyard commodity types.

Connections for all voltage levels are considered. As discussed during the November 30, 2006 NEI/NRC meeting, bolted connections are the main concern. The stressors thermal cycling, ohmic heating, and electrical transients are potential stressors only for high-load connections.

Thermal cycling, ohmic heating, and electrical transients are not potential stressors for low-load connections. Low-load connections located in a controlled environment are not included in the program, because vibration, chemical contamination, corrosion and oxidation are not of concern. Low-load in-scope connections to field instrumentation such as pressure transmitters, RTDs, and flow transmitters are not subject to aging management review (AMR), because the in-scope instrumentation located in a harsh environment is typically EQ, and the non-EQ sensitive instrument circuit (high radiation and neutron monitoring) connections are included in the XI.E2 program.

Section 3.6.2.1, Aging Effects Requiring Management

Add the following aging effect to this section:

- Loosening of Bolted Connections

Section 3.6.2.1, Aging Management Programs

Add the following AMP to this section:

- Bolted Cable Connections Program

Table 3.6.1, Item 3.6.1-13

Revise line items as shown below (strike-outs = deleted, underlined = text added).

Item Number	Component	Aging Effect / Mechanism	AMP	Further Evaluation Recommended	Discussion
3.6.1-13	Cable Connections metallic parts	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements	No	~~NUREG-1801 aging effect is not applicable to VYNPS. Cable connections outside of active devices are taped or sleeved for protection. Operating experience with metallic parts of electrical cable connections at VYNPS indicated no aging effects requiring management.~~ VYNPS is providing a plant specific program (Bolted Cable Connections Program) as an alternate to the NUREG-1801, XI.E6 program.

Notes for Table 3.6.2-1
No changes required.

Table 3.6.2-1

Revise line items as shown below (strike-outs = deleted, underlined = text added).

Component Type	Intended Function	Material	Environment	AERM	AMP	NUREG-1801, Vol.2 Item	Table 1 Item	Notes
Cable Connections (metallic parts)	CE	Various metals used for electrical connections	Heat and air Outdoor Weather	~~None~~ Loosening of bolted connections	~~None~~ Bolted Cable Connections Program	VI.A-1 (LP-12)	3.6.1-13	~~I~~ E

LRA Appendix A is revised to add the following:

Appendix A.2.1.39

BOLTED CABLE CONNECTIONS PROGRAM

The Bolted Cable Connections Program will focus on the metallic parts of the cable connections. This sampling program provides a one-time inspection to verify that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients,

vibration, chemical contamination, corrosion, and oxidation is not an aging issue that requires a periodic AMP. A representative sample of the electrical cable connection population subject to aging management review will be inspected or tested. Connections covered under the EQ program, or connections inspected or tested as part of a preventive maintenance program are excluded from aging management review. The factors considered for sample selection will be application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected is to be documented.

This program will be implemented prior to the period of extended operation.

LRA Appendix B is revised to add the following:

Appendix B.1.33

BOLTED CABLE CONNECTIONS PROGRAM

Program Description

Cable connections are used to connect cable conductors to other cables or electrical devices. Connections associated with cables within the scope of license renewal are considered for this program. The most common types of connections used in nuclear power plants are splices (butt or bolted), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulating material and metallic parts. This aging management program for electrical cable connections (metallic parts) accounts for loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. This program does not apply to the high voltage (> 35 kV) switchyard connections.

NUREG-1801, XI.E4, "Metal Enclosed Bus," manages the aging effects for the connections associated with metal enclosed bus (MEB). XI.E4 manages the aging effects from thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation on the metallic parts of MEB connections. Therefore, MEB connections are not included in this program.

Circuits exposed to appreciable ohmic or ambient heating during operation may experience loosening related to repeat cycling of connected loads or cycling of the ambient temperature. Bolted connectors, splices, and terminal blocks may loosen if subjected to significant thermally induced cyclic stress.

The design of these connections will account for the stresses associated with ohmic heating, thermal cycling, and dissimilar metal connections. Therefore, these stressors / mechanisms should not be a significant aging issue. However, confirmation of the lack of aging effects is warranted.

This sampling program provides for one-time inspections that will be completed prior to the period of extended operation. The factors considered for sample selection are application (medium and low voltage), circuit loading (high loading), and location (high temperature,

high humidity, vibration, etc.). The technical basis for the sample selections will be documented. If an unacceptable condition or situation is identified in the selected sample, the corrective action program will be used to evaluate the condition and determine appropriate correction action.

None of the connections in this program is subject to the environmental qualification (EQ) requirements of 10 CFR 50.49. This plant-specific aging management program has been developed as an alternate to NUREG-1801, XI.E6, and will ensure that electrical cable connections will perform their intended function for the period of extended operation.

Evaluation and Technical Basis

1. ***Scope of Program:*** Non-EQ connections associated with cables in scope of license renewal are part of this program. This program does not include the high voltage (> 35kV) switchyard connections. In-scope connections are evaluated for applicability of this program. The criteria for including connections in the program are that the connection is a bolted connection and is not covered under the EQ program or an existing preventive maintenance program.

2. ***Preventive Actions***: This one-time inspection program is a condition monitoring program; therefore, no actions are taken as part of this program to prevent or mitigate aging degradation.

3. ***Parameters Monitored/Inspected***: This program will focus on the metallic parts of the cable connections. The one-time inspection verifies that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an issue that requires a periodic aging management program.

4. ***Detection of Aging Effects***: A representative sample of electrical connections within the scope of license renewal, and subject to aging management review will be inspected or tested prior to the period of extended operation to verify there are no aging effects requiring management during the period of extended operation. The factors considered for sample selection will be application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected is to be documented. Inspection methods may include thermography, contact resistance testing, or other appropriate methods including visual based on plant configuration and industry guidance. The one-time inspection provides additional confirmation to support industry operating experience (OE) that shows that electrical connections have not experienced a high degree of failures, and that existing installation and maintenance practices are effective.

5. ***Monitoring and Trending***: Trending actions are not included as part of this program because this is a one-time inspection.

6. ***Acceptance Criteria***: The acceptance criteria for each inspection / surveillance are defined by the specific type of inspection or test performed for the specific type of cable connections. Acceptance criteria ensure that the intended functions of the cable connections can be maintained consistent with the current licensing basis.

7. ***Corrective Actions***: If the inspection or test acceptance criteria are not met the corrective action program will be used to perform an evaluation that will consider extent of condition, the indications of aging effects, possible changes to the one-time inspection program such as frequency and sample size. As discussed in the appendix to NUREG-1801, the staff finds the requirements of 10 CFR Part 50, Appendix B, are acceptable to address the corrective actions.

8. **Confirmation Process:** The requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process.

9. ***Administrative Controls***: The requirements of 10 CFR Part 50, Appendix B, acceptable to address the administrative controls.

10. ***Operating Experience (OE)***: Operating experience has shown that loosening of connections and corrosion of connections could be a problem without proper installation and maintenance activities. Industry OE supports performing this one-time inspection program in lieu of a periodic testing program. This one-time inspection program will verify that the installation and maintenance activities are effective.

The Bolted Cable Connections Program at VYNPS is a new program. Plant and industry OE will be considered when developing this program. Industry OE that forms the basis for the program is described in the OE element of the NUREG-1801, Section XI.E6 program description. VYNPS plant-specific OE is consistent with the OE in the NUREG-1801 XI.E6 program description.

Conclusion

The Bolted Cable Connections Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Bolted Cable Connections Program will provide reasonable assurance that applicable cable connections will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

VYNPS License Renewal Commitment 42 has been initiated to ensure that the Bolted Cable Connections Program is implemented prior to the period of extended operation. The revised commitment list is provided as Attachment 1 to this letter.

Attachment 8

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 23

RAI 2.5-4 Response Clarification

VERMONT YANKEE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
ATTACHMENT 8

RAI 2.5-4 Response Clarification

As stated in the VYNPS response to RAI 2.5-4 provided in LRA Amendment 12, [BVY 06-083, dated 09/05/06] Entergy stated that an XI.E6 program was not required. Based on the November 30, 2006 meeting with the NRC, an alternate XI.E6 program, which will be a one-time inspection of a representative sample of cable connections subject to aging management review, will be used at VYNPS.

Basis for Clarification

The RAI and the applicant response were associated with the VY RAI 3.6.2.2-N-01 and response in LRA Amendment 4 [BVY 06-063, dated 07/14/06].

Section 2.5 of the LRA lists "cable connections (metallic parts)" as a commodity requiring aging management review. Table 2.5-1 also contains the commodity "cable connections (metallic parts)". Section 3.6.1 of the LRA addresses commodities that require aging management review, and "insulated cables and connections" is included. However, the results of the aging management review in Section 3.6.2 of the LRA did not include "Loosening of Bolted Connections" as an aging effect requiring management, so a NUREG-1801, XI.E6 aging management program was not included.

The clarification for VY RAI 3.6.2.2-N-01 included "Loosening of Bolted Connections" as an aging effect requiring management in LRA Section 3.6.2, and a plant specific aging management program, "Bolted Cable Connections Program," was added to Appendix A and B of the LRA.

Section 2.5

No changes to this section of the LRA are required from the clarifications to RAI 2.5-4 or RAI 3.6.2.2-N-01.

Table 2.5-1

No changes to this table in the LRA are required from the clarifications to RAI 2.5-4 or RAI 3.6.2.2-N-01.