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July 28, 2006

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Dr. Richard E. Wardwell
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Washington, D.C. 20555-0001

In the Matter of
Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.
(Vermont Yankee Nuclear Power Station)
Docket No. 50-271-LR; ASLBP No. 06-849-03-LR

Gentlemen:

Enclosed for the information of the Licensing Board and participants are two documents relevant to proposed contentions in the Vermont Yankee license renewal proceeding. The first document is Amendment 6 to license renewal application updating the section of the Environmental Report on thermal impacts to reflect the amendment to the NPDES permit that was issued after the application was filed. This submittal is relevant to NEC Contention 1.

The second document is Amendment 5 to the license renewal application reflecting changes in response to NRC Staff questions during on-site license renewal audits. This amendment contains some changes to the application relevant to NEC Contention 2. With respect to components for which CUFs are estimated using generic values from NUREG/CR-6260 (see license renewal application Section 4.3), Audit Item 318 includes a commitment by Entergy requiring an analysis that addresses the effects of reactor coolant environment on fatigue performed to an NRC-approved version of the ASME code. A further amendment to the application will be filed shortly in response to discussions with the NRC staff on this Audit Item and will state:

> For the NUREG/CR-6260 locations, VYNPS will determine CUFs incorporating the potential effects of reactor water environment by applying Fen factors to valid CUFs determined by one of the following methods.

Template = SECY-037

SECY-02

1. For locations with existing fatigue analysis, use the existing CUF.

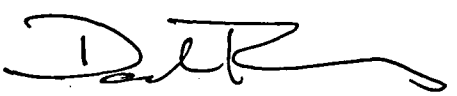
2. More limiting VYNPS-specific locations with a valid CUF may be substituted for the NUREG/CR-6260 locations.

3. Representative CUF values from other plants of from NUREG/CR-6260 may be used if they are adjusted to or envelope the VYNPS-specific external loads.

4. An analysis using an NRC-approved version of the ASME code may be performed for the NUREG/CR-6260 location to determine a valid CUF.

VYNPS will commit to complete these actions two years prior to the period of extended operation and perform such analysis to an NRC-approved version of the ASME Code.

Sincerely,



David R. Lewis
Counsel for Entergy

Enclosures
(1) LRA Amendment 6 (July 27, 2006)
(2) LRA Amendment 5 (July 14, 2006)

cc: Service List

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing letter were served on the persons listed below by deposit in the U.S. Mail, first class, postage prepaid, and where indicated by an asterisk by electronic mail, this 28th day of July, 2006.

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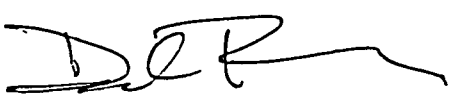

David R. Lewis

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July 14, 2006

Docket No. 50-271
BVY 06-064
TAC No. MC 8634

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.

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
License Renewal Application, Amendment 5

On January 25, 2006, Entergy Nuclear Operations, Inc. and Entergy Nuclear Vermont Yankee, LLC (Entergy) submitted the License Renewal Application for the Vermont Yankee Nuclear Power Station (VYNPS) as indicated by Reference 1. Attachment 1 transmits changes to the VYNPS License Renewal Application in response to NRC staff questions received during on-site license renewal audits. Attachment 2 transmits changes to the VYNPS License Renewal Application tables in Sections 3.1 through 3.4 to address time-limited aging analyses in response to Audit Question 309.

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

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 14, 2006.

Sincerely,

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

Attachments 1 and 2
cc: See next page

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Attachment 1

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

Amendment 5

ATTACHMENT 1
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST

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, and 146: 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 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.

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."

ATTACHMENT 1
LICENSE RENEWAL APPLICATION SUPPLEMENT
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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 item 64: The exception taken to NUREG-1801 Section XI.M3 in LRA Section B.1.23 is deleted. In accordance with ASME Code Case N-652, future examination will be visual only. Code Case N-652 has been endorsed by the NRC per Table 1 of Regulatory Guide 1.147. Revision 14. As this Code Case is now endorsed, this inspection is no longer an exception to NUREG-1801.

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, 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.

ATTACHMENT 1
LICENSE RENEWAL APPLICATION SUPPLEMENT
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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.

ATTACHMENT 1
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Audit items 224, 225, 226, 229, 293, 294, 315, and 369: LRA Section B.1.21 is 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."

ATTACHMENT 1
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST

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)	3.5.1-8	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 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.

Audit item 309: 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 2 to this letter.

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.

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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

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 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 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.

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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 2

Vermont Yankee Nuclear Power Station

License Renewal Application Supplement

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ATTACHMENT 2
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TLAA TABLE CHANGES

Audit item 309 – Tables and text of LRA Sections 3.1, 3.2, 3.3 and 3.4 are modified as follows:

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Table 3.1.2-1 Reactor Vessel									
Closure flange studs, nuts, washers and bushings	Pressure boundary	Low alloy steel	Air-indoor (ext)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~C, 101~~	Aging effect entry for component line deleted – Cracking managed by Reactor Head Closure Studs Program in following entry of line.
Incore housing bolting • Flange bolts • Flange • Nut and washer	Pressure boundary	Stainless steel	Air-indoor (ext)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~			~~G~~	Aging effect entry for component line deleted – Cracking managed by Inservice Inspection Program in following entry of line.
Other pressure boundary bolting • Flange bolts and nuts (N6A, N6B, N7) • CRD flange caps-crews and washers	Pressure boundary	Low alloy steel	Air-indoor (ext)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~C, 101~~	Aging effect entry for component line deleted – Cracking managed by Inservice Inspection Program in following entry of line.
CAP • CRD return line (N9)	Pressure boundary	Stainless steel	Treated water >270ºF (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR CRD Return Line Nozzle Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Thermal sleeves • Recirc inlet (N2) • Core spray (N5)	Pressure boundary	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
~~Thermal sleeves • Feedwater inlets (N4)~~	~~Pressure boundary~~	~~Stainless steel and Nickel-based alloy~~	~~Treated water >270°F (int)~~	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~A~~	Deleted entire line – Feedwater inlet thermal sleeves are not welded to nozzles and are not subject to aging management review (See audit items 209 and 291).
Weld • SLC nozzle to safe end weld (N10)	Pressure boundary	Nickel-based alloy	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR Penetrations Program in following entry of line.
Table 3.1.2-2 Reactor Vessel Internals									
Control rod guide tubes • Tubes	Support for Criterion (a)(1) equipment	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Control rod guide tubes • Bases	Support for Criterion (a)(1) equipment	CASS	Treated water >482°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Core plate • Plate, beams • Blocks, plugs, • Alignment assemblies	Support for Criterion (a)(1) equipment	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Core spray lines	Flow distribution	Stainless steel	Treated water >270ºF (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Fuel support pieces • Orificed supports • Peripheral supports	Support for Criterion (a)(1) equipment	CASS	Treated water >482ºF (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Incore dry tubes	Pressure boundary	Stainless steel	Treated water >270ºF (ext)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Incore guide tubes	Pressure boundary	Stainless steel	Treated water >270ºF (ext)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Jet pump assemblies • Risers, riser braces • Riser hold down bolts • Mixer barrels and adapters • Restraint brackets, wedges, bolts • Diffusers and tailpipes • Adapter upper rings	Floodable volume	Stainless steel	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Jet pump assemblies • Hold-down beams • Adapter lower ring	Floodable volume	Nickel-based alloy	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Jet pump castings • Transition piece • Inlet elbow/ nozzle • Mixer flange and flare • Diffuser collar	Floodable volume	CASS	Treated water >482°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Shroud	Floodable volume	Stainless steel	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Shroud support • Ring, cylinder, and legs • Access hole cover	Support for Criterion (a)(1) equipment	Nickel-based alloy	Treated water >270ºF (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Top guide assembly	Support for Criterion (a)(1) equipment	Stainless steel	Treated water >270ºF (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Table 3.1.2-3: Reactor Coolant System Pressure Boundary									
Detector (CRD)	Pressure boundary	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	A	Aging effect entry for component line deleted – Cracking managed by One-Time Inspection Program in previous entry of line.
Drive (CRD)	Pressure boundary	Stainless steel	Treated water ~~>270°F (int)~~	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	A	Environment for this component line changed. CRD drive temperatures maintained below threshold for fatigue. Aging effect entry for component line deleted.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Pump casing and cover (RR)	Pressure boundary	CASS	Treated water >482°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR Stress Corrosion Cracking and Inservice Inspection Programs in preceding entry of line.
Restrictors (MS)	Flow control	CASS	Treated water >482°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by One-Time Inspection Program in preceding entry of line.

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Table 3.2.2-1: Residual Heat Removal System									
~~Heat exchanger (shell)~~	~~Pressure boundary~~	~~Carbon steel~~	~~Treated water >270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~V.D2-32 (E-10)~~	~~3.2.1-1~~	~~C~~	Line deleted. See next line.
Heat exchanger (shell)	***Pressure boundary***	***Carbon steel***	***Treated water >270°F (int)***	***Cracking***	***One-Time Inspection***	***V.D2-32 (E-10)***	***3.2.1-1***	***E***	New line item.
~~Heat exchanger (tubes)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water >270°F (ext)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~C~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
~~Heat exchanger (tubes)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water >270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~C~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table
~~Pump casing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Treated water >270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~V.D2-32 (E-10)~~	~~3.2.1-1~~	~~A~~	Line deleted. See next line.
Pump casing	***Pressure boundary***	***Carbon steel***	***Treated water >270°F (int)***	***Cracking***	***One-Time Inspection***	***V.D2-32 (E-10)***	***3.2.1-1***	***E***	New line item.
Table 3.2.2-4: High Pressure Coolant Injection System									
~~Turbine casing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Steam > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VIII.B2-5 (S-08)~~	~~3.4.1-1~~	~~C~~	Line deleted. See next line.
Turbine casing	***Pressure boundary***	***Carbon steel***	***Steam > 270°F (int)***	***Cracking***	***One-Time Inspection***	***VIII.B2-5 (S-08)***	***3.4.1-1***	***E***	New line item.
Table 3.2.2-5: Reactor Core Isolation Cooling									
~~Turbine casing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Steam > 220°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VIII.B2-5 (S-08)~~	~~3.4.1-1~~	~~C~~	Line deleted. See next line.
Turbine casing	***Pressure boundary***	***Carbon steel***	***Steam > 220°F (int)***	***Cracking***	***One-Time Inspection***	***VIII.B2-5 (S-08)***	***3.4.1-1***	***E***	New line item.
3.3.2-13-36: Reactor Water Clean-Up System									
~~Heat exchanger (shell)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~C~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
~~Pump casing~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~A~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table
~~Tank~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~A~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table
3.4.2-1: Main Condenser and MSIV Leakage Pathway									
~~Heat exchanger (tubes)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Steam > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~			~~H~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table

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Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1						
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**	**Change Description**
3.2.1-1	Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA ***for most components. The One-Time Inspection Program manages cracking for components susceptible to fatigue with no TLAA.*** See Section 3.2.2.2.1.	Discussion modified as shown

Section 3.2.2.2.1 is revised as follows:

3.2.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management ***for components designed to ASME Code requirements,*** the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

Where fatigue damage is identified as an aging effect requiring management for components with no fatigue design requirements, the aging effect is managed by inspection. The One-Time Inspection program will manage cracking due to fatigue for these components.

ATTACHMENT 2
LICENSE RENEWAL APPLICATION SUPPLEMENT
TLAA TABLE CHANGES

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1						
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**	**Change Description**
3.4.1-1	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA ***for most components. The One-Time Inspection Program manages cracking for components susceptible to fatigue with no TLAA.*** See Section 3.4.2.2.1.	Discussion modified as shown

Section 3.4.2.2.1 is revised as follows:

3.4.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management ***for components designed to ASME Code requirements,*** the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

Where fatigue damage is identified as an aging effect requiring management for components with no fatigue design requirements, the aging effect is managed by inspection. The One-Time Inspection program will manage cracking due to fatigue for these components.

ATTACHMENT 1
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST

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, and 146: 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 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.

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 item 64: The exception taken to NUREG-1801 Section XI.M3 in LRA Section B.1.23 is deleted. In accordance with ASME Code Case N-652, future examination will be visual only. Code Case N-652 has been endorsed by the NRC per Table 1 of Regulatory Guide 1.147. Revision 14. As this Code Case is now endorsed, this inspection is no longer an exception to NUREG-1801.

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, 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 is 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)	3.5.1-8	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 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.

Audit item 309: 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 2 to this letter.

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.

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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

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 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 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.

ATTACHMENT 1
LICENSE RENEWAL APPLICATION SUPPLEMENT
AMENDMENT LIST

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 2
LICENSE RENEWAL APPLICATION SUPPLEMENT
TLAA TABLE CHANGES

Audit item 309 – Tables and text of LRA Sections 3.1, 3.2, 3.3 and 3.4 are modified as follows:

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Table 3.1.2-1 Reactor Vessel									
Closure flange studs, nuts, washers and bushings	Pressure boundary	Low alloy steel	Air-indoor (ext)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~C, 101~~	Aging effect entry for component line deleted – Cracking managed by Reactor Head Closure Studs Program in following entry of line.
Incore housing bolting • Flange bolts • Flange • Nut and washer	Pressure boundary	Stainless steel	Air-indoor (ext)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~			~~G~~	Aging effect entry for component line deleted – Cracking managed by Inservice Inspection Program in following entry of line.
Other pressure boundary bolting • Flange bolts and nuts (N6A, N6B, N7) • CRD flange caps-crews and washers	Pressure boundary	Low alloy steel	Air-indoor (ext)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~C, 101~~	Aging effect entry for component line deleted – Cracking managed by Inservice Inspection Program in following entry of line.
CAP • CRD return line (N9)	Pressure boundary	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by BWR CRD Return Line Nozzle Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Thermal sleeves • Recirc inlet (N2) • Core spray (N5)	Pressure boundary	Stainless steel	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA—metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
~~Thermal sleeves • Feedwater inlets (N4)~~	~~Pressure boundary~~	~~Stainless steel and Nickel-based alloy~~	~~Treated water >270°F (int)~~	~~Cracking—fatigue~~	~~TLAA—metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	A	Deleted entire line – Feedwater inlet thermal sleeves are not welded to nozzles and are not subject to aging management review (See audit items 209 and 291).
Weld • SLC nozzle to safe end weld (N10)	Pressure boundary	Nickel-based alloy	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA—metal fatigue~~	~~IV.A1-7 (R-04)~~	~~3.1.1-2~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Penetrations Program in following entry of line.
Table 3.1.2-2 Reactor Vessel Internals									
Control rod guide tubes • Tubes	Support for Criterion (a)(1) equipment	Stainless steel	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Control rod guide tubes • Bases	Support for Criterion (a)(1) equipment	CASS	Treated water >482°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Core plate • Plate, beams • Blocks, plugs, • Alignment assemblies	Support for Criterion (a)(1) equipment	Stainless steel	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Core spray lines	Flow distribution	Stainless steel	Treated water >270°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Fuel support pieces • Orificed supports • Peripheral supports	Support for Criterion (a)(1) equipment	CASS	Treated water >482°F (int)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Incore dry tubes	Pressure boundary	Stainless steel	Treated water >270°F (ext)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Incore guide tubes	Pressure boundary	Stainless steel	Treated water >270°F (ext)	~~Cracking—fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Jet pump assemblies • Risers, riser braces • Riser hold down bolts • Mixer barrels and adapters • Restraint brackets, wedges, bolts • Diffusers and tailpipes • Adapter upper rings	Floodable volume	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Jet pump assemblies • Hold-down beams • Adapter lower ring	Floodable volume	Nickel-based alloy	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Jet pump castings • Transition piece • Inlet elbow/ nozzle • Mixer flange and flare • Diffuser collar	Floodable volume	CASS	Treated water >482°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Shroud	Floodable volume	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Shroud support • Ring, cylinder, and legs • Access hole cover	Support for Criterion (a)(1) equipment	Nickel-based alloy	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Top guide assembly	Support for Criterion (a)(1) equipment	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA-metal fatigue~~	~~IV.B1-14 (R-53)~~	~~3.1.1-5~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Vessel Internals Program in following entry of line.
Table 3.1.2-3: Reactor Coolant System Pressure Boundary									
Detector (CRD)	Pressure boundary	Stainless steel	Treated water >270°F (int)	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	A	Aging effect entry for component line deleted – Cracking managed by One-Time Inspection Program in previous entry of line.
Drive (CRD)	Pressure boundary	Stainless steel	Treated water ~~>270°F (int)~~	~~Cracking – fatigue~~	~~TLAA – metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	A	Environment for this component line changed. CRD drive temperatures maintained below threshold for fatigue. Aging effect entry for component line deleted.

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Pump casing and cover (RR)	Pressure boundary	CASS	Treated water >482°F (int)	~~Cracking—fatigue~~	~~TLAA—metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	A	Aging effect entry for component line deleted – Cracking managed by BWR Stress Corrosion Cracking and Inservice Inspection Programs in preceding entry of line.
Restrictors (MS)	Flow control	CASS	Treated water >482°F (int)	~~Cracking—fatigue~~	~~TLAA—metal fatigue~~	~~IV.C1-15 (R-220)~~	~~3.1.1-3~~	~~A~~	Aging effect entry for component line deleted – Cracking managed by One-Time Inspection Program in preceding entry of line.

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
Table 3.2.2-1: Residual Heat Removal System									
~~Heat exchanger (shell)~~	~~Pressure boundary~~	~~Carbon steel~~	~~Treated water >270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~V.D2-32 (E-10)~~	~~3.2.1-1~~	~~C~~	Line deleted. See next line.
Heat exchanger (shell)	***Pressure boundary***	***Carbon steel***	***Treated water >270°F (int)***	***Cracking***	***One-Time Inspection***	***V.D2-32 (E-10)***	***3.2.1-1***	***E***	New line item.
~~Heat exchanger (tubes)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water >270°F (ext)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~C~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
~~Heat exchanger (tubes)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water >270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~C~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table
~~Pump casing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Treated water >270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~V.D2-32 (E-10)~~	~~3.2.1-1~~	~~A~~	Line deleted. See next line.
Pump casing	***Pressure boundary***	***Carbon steel***	***Treated water >270°F (int)***	***Cracking***	***One-Time Inspection***	***V.D2-32 (E-10)***	***3.2.1-1***	***E***	New line item.
Table 3.2.2-4: High Pressure Coolant Injection System									
~~Turbine casing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Steam > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VIII.B2-5 (S-08)~~	~~3.4.1-1~~	~~C~~	Line deleted. See next line.
Turbine casing	***Pressure boundary***	***Carbon steel***	***Steam > 270°F (int)***	***Cracking***	***One-Time Inspection***	***VIII.B2-5 (S-08)***	***3.4.1-1***	***E***	New line item.
Table 3.2.2-5: Reactor Core Isolation Cooling									
~~Turbine casing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Steam > 220°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VIII.B2-5 (S-08)~~	~~3.4.1-1~~	~~C~~	Line deleted. See next line.
Turbine casing	***Pressure boundary***	***Carbon steel***	***Steam > 220°F (int)***	***Cracking***	***One-Time Inspection***	***VIII.B2-5 (S-08)***	***3.4.1-1***	***E***	New line item.
3.3.2-13-36: Reactor Water Clean-Up System									
~~Heat exchanger (shell)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~C~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table

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Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes	Change Description
~~Pump casing~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~A~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table
~~Tank~~	~~Pressure boundary~~	~~Stainless steel~~	~~Treated water > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~	~~VII.E3-14 (A-62)~~	~~3.3.1-2~~	~~A~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table
3.4.2-1: Main Condenser and MSIV Leakage Pathway									
~~Heat exchanger (tubes)~~	~~Pressure boundary~~	~~Stainless steel~~	~~Steam > 270°F (int)~~	~~Cracking-fatigue~~	~~Metal fatigue TLAA~~			~~H~~	Line deleted – Cracking managed by Water Chemistry Control – BWR augmented by One-Time Inspection in preceding line of table

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Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1						
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**	**Change Description**
3.2.1-1	Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA ***for most components. The One-Time Inspection Program manages cracking for components susceptible to fatigue with no TLAA.*** See Section 3.2.2.2.1.	Discussion modified as shown

Section 3.2.2.2.1 is revised as follows:

3.2.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management ***for components designed to ASME Code requirements,*** the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

Where fatigue damage is identified as an aging effect requiring management for components with no fatigue design requirements, the aging effect is managed by inspection. The One-Time Inspection program will manage cracking due to fatigue for these components.

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Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1						
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**	**Change Description**
3.4.1-1	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA ***for most components. The One-Time Inspection Program manages cracking for components susceptible to fatigue with no TLAA.*** See Section 3.4.2.2.1.	Discussion modified as shown

Section 3.4.2.2.1 is revised as follows:

3.4.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management ***for components designed to ASME Code requirements,*** the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

Where fatigue damage is identified as an aging effect requiring management for components with no fatigue design requirements, the aging effect is managed by inspection. The One-Time Inspection program will manage cracking due to fatigue for these components.

Entergy

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July 27, 2006

Docket No. 50-271
BVY 06-065
TAC No. MC 9670

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.

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
License Renewal Application, Amendment 6

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. The following attachments to the License Renewal Application Environmental Report enclosed with this letter are listed below:

- Attachment 1: LRA, Appendix E, Section 4.4, Revision 1.
- Attachment 2: LRA, Appendix E, Section 4.23, Reference List, Revision 1, Reference 4-21 added.
- Attachment 3: LRA, Appendix E, Attachment D, Revision 1, renewed NPDES Permits as listed on Attachment D cover sheet.

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

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 27, 2006.

Sincerely,

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

Attachments 1, 2 and 3.
cc: See next page

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BVY 06-065
Docket No. 50-271

Attachment 1

Vermont Yankee Nuclear Power Station

License Renewal Application

Amendment 6

Appendix E, Section 4.4, Revision 1

4.4 Heat Shock

4.4.1 Description of Issue

Heat shock (for all plants with once-through and cooling pond heat dissipation systems)

4.4.2 Findings from Table B-1, Appendix B to Subpart A

SMALL, MODERATE, or LARGE. Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants. See 10 CFR 51.53(c)(3)(ii)(B).

4.4.3 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(a) determinations and variance in accordance with 40 CFR 125, or equivalent state permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock.

4.4.4 Background

Based on the research literature, monitoring reports, and agency consultations, the potential for thermal discharges to cause thermal discharge effect mortalities is considered small for most plants. However, impacts may be moderate or even large at a few plants with once-through cooling systems. For example, thermal discharges at one plant are considered by the agencies to have damaged the benthic invertebrate and seagrass communities in the effluent mixing zone around the discharge canal; as a result, helper cooling towers have been installed to reduce the discharge temperatures. Conversely, at other plants it may become advantageous to increase the temperature of the discharge in order to reduce the volume of water pumped through the plants and thereby reduce entrainment and impingement effects. Because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions, this is a Category 2 issue for plants with once-through cooling systems. [Reference 4-11, Section 4.2.2.1.4]

4.4.5 Analysis of Environmental Impact

VYNPS utilizes a variable condenser cooling system which can be operated in a variety of configurations to maintain compliance with temperature discharge limits. The cooling system can be operated in a once-through configuration, a closed-cycle recirculating system utilizing cooling towers, or a combination of both, known as hybrid cycle mode. The plant withdraws cooling water from Vernon Pool at a maximum rate of approximately 360,000 gpm using a once-through cooling configuration. When the plant is operated in a closed-cycle configuration using both cooling towers, the amount of water pumped from Vernon Pool is reduced to about 10,000 gpm (22 cfs).

4.4.5.1 Temperature Limits

The operational mode of the plant cooling water system is related to calendar dates and ambient river temperatures as specified in VYNPS NPDES Permit VT0000264 (VDEC Permit No. 3-1199). An amendment to VYNPS's NPDES Permit was issued on March 30, 2006, to allow a 1°F increase in the thermal limitations during the period from June 16 through October 14. The amended permit is included as Attachment D, along with supporting documentation consisting of the Amended Fact Sheet and the Responsiveness Summary addressing comments received during the amendment proceeding. Entergy submitted a timely application for renewal of this NPDES permit on September 30, 2005, and therefore the permit does not expire until the application for its renewal has been finally acted upon.

VYNPS operates the condenser cooling water system in a once-through, recirculating, or hybrid configuration according to limits established for two of three periods of the year.

- During the period from May 16 through June 15, the increase in temperature above ambient at Station 3 shall not exceed the following limits provided in the following table. Although not necessary for operation after the extended power uprate, Entergy has applied for an amendment to the NPDES permit to allow a 1°F increase in the thermal discharge limits applicable to the summer period for river temperatures above 55°F and below 78°F.

River Temperature at Station 7 (upstream)	Increase Above Ambient at Station 3 (downstream)
>63°F	2°F
>59°F, ≤63°F	3°F
≥55°F, ≤59°F	4°F
<55°F	5°F

- During the period from June 16, through October 14, the increase in temperature above ambient at Station 3 shall not exceed the following limits..

River Temperature at Station 7 (upstream)	Increase Above Ambient at Station 3 (downstream)
>78°F	2°F
>63°F≤78°F	3°F
>59°F, ≤63°F	4°F
≤59°F	5°F

Further, during the period from June 16 through October 14, when the average hourly temperature at Station 3 equals or exceeds 85°F, VYNPS is required by the permit to reduce, as soon as possible, the thermal output of the discharge to the extent that the average hourly temperature at Station 3 does not exceed 85°F.

- During the period from October 15 through May 15, the discharge of cooling water to the river is permitted under the following standards:

  (1) When using once-through cooling, the temperature at Station 3 (downstream of Vernon Dam) shall not exceed 65°F;

  (2) The rate of temperature change shall not exceed 5°F/hr, and

  (3) The increase in temperature above ambient shall not exceed 13.4°F.

As discussed in Section 2.2, river flow at Vernon Dam is regulated to maintain a minimum sustained flow of 1,250 cfs, if sufficient flow is available. The theoretical maximum temperature increase from plant discharges is 12.9°F above ambient, when the river flow is 1,250 cfs. At this flow rate, the above temperature standards allow operation of the plant in a once-through cooling configuration from October 15 through May 15 when the river temperature is less than 52.1°F.

When the ambient water temperature is greater than 52.1°F, the temperature of the discharge can be reduced by using cooling towers. [Reference 4-10, Section 2.1]. Based on the operational and temperature limits in the VYNPS NPDES Permit that have been established to protect the water quality in the Connecticut River, the Vermont Agency for Natural Resources (VANR), which is the NPDES permitting agency in Vermont, has determined that the thermal impacts of cooling water discharges on aquatic biota are minimal or insignificant.

The NPDES permit is supported by a § 316(a) demonstration [Reference 4-21] submitted by Entergy and credited by the State of Vermont in granting the permit, substantive input from the New Hampshire Fish and Game Department and the U.S. Fish and Wildlife Service, and review by an independent third-party consultant for the VANR. Amended Fact Sheet at 3, 4. In approving the 1°F increase in the thermal limitations during the period from June 16 through October 14, the VANR concurred with the determination that the existing discharge under the thermal effluent limitations in effect at the time had resulted in "no appreciable harm" to the aquatic biota. Amended Fact Sheet at 4. The VANR also agreed that the amended limits would continue to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife during this period (Amended Fact Sheet at 4-5), as is required by section 316(a) of the Clean Water Act (33 U.S.C. § 1326(a)).

> The Applicant's predictive analysis for the Demonstration indicates that the approved temperature increase will create insignificant changes in the thermal structures of the receiving waters affected by the project's discharge and that as a result the use of the waters by all species will be maintained and protected.
>
> * * *
>
> The Agency has concluded that there will be no significant impact from the proposed discharge on the aquatic biota that are present in the area affected by the proposed discharge. The agency therefore agrees with

the Applicant's analysis that the use of the waters by all species present will be maintained and protected.

Amended Fact Sheet at 6-7.

4.4.5.2 Environmental Monitoring

Part IV of the discharge permit requires VYNPS to conduct environmental monitoring studies to assure the plant does not violate applicable water quality standards and is not adverse to fish and other wildlife that inhabit the Connecticut River. In addition to monitoring compliance with established temperature limits, the studies require annual monitoring of river flow rate, water quality, macroinvertebrates, larval fish, resident fish populations, anadromous fish (American shad and Atlantic salmon), and fish impingement. A copy of the most recent annual report is included in Attachment F [Reference 4-10]. Annual reports are reviewed by an Environmental Advisory Committee composed of agencies representing the states of Vermont, New Hampshire, Massachusetts, and the USFWS.

4.4.5.3 316(a) Demonstrations

VYNPS was originally permitted in 1973 to operate solely in closed-cycle cooling mode until determinations could be made concerning possible environmental impacts from the thermal discharge of a once-through cooling system. VYNPS operated in the closed-cycle mode until February 1974 when the first of several once-through cooling testing modes was begun.

There have been numerous technical reports prepared for VYNPS in support of previous thermal effluent limitations [Reference 4-821, Section 3.26.1]. The 316(a) demonstrations described the results of monitoring studies performed in the vicinity of the plant and examined the potential for adverse environmental impact due to the proposed changes in the thermal discharge limits. The demonstrations concluded that thermal discharge limits at VYNPS assure the protection and propagation of a balanced indigenous community of aquatic life in the Connecticut River [Reference 4-821, Section 5.20]. The result of these demonstrations is reflected in the NPDES Permit thermal discharge limits discussed in Section 4.4.5.1 above.

4.4.6 Conclusion

Although operational and temperature limits have been established in the station's NPDES permit to protect water quality in the Connecticut River, VYNPS has extensively studied the potential thermal impact of cooling water discharges on aquatic biota. Over 30 years of data collected on the Connecticut River support the conclusion that the plant does not have an adverse impact on fish or shellfish populations. Therefore, Entergy concludes that any impact on these populations from heat shock during the license renewal period would be SMALL and does not warrant further mitigation.

BVY 06-065
Docket No. 50-271

Attachment 2

Vermont Yankee Nuclear Power Station

License Renewal Application

Amendment 6

Appendix E, Section 4.23, References, Revision 1

4-13 NRC (U. S. Nuclear Regulatory Commission). 2001. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Arkansas Nuclear One, Unit 1. NUREG-1437, Supplement 3. Office of Nuclear Reactor Regulation, Washington, D.C. April 2001.

4-14 NRC (U. S. Nuclear Regulatory Commission). 2004a. Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Arkansas Nuclear One, Unit 2, NUREG-1437, Supplement 19, Washington, DC.

4-15 NRC (U.S. Nuclear Regulatory Commission). 2004b. Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues. NRR Office Instruction No. LIC-203, Revision 1, May 24, 2004.

4-16 SVPSB (State of Vermont Public Service Board). 2003. Petition of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. Pursuant to 30 V.S.A.§248, for a Certificate of Public Good to Modify Certain Generation Facilities, Prefiled Testimony of Sonja A. Schuyler on Behalf of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc., February 21, 2003.

4-17 USCDC (U.S. Center for Disease Control). 2004. Division of Parasitic Diseases.*Naegleria* Infection Fact Sheet. Accessed on the Internet on November 30, 2004 at http://www.cdc.gov/ncidod/dpd/parasites/naegleria/2004_PDF_Naegleria.pdf.

4-18 VAT (Vermont Agency of Transportation). 2004. Automatic Traffic Recorder History 1988 – 2003. Program Development Division, Traffic Research Unit, May 2004.

4-19 VYNPC (Vermont Yankee Nuclear Power Corporation). 1969. Vermont Yankee Nuclear Power Station Drawings B-191394 (115 kV Transmission System, S/C Type "D", 90xAngle & DE Tower, Load & Clearance Diagram), B-191402 (Sag and Tension Data, Location of Spans) and B-191404 (Sag and Tension Data for Spans 3, 4, 5 7 8), 1969.

4-20 VYNPC (Vermont Yankee Nuclear Power Corporation). 2002. Letter Agreement dated July 16, 2002, from Bruce Wiggett (Vermont Nuclear Power Corporation) to Bruce Davin (USGEN New England, Inc. c/o PG&E National Energy Group).

4-21 Normandeau Associates, Inc. 2004. 316(A) Demonstration in Support of a Request for Increased Discharge Temperature Limits at Vermont Yankee Nuclear Power Station During May through October, Prepared for Entergy Nuclear Vermont Yankee, April 2004.

BVY 06-065
Docket No. 50-271

Attachment 3

Vermont Yankee Nuclear Power Station

License Renewal Application

Amendment 6

Appendix E, Attachment D, Revision 1

Attachment D
Revision 1

- **VYNPS NPDES Final Amended Discharge Permit (VDEC Permit No. 3-1199), amended March 30, 2006.**
- **VYNPS NPDES Permit Fact Sheet (VDEC No. 3-1199), revised March 2006**
- **VYNPS NPDES Responsiveness Summary for Draft Amended Discharge Permit No. 3-1199 for Entergy Nuclear Vermont Yankee, March 2006.**

State of Vermont

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation

Wastewater Management Division
103 South Main Street - Sewing Bldg.
Waterbury, Vermont 05671-0405

Telephone: (802) 241-3822
Fax: (802) 241-2596
www.anr.state.vt.us/dec/ww/wwmd.cfm

Department of Fish and Wildlife
Department of Forests, Parks, and Recreation
Department of Environmental Conservation
State Geologist
RELAY SERVICES FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
1-800-253-0195 Voice>TDD

March 30, 2006

Ms Lynn DeWald
Entergy Nuclear Vermont Yankee, LLC
320 Governor Hunt Road
Vernon, VT 05354

Re: Final Amended Discharge Permit #3-1199

Dear Ms DeWald:

Enclosed is your copy of the above referenced permit, which has been signed by the Director of the Wastewater Management Division for the Commissioner of the Department of Environmental Conservation. Please read the permit carefully and familiarize yourself with all its terms and conditions. Your attention is particularly directed to those conditions which may require written responses by certain dates.

One change has been made to the final permit. In response to comments received during the public notice period, a 85° F upper temperature limit at downstream Station 3 during the period of June 16 through October 14 has been included. The condition requires that Entergy reduce the thermal output of the discharge to the extent that the average hourly temperature at Station 3 does not exceed 85° F.

As you are aware, Part IV – *Environmental Monitoring Studies, Connecticut River* of Entergy's NPDES Discharge Permit includes a section on the role of the Environmental Advisory Committee (EAC) in defining objective specific investigations for Entergy to complete. Conceptually a juvenile shad outmigration study has been discussed and agreed to during the application review period (see 7/9/04 Ken Cox memorandum, 8/16/04 Entergy letter, and 9/10/04 Versar review). In addition, US Fish and Wildlife Service and New Hampshire Fish and Game Department have reiterated the need for such studies via recent correspondence. EAC members will be meeting in the near future to begin developing this study plan.

If you have any questions concerning your permit, please contact Carol Carpenter at 241-3828.

Sincerely,

Brian D. Kooiker

Brian D. Kooiker, Chief
Discharge Permits Section

Enclosures

cc: EAC members (w/o enclosures)

Permit No. 3-1199
File No. 13-17
NPDES No. VT0000264
Project ID No. NS75-0006

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WASTEWATER MANAGEMENT DIVISION
103 SOUTH MAIN STREET
WATERBURY, VERMONT 05671-0405

AMENDED[1] DISCHARGE PERMIT

In compliance with the provisions of the Vermont Water Pollution Control Act, as amended, (10 V.S.A. Chap. 47 §1251 et. seq;) and the Federal Clean Water Act, as amended (33 U.S.C. §1251 et seq),

Entergy Nuclear Vermont Yankee, LLC
320 Governor Hunt Road
Vernon, VT 05354

(hereinafter referred to as the "permittee") is authorized, by the Secretary, Agency of Natural Resources, to discharge from a facility located at:

320 Governor Hunt Road
Vernon, Vermont

to the Connecticut River, Class B at the point of discharge

in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, III hereof.

This permit shall become effective on the date of signing

This permit and the authorization to discharge shall expire on March 31, 2006.

Signed this 30th day of March, 2006.

Received
MAR 31 2006
By Lyn Dewald

Jeffrey Wennberg, Commissioner
Department of Environmental Conservation

By Christine Thompson
Christine Thompson, Director
Wastewater Management Division

(1) *Amended sections (Part I.A.6.c. and Part IV. Trend Analysis) are italicized.*

Part I

A. EFFLUENT LIMITATIONS, MONITORING REQUIREMENTS, AND SPECIAL CONDITIONS

1. Through March 31, 2006, the permittee is authorized to discharge from outlet serial number S/N 001: Circulating water discharge - main condenser cooling water and service water. Such discharges shall be limited by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	lbs/day		Other units			
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.	Measurement Frequency	Sample Type
Flow: Open/Hybrid-Cycle				543 MGD	Daily	Calculated Flow
Closed Cycle				12.1 MGD	Daily	Calculated Flow
Temperature	see Part I.6.a-f, pp.4-5					
Free Residual Chlorine	(b)		0.2 mg/l		(c)	Grab
Total Residual Oxidant	(a)(b)		Monitor Only		(c)	Grab
pH		6.5 to 8.5 Standard Units			1 x daily	Grab (d)

The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving water.

Samples taken in compliance with the monitoring requirements specified above shall be collected at locations which are representative of the effluents discharged.

(a) Where "Total Oxidant" is chlorine, chlorine plus bromine, or bromine.
(b) Oxidant or chlorine injection is limited to discharge during closed cycle only and detectable residuals are not to exceed 2 hours/day with the exception that the service water system may be treated during open/hybrid cycle provided that treatment does not exceed 2 hours/day with no detectable oxidant being measured at the discharge structure.
(c) Monitoring is required during the period that oxidant, or chlorine, treatment is occurring. The duration of the treatment shall be reported for each treatment day in the monthly discharge monitoring report.
(d) A daily grab represents the minimum monitoring frequency. Continuous pH monitoring is acceptable and if utilized will require reporting daily minimum and maximum values on the monthly monitoring report.

2. Through March 31, 2006, the permittee is authorized to discharge from outfall serial number S/N 002: Radioactive liquid. Such discharges shall be limited by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Monthly Avg.	Daily Max.	Measurement Frequency	Sample Type
Flow		0.01 MGD	(a)	Estimate
Radioactivity	see Part 1.10.a-f., p. 8		(a)	see Part 1.10.a-f.
pH	6.5 to 8.5 Standard Units		(a)	Grab

The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving water.

Samples taken in compliance with the monitoring requirements specified above shall be collected at locations that are representative of the radioactive effluent discharge.

(a) Shall be monitored daily when the discharge occurs. When it is determined that a discharge of radioactive liquid wastewater is necessary, the permittee shall notify the Wastewater Management Division prior to the discharge or, if necessary, within 24 hours following the discharge.

3. Through March 31, 2006, the permittee is authorized to discharge from outfall serial number S/N 003: Plant Heating Boiler Blowdown. Such discharges shall be limited by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Monthly Avg.	Daily Max.	Measurement Frequency	Sample Type
Flow		0.001 MGD (a)	Each discharge	Estimate
BetzDearborn Control OS7700	(b)		No Monitoring Required	

The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving water.

Samples taken in compliance with the monitoring requirements specified above shall be collected before combining with other waste streams.

(a) Each of the two boilers may be drained of 0.002 MGD at the end of the heating season.
(b) See Part I.15.

4. Through March 31, 2006, the permittee is authorized to discharge from outfall serial number S/N 004: Water treatment carbon filter backwash. Such discharges shall be limited by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Monthly Avg.	Daily Max.	Measurement Frequency	Sample Type
Flow		0.010 MGD	(a)	Estimate
Total Suspended Solids		8.3 lbs.	No Monitoring Required	

The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving water.

(a) Shall be monitored daily when the discharge occurs.

5. Through March 31, 2006, the permittee is authorized to discharge from outfall serial number S/N 005: Cooling water discharge from the four RHR-Service Water pumps.

The permittee may discharge up to 46,500 gpd. No effluent limits or monitoring is required for this waste stream.

6. The permittee is required to operate its circulating water cooling facilities (S/N 001) whether closed, open, or in a hybrid mode as follows:

a. During the period **October 15 through May 15**:

i. The temperature at Station 3 shall not exceed 65°F.

ii. The rate of change of temperature at Station 3 shall not exceed 5°F per hour. The rate of change of temperature shall mean the difference between consecutive hourly average temperatures.

iii. The increase in temperature above ambient at Station 3 shall not exceed 13.4°F. The increase in temperature above ambient shall mean plant induced temperature increase as shown by equation 1.1 (defined on page 1-8 of Vermont Yankee's 316 Demonstration: Engineering, Hydrological and Biological Information and Environmental Impact Assessment (March 1978).

b. During the period **May 16 through June 15**, the increase in temperature above ambient at Station 3 shall not exceed the limits set forth in the following table:

Station 7 Temperature:	Increase in Temperature Above Ambient at Station 3:
Above 63°F	2°F
>59°F, ≤63°F	3°F
≥55°F, ≤59°F	4°F
Below 55°F	5°F

The increase in temperature above ambient shall mean plant induced temperature increase as shown by equation 1.1 (defined on page 1-8 of Vermont Yankee's 316 Demonstration: Engineering, Hydrological and Biological Information and Environmental Impact Assessment (March 1978).

c. *During the period June 16 through October 14, the increase in temperature above ambient at Station 3 shall not exceed the limits set forth in the following table:*

Station 7 Temperature:	*Increase in Temperature Above Ambient at Station 3:*
Above 78°F	*2°F*
>63°F, ≤ 78°F	*3°F*
>59°F, ≤63°F	*4°F*
≤59°F	*5°F*

The increase in temperature above ambient shall mean plant induced temperature increase as shown by equation 1.1 (defined on page 1-8 of Vermont Yankee's 316 Demonstration: Engineering, Hydrological and Biological Information and Environmental Impact Assessment (March 1978).

Notwithstanding the temperature limits in table 6.c. above, when the average hourly temperature at Station 3 equals or exceeds 85°F, the permittee shall, as soon as possible, reduce the thermal output of the discharge to the extent that the average hourly temperature at Station 3 does not exceed 85°F.

d. Experimental open/hybrid cycle test programs with alternative thermal limits (to 6a., 6b. and 6c. above) may be administered as approved by the Vermont Yankee Environmental Advisory Committee (defined in Part I.11.) and which receive written authorization from the Secretary of the Agency of Natural Resources.

e. During power operation, if an unexpected failure results in a complete loss of the cooling tower system, the above restrictions may be modified for a period not to exceed 24 hours to allow an orderly shutdown by utilizing the main condenser as a heat sink and operating in an open-cycle mode. The cooling tower system includes all auxiliary components required for cooling tower operation.

f. Notwithstanding the above, the Secretary may reopen and modify the permit to incorporate more stringent effluent limitations for control of the thermal component of Entergy Nuclear Vermont Yankee's discharge, including the requirements of closed-cycle operation, if the Secretary determines that open-cycle operation is having an adverse effect in resident or anadromous fish species in the river. Entergy Nuclear Vermont Yankee will be given notice and opportunity for a hearing prior to the imposition of such more stringent effluent limitations.

7. Through March 31, 2006, the permittee is authorized to discharge from outfall serial numbers S/N 006, 007, 008, 010, 011: Stormwater runoff; and demineralized trailer rinse down water (S/N 006 only).

006 - North Storm System Discharge Point: to the north of the intake structure.
007 - South Storm System Discharge Point: to the forebay of the discharge structure; includes discharges from S/N 003, S/N 004 and S/N 005.
008 - Southeast Storm System Discharge Point: to the southeast of the east cooling tower.
010 - 345 kV Switchyard Storm System Discharge Point: about 300 yards north of the intake structure.
011 - 115kV Switchyard Storm System Discharge Point: about 350 yards north of the intake structure.

Effluent limits and monitoring are not required for the stormwater discharges; however, future storm drain and manhole construction shall conform to the Agency's policy for stormwater treatment.

The permittee is authorized to discharge demineralized trailer rinse down water to the stormdrain system (S/N 006). The permittee may discharge up to 10,000 gpd. No effluent limits or monitoring is required for this waste stream.

8. Through March 31, 2006, the permittee is authorized to discharge from outfall serial number S/N 009: Strainer and traveling screen backwash.

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Monthly Avg.	Daily Max.	Measurement Frequency	Sample Type
Flow		0.050 MGD	(a)	Estimate
Bulab 8006	(b)		No Monitoring Required	

The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving water.

Samples taken in compliance with the monitoring requirements specified above shall be collected before combining with other waste streams.

(a) Shall be monitored daily when the discharge occurs.
(b) See Part I.15.

9. The permittee will conduct an environmental monitoring program to measure and record physical, chemical, and biological data to assure compliance with the requirements of this permit in accord with Part IV of this permit: Environmental Monitoring Studies, Connecticut River. The permittee shall submit an annual report by May 31 of each year to the Secretary of the Agency of Natural Resources and the Environmental Advisory Committee.

10. All radioactive liquid waste collected in the plant will be processed through a treatment system, including filtering and/or demineralization, and the liquid will be processed and disposed of in accordance with the Nuclear Regulatory Commission Regulations. Low level radioactive wastes may be released to the Connecticut River after treatment pursuant to Final Safety Analysis Report, Volume 111, Section 9.2; Station Radioactive Liquid Waste System, Vermont Yankee Nuclear Power Station, as amended, subject to the following restrictions:

    a. The maximum instantaneous concentration of radionuclides in liquid effluents released to the unrestricted environment shall not exceed the limits specified in 10 CFR Part 20.1001 - 20.2401, Appendix B, Table 2, including applicable notes thereto.
    b. The maximum annual quantity of radionuclides, except tritium, in liquid effluents released to the unrestricted environment shall not exceed five (5) curies.
    c. The maximum annual quantity of tritium in liquid effluents released to the unrestricted environment shall not exceed five (5) curies.
    d. The dose or dose commitment to a member of the public from radionuclides in liquid effluents released to the unrestricted environment shall be limited to the following:
        i. During any calendar quarter: less than or equal to 1.5 millirems to the total body, and less than or equal to 5 millirems to any organ.
        ii. During any calendar year: less than or equal to 3 millirems to the total body, and less than or equal to 10 millirems to any organ.
    e. The permittee shall report to the Agency of Natural Resources any abnormal releases of radioactivity in liquid effluents in a manner and timeframe consistent with Nuclear Regulatory Commission requirements.
    f. The permittee shall monitor and report concentrations, quantities, and calculated doses of gamma radionuclides and tritium in liquid effluents released to the Connecticut River and report such data to the Agency of Natural Resources. Other radionuclides shall be reported to the Agency of Natural Resources in a manner consistent with the reports submitted to the Nuclear Regulatory Commission.

11. An Environmental Advisory Committee (EAC) is comprised of one individual each representing (1) Vermont Department of Environmental Conservation; (2) Vermont Department of Fish and Wildlife; (3) New Hampshire Fish and Game Department; (4) New Hampshire Department of Environmental Services; (5) Massachusetts Office of Watershed Management; (6) Massachusetts Division of Fisheries and Wildlife; and, (7) Coordinator of the Connecticut River Anadromous Fish Program, U.S. Fish and Wildlife Service. The EAC shall be advisory in function and Entergy Nuclear Vermont Yankee, LLC shall meet with the EAC as often as necessary, but at least annually, to review and evaluate the aquatic environmental monitoring and studies program. The Entergy Nuclear Vermont Yankee, LLC Chemistry Manager or designee will serve as the administrative coordinator and Secretary for the EAC.

12. The temperature probe in the Vernon fishway shall be compatible with the temperature monitoring system utilized at Stations 3 and 7 in the Connecticut River.

13. Racks and screens preventing fish and other wildlife from entering the condenser water intake must be operated and maintained in a manner as previously approved by the Vermont Water Resources Board. Solids collected on the traveling screen shall not be returned to the Connecticut River.

14. The permittee is authorized to pump river silt, as necessary, that deposits in the intake structure and cooling tower basins, in the form of a silt-water slurry to be deposited on land on the plant site in the sedimentation area. Slurry volumes to be pumped shall not exceed 0.500 MGD or 350 gpm. River sediment/silt will be pumped from the West Cooling Tower into the existing spray pond where it will be passively filtered to reduce turbidity before the water portion is routed to the discharge structure. The remaining sediment will be removed form the spray pond and disposed of properly in accordance with state and federal statutes and regulations.

15. The permittee is authorized to use either the following chemicals, or chemicals which are similar in composition, concentration, and toxicity, to the maximum concentrations indicated below. An increase in dosage rate or a substantial change in the chemicals identified must be reviewed and approved by the Department to assure that no adverse impact will occur. A substantial change in chemicals shall be defined as chemicals that are not similar in composition, concentration, and toxicity to those identified. A change of chemical vendors will require, as a minimum, a submittal of the appropriate MSDS, prior to use of the chemical, to the Wastewater Management Division of the Department.

Bulab 8006: penetrant/biodispersant for use in minimizing and removing fouling within the Service Water System; maximum concentration 20 ppm.

Bulab 7034 or Depositrol BL5303: general corrosion inhibitors for use in service water or circulating water; maximum concentration 30 ppm.

Bulab 9027 or Inhibitor AZ8103: copper corrosion inhibitors for use in the circulating water for condenser corrosion control. Maximum concentration for Bulab 9027 is 10 ppm. Maximum concentration for Inhibitor AZ8103 is 50 ppm (used monthly for a 10 minute period).

Dianodic DN2301: a dispersant for use in the circulating and service water systems; maximum concentration 20 ppm.

Ondeo Nalco H-550 or Spectrus NX-1104: a biocide for use in service waters as an alternative or in addition to bromine/chlorine. The use of these chemicals must be controlled such that the discharge concentration to the Connecticut River of either chemical is maintained at less than 2.0 ppm.

Cortrol OS7700: an oxygen scavenger and pH control agent containing hydroquinone as the oxygen scavenger. Use concentration varies from approximately 100 ppm to 2,000 ppm. Boiler discharges are limited to 15 ppm as hydroquinone.

Ferroquest FQ7101: a chemical for use in the service water system to correct biological/corrosion fouling with the service water pumps. The maximum concentration is

96 ppm for one minute approximately eight times per year.

Ferroquest FQ7102: a pH control agent. Less than two gallons are used to maintain a neutral pH when using FQ 7101. The maximum concentration is 7 ppm for one minute approximately eight times per year.

Oxidizing biocides (chlorine or chlorine with bromine) for treatment of the Service Water System (SWS)

a. Open/hybrid cycle, treatment of the SWS shall not exceed 2 hours per day with no detectable free residual oxidant being measured at the discharge structure (S/N 001).

b. Closed cycle, free residual oxidant as measured at the discharge structure (S/N 001) is limited to 0.2 mg/l and detectable residual oxidant shall not exceed 2 hours per day.

16. There shall be no discharge of polychlorinated biphenyl compounds, such as those commonly used for transformer fluids.

17. There shall be no discharges of metal cleaning waste including wastewater from chemical cleaning of boiler tubes, air preheater washwater, and boiler fireside washwater.

B. REAPPLICATION

If the permittee desires to continue to discharge after the expiration date of this permit, the permittee shall apply on the application forms then in use at least 180 days before the permit expires.

Reapply for a Discharge Permit by **September 30, 2005.**

C. OPERATING FEES

This discharge is subject to operating fees. The permittee shall submit the operating fees in accordance with the procedures provided by the Secretary.

D. MONITORING AND REPORTING

1. **Sampling and Analysis**

The sampling, preservation, handling, and analytical methods used shall conform to regulations published pursuant to Section 304(g) of the Clean Water Act, under which such procedures may be required. Guidelines establishing these test procedures have been published in the Code of Federal Regulations, Title 40, Part 136 (Federal Register, Vol. 56, No. 195, July 1, 1999 or as amended).

Samples shall be representative of the volume and quality of effluent discharged over the sampling and reporting period. All samples are to be taken during normal operating hours. The permittee shall identify the effluent sampling location used for each discharge.

2. Reporting

The permittee is required to submit monitoring results as specified on a Discharge Monitoring Report (Form WR-43). Reports are due on the 15th day of each month, beginning with the month following the effective date of this permit.

If, in any reporting period, there has been no discharge, the permittee must submit that information by the report due date.

Signed copies of these, and all other reports required herein, shall be submitted to the Secretary at the following address:

Agency of Natural Resources
Department of Environmental Conservation
Wastewater Management Division
103 South Main Street
Waterbury, Vermont 05671-0405

All reports shall be signed:

a. In the case of corporations, by a principal executive officer of at least the level of vice president, or his/her duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the permit form originates;

b. In the case of a partnership, by the general partner;

c. In the case of a sole proprietorship, by the proprietor;

d. In the case of a municipal, state, or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

3. Recording of Results

The permittee shall maintain records of all information resulting from any monitoring activities required including:

a. The exact place, date, and time of sampling;
b. The dates and times the analyses were performed;
c. The person(s) who performed the analyses;
d. The analytical techniques and methods used including sample collection, handling, and preservation techniques;
e. The results of all required analyses;
f. The records of monitoring activities and results, including all instrumentation and calibration and maintenance records;
g. The original calculation and data bench sheets of the operator who performed analysis of the influent or effluent pursuant to requirements of Section I.A of this permit.

The results of monitoring requirements shall be reported (in the units specified) on the Vermont reporting form WR-43 or other forms approved by the Secretary.

4. Additional Monitoring

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

PART II

A. MANAGEMENT REQUIREMENTS

1. Facility Modification / Change in Discharge.

All discharges authorized herein shall be consistent with the terms and conditions of this permit. Such a violation may result in the imposition of civil and/or criminal penalties as provided for in Section 1274 and 1275 of the Vermont Water Pollution Control Act. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new permit application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. Noncompliance Notification

In the event the permittee is unable to comply with any of the conditions of this permit due among other reasons, to:

a. breakdown or maintenance of waste treatment equipment (biological and physical-chemical systems including, but not limited to, all pipes, transfer pumps, compressors, collection ponds or tanks for the segregation of treated or untreated wastes, ion exchange columns, or carbon absorption units),

b. accidents caused by human error or negligence, or

c. other causes such as acts of nature,

the permittee shall notify the Secretary within 24 hours of becoming aware of such condition or by the next business day and shall provide the Secretary with the following information, in writing, within five (5) days:

i. cause of non-compliance

ii. a description of the non-complying discharge including its impact upon the receiving

water;

iii. anticipated time the condition of non-compliance is expected to continue or, if such condition has been corrected, the duration of the period of non-compliance;

iv. steps taken by the permittee to reduce and eliminate the non-complying discharge; and

v. steps to be taken by the permittee to prevent recurrence of the condition of non-compliance.

3. Operation and Maintenance

All waste collection, control, treatment. And disposal facilities shall be operated in a manner consistent with the following:

a. The permittee shall, at all times, maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit; and

b. The permittee shall provide an adequate operating staff which is duly qualified to carry out the operation, maintenance, and testing functions required to insure compliance with the conditions of this permit.

4. Quality Control

The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at regular intervals to ensure accuracy of measurements or shall ensure that both activities will be conducted.

The permittee shall keep records of these activities and shall provide such records upon request of the Secretary.

The permittee shall analyze any additional samples as may be required by the Agency of Natural Resources to ensure analytical quality control.

5. Bypass

The diversion or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except where authorized under terms and conditions of an emergency pollution permit issued pursuant to 10 V.S.A. Section 1268.

6. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to waters of the State resulting from non-compliance with any condition specified in this permit, including accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, and shall be submitted to Department representatives upon request. This period shall be extended during the course of unresolved litigation regarding the discharge of pollutants or when requested by the Secretary.

8. Solids Management

Collected screenings, sludges, and other solids removed from liquid wastes shall be stored, treated and disposed of in accord with the terms and conditions of any certification, interim or final, transitional operation authorization or order issued pursuant to 10 V.S.A., Chapter 159 that is in effect on the effective date of this permit or is issued during the term of this permit.

9. Emergency Pollution Permits

Maintenance activities, or emergencies resulting from equipment failure or malfunction, including power outages, which result in an effluent which exceeds the effluent limitations specified herein, shall be considered a violation of the conditions of this permit, unless the permittee immediately applies for, and obtains, an emergency pollution permit under the provisions of 10 V.S.A., Chapter 47, Section 1268. The permittee shall notify the Department of the emergency situation within 24 hours.

10 V.S.A., Chapter 47, Section 1268 reads as follows:

"When a discharge permit holder finds that pollution abatement facilities require repairs, replacement, or other corrective action in order for them to continue to meet standards specified in the permit, he may apply in the manner specified by the Secretary for an emergency pollution permit for a term sufficient to effect repairs, replacements or other corrective action. The permit may be issued without prior public notice if the nature of the emergency will not provide sufficient time to give notice; provided that the Secretary shall give public notice as soon as possible but in any event no later than five days after the effective date of the emergency pollution permit. No emergency pollution permit shall be issued unless the applicant certifies and the Secretary finds that:

(1) there is no present, reasonable alternative means of disposing of the waste other than by discharging it into the waters of the State during the limited period of time of the emergency;

(2) the denial of an emergency pollution permit would work an extreme hardship upon the applicant;

(3) the granting of an emergency pollution permit will result in some public benefit;

(4) the discharge will not be unreasonably harmful to the quality of the receiving waters;

(5) the cause or reason for the emergency is not due to willful or intended acts or omissions

of the applicant."

Application shall be made to the Secretary of the Agency of Natural Resources, Department of Environmental Conservation, Wastewater Management Division, 103 South Main Street, Waterbury, Vermont 05671-0405.

10. Power Failure

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. Provide an alternative power source sufficient to operate the wastewater control facilities; or, if such alternative power source is not in existence,

b. Halt, reduce, or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall permit the Secretary or authorized representative, upon presentation of proper credentials:

a. to enter upon the permittee's premises where an effluent source or any records required to be kept under the terms and conditions of this permit are located; and

b. to have access to and copy any records required to be kept under the terms and conditions of this permit;

c. to inspect any monitoring equipment or method required in this permit; or

d. to sample any discharge of pollutants.

2. Transfer of Ownership or Control

This permit is not transferable without prior written approval of the Secretary. All application and operating fees must be paid in full prior to transfer of this permit. In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall provide a copy of this permit to the succeeding owner or controller and shall send written notification of the change in ownership or control to the Secretary. The permittee shall also inform the prospective owner or operator of their responsibility to make an application for transfer of this permit. This application must include as a minimum; a written statement from the prospective owner or operator certifying:

a. The conditions of the operation that contribute to, or affect, the discharge will not be materially different under the new ownership.

b. The prospective owner or operator has read and is familiar with the terms of the permit and agrees to comply with all terms and conditions of the permit.

c. The prospective owner or operator has adequate funding to operate and maintain the treatment system and remain in compliance with the terms and conditions of the permit.

d. The date of the sale or transfer of the business.

The Department may require additional information dependent upon the current status of the facility operation, maintenance, and permit compliance.

3. Confidentiality

Pursuant to 10 V.S.A. 1259(b):

"Any records, reports or information obtained under this permit program shall be available to the public for inspection and copying. However, upon a showing satisfactory to the secretary that any records, reports or information or part thereof, other than effluent data, would, if made public, divulge methods or processes entitled to protection as trade secrets, the secretary shall treat and protest those records, reports or information as confidential. Any records, reports or information accorded confidential treatment will be disclosed to authorized representatives of the state and the United States when relevant to any proceedings under this chapter."

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. Toxic Effluent Standards

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307 (a) of the Federal Clean Water Act for a toxic pollutant which is present in the discharge, and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, the secretary shall revise or modify the permit in accordance with the toxic effluent standard or prohibition and so notify the permittee.

6. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under 10 V.S.A. Section 1281.

7. Civil and Criminal Liability

Except as provided in permit conditions on Bypass (Part II, A. 5.), Power Failure (Part II, A. 10.), and Emergency Pollution Permits (Part II, A. 9.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Civil penalties as authorized under 10 V.S.A. §1274 and 10 V.S.A. §8010, shall not exceed $10,000 a day for each day of violation. Criminal penalties, as authorized under 10 V.S.A. §1275, shall not exceed $25,000 for each day of violation, imprisonment for up to six months, or both.

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

9. Property Rights

Issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

11. Authority

This permit is issued under authority of 10 V.S.A. Section 1259 which states that: "No person shall discharge any waste, substance, or material into waters of the State, nor shall any person discharge any waste, substance, or material into an injection well or discharge into a publicly owned treatment works any waste which interferes with, passes through without treatment, or is otherwise incompatible with those works or would have a substantial adverse effect on those works or on water quality, without first obtaining a permit for that discharge from the Secretary", and under the authority of Section 402 of the Clean Water Act, as amended.

PART III

A. OTHER REQUIREMENTS

This permit shall be modified, suspended or revoked to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

1. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

2. Controls any pollutant not limited in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Vermont Water Pollution Control Act then applicable.

B. DEFINITIONS

For purposes of this permit, the following definitions shall apply:

The Act - The Vermont Water Pollution Control Act, 10 V.S.A. Chapter 47.

Average - The arithmetic mean of values taken at the frequency required for each parameter over the specific period.

The Clean Water Act - The federal Clean Water Act, as amended.

Composite Sample - A sample consisting of a minimum of one grab sample per hour collected over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow over a normal operating day.

Daily Discharge - The discharge of a pollutant measured during a calendar day or any 24 hour period that reasonably represents the calendar day for purposes of sampling.

For pollutants with limitations expressed in pounds, the daily discharge is calculated as the total pounds of pollutants discharged over the day.

For pollutants with limitations expressed in mg/l, the daily discharge is calculated as the average measurement of the pollutant over the day.

Grab Sample - An individual sample collected in a period of less than 15 minutes.

Maximum Day (maximum daily discharge limitation) - The highest allowable "daily discharge" (mg/l, lbs., or gallons).

Mean - The mean value is the arithmetic mean.

Monthly Average (average monthly discharge limitation) - The highest allowable average of daily

discharges (mg/l, lbs., or gallons) over a calendar month, calculated as the sum of all daily discharges (mg/l, lbs.,or gallons) measured during a calendar month, divided by the number of daily discharges measured during that month.

NPDES - The National Pollutant Discharge Elimination System.

Secretary - The Secretary of the Agency of Natural Resources

Closed-Cycle Operation and Blowdown - The circulating water system mode in which water is circulated through the cooling towers to dissipate condenser heat. The only water discharged to the River during closed-cycle operation is the blowdown from the cooling towers except for minor leakage through the intake gates which is less than 1% of the circulating water flow. Blowdown refers to the water continuously removed from the cool side of the cooling tower collection basins to rid cooling towers of dissolved solids.

Instantaneous Maximum - A value not to be exceeded in any grab sample.

PART IV

ENVIRONMENTAL MONITORING STUDIES, CONNECTICUT RIVER

The environmental monitoring and studies specified in Part IV are intended to assure that the discharges authorized by this permit do not violate applicable Vermont Water Quality Standards and are not adverse to fish and other wildlife that inhabit the Connecticut River in and around the vicinity of Vernon.

In the event the US Fish and Wildlife Service determines that the field sampling activities as required in the **Larval Fish, Fish, Anadromous Fish,** and **Fish Impingement** sections of this permit may violate the applicable provisions of Endangered Species Act of 1973 as amended (16 USC 1531-43) the Agency, after consultation with other appropriate governing agencies, may direct the permittee to make changes and/or substitutions in the sampling protocol as required in this permit.

CONNECTICUT RIVER MONITORING

River Flow Rate

Frequency/Date: Once per hour - All months
Location: Vernon Dam
River flow data shall be tabulated based on data supplied by the Wilder Station.

Temperature

Frequency/Date: Once per hour - All months
Location: Stations 3 and 7
Water temperature shall be measured to within 0.1°F.

Frequency/Date: Once per hour - During fishway operation
Location: Vernon Fishway
Water temperature shall be measured to within 0.1°F. These data shall be collected only when the fishway is officially operating. Data shall be reported as hourly, daily, monthly means.

Water Quality Parameters

Frequency/Date: Once per month - All months
Location: Stations 3 and 7, and the Plant discharge
Water quality parameters shall be grab samples collected via monitor pumps or directly from the River for the following:

Parameter	Station 7	Discharge	Station 3
Total Copper, mg/l	*	*	*
Total Iron, mg/l	*	*	*
Total Zinc, mg/l	*	*	*

* *Monitoring required only if Entergy Nuclear Vermont Yankee is operating during the specified sample period.*

Macroinvertebrates

Macroinvertebrates shall be collected according to the following schedule:

Frequency/Date: June, August, and October (once each month)
Locations: Stations 2 and 3

Cage samplers shall be deployed in June, August, and October. Multiple samplers (minimum of three) should be set at each deployment. Physical characteristics at deployment sites should be standardized between stations to the greatest extent possible. Final sampling plan to be approved by the DEC.

Larval Fish

Larval fish shall be collected when the plant cooling water intake is operating in open/hybrid cycle according to the following schedule and methods:

Frequency/Date: Weekly - May through July 15
Location: Connecticut River adjacent to the plant intake

Collect three plankton net samples on the same day in each week. The net shall be deployed as close as possible to the intake allowing each sample to be representative of the water column, bottom to surface. The volume sampled shall be measured with a flow meter mounted near the net mouth and used to calculate the density of larval fish in each tow. Larval fish shall be identified to the lowest distinguishable taxonomic level and enumerated.

With the written concurrence of the Agency, the sampling method may be modified or replaced.

Fish

Fish shall be collected according to the following schedule and methods:

Frequency/Date: Monthly - May, June, September, and October
Locations: Connecticut River at Rum Point; Station 5; Station 4; N.H. Setback; 0.1 mile south of the Vernon Dam; Station 3; Stebbin Island; and, Station 2

Fish shall be collected at each location with boat mounted electrofishing gear. All fish caught shall be identified, enumerated to the lowest distinguishable taxonomic level, and measured for length and weight. A representative sample of American Shad and Atlantic Salmon shall be scaled for annuli determination of age. Catch-per-unit-of-effort (CPUE)

shall be calculated for each species sampled.

Anadromous Fish

Juvenile and adult American shad shall be monitored according to the following schedule:

Frequency/Date: Twice monthly - July through October
Locations: Connecticut River 0.1 mile south of Vernon Dam; Station 3; and Stebbin Island

Juvenile shad shall be collected at each location with boat mounted electrofishing gear. All captured juvenile American shad shall be identified, enumerated, and measured for length and weight. Catch-per-unit-of-effort shall be calculated.

Frequency/Date: Twice monthly - July through October
Location: Connecticut River between Vernon Dam and the confluence of the West River

Collect 20 beach seine hauls and 12 surface trawl tows (utilizing midwater trawl tow gear) per sampling event. All fish caught shall be identified, enumerated to the lowest distinguishable taxonomic level, and measured for length and weight. Catch-per-unit-of-effort shall be calculated for American shad.

Frequency/Date: Weekly - May 15 through June
Location: Vernon Fish Ladder

Adult American shad shall be sampled in the fish trap and enumerated, measured for length and weight and evaluated for sex and sexual condition. Scale samples shall be taken from each fish and used for annuli determination of age.

All sampling activities at the Vernon Fish Ladder are under the direction of the Vermont Department of Fish & Wildlife.

Fish Impingement

Impingement samples shall be collected when the plant cooling water intake is operating in open/hybrid cycle according to the following schedule and methods:

Frequency/Date: Weekly - April 1 through June 15; August 1 through October 31
Locations: Circulating water traveling screens

Prior to the start of each weekly sample, the three circulating water screens shall be backwashed and the debris removed. Debris shall be examined for American shad and Atlantic salmon. On the following day, the three circulating water screens shall be backwashed and the debris shall be

sorted to remove all impinged fish. Fish shall be identified to the lowest distinguishable taxonomic level, enumerated, measured for total length and weighed.

(When air temperatures are at freezing the permittee may be unable to rotate the traveling screens until the air temperature rises above freezing. In such cases, the scheduled sample may be collected once air temperatures have risen above freezing.)

Trend Analysis

Fish: The annual report required under Part I.A.9. shall include a time series trend analysis consistent with the non-parametric Mann-Kendall test that was used in the permittee's §316(a) Demonstration in Support of a Request for Increased Discharge Limits at Vermont Yankee Nuclear Power Station During May through October, dated April 2004 (Normandeau Associates). The trend analysis shall statistically test for significant ($p<0.05$) increasing or decreasing trends in the annual total catch per unit of effort for each of the nine representative important species collected since 1991 according to the schedule and methods required in the Fish section of Part IV.

Each year's annual report shall include a long term trend analysis. Specifically this shall include an analysis of the current and preceding years back through 1991.

Macroinvertebrates: The annual report required under Part I.A.9. shall include a time series trend analysis consistent with the non-parametric Mann-Kendall test that was used in the permittee's §316(a) Demonstration in Support of a Request for Increased Discharge Limits at Vermont Yankee Nuclear Power Station During May through October, dated April 2004 (Normandeau Associates). The trend analysis shall statistically test for significant ($p<0.05$) increasing or decreasing trends in the annual total catch per unit of effort (numbers of orgs/basket/30 days of deployment) for each of five macroinvertebrate abundance measures: total abundance; ephemeroptera; trichoptera; diptera; and crustacea. Analysis shall incorporate all rock basket data collected at stations 2 and 3 since 1996 according to the schedule and methods required in the Benthic Macroinvertebrate section of Part IV.

Standard Operating Procedures

Field sampling required as specified in the **Macroinvertebrates, Larval Fish, Fish, Anadromous Fish,** and **Fish Impingement** sections shall be performed according to approved Standard Operating Procedures. A Standard Operating Procedures Manual describing the field sampling activities shall be provided to the Agency for review and approval prior to the start of field sampling.

Atlantic salmon: The plant shall revert to closed cycle if the annual Atlantic salmon impingement limit as determined by the U.S. Fish and Wildlife Service, is exceeded and shall remain on closed cycle until June 15 of the current calendar year. If any anadromous Atlantic salmon are impinged, the Vermont Department of Fish and Wildlife shall be notified.

1. If Atlantic salmon are impinged, the frequency of impingement sampling shall increase to daily sampling when either of the following criteria are met:

a. when any daily impingement of Atlantic salmon exceeds 10% of the annual impingement limit or,

b. when 50% or more of the annual limit have been exceeded during the current year.

Daily impingement sampling shall continue until three consecutive daily samples have been collected and no Atlantic salmon obtained. Sampling frequency shall then revert to weekly sampling.

2. If the criteria listed above are not met, impingement sampling will remain on a weekly schedule.

The maximum number of Atlantic salmon which can be impinged by Entergy Nuclear Vermont Yankee, LLC during a calendar year is determined by:
Impinged Atlantic salmon limit = 0.001 x (smolt equivalents)

Smolt equivalents (SE) are defined as:

$$SE = SE_F + SE_P + SE_S + SE_N$$

where:

SE_F is defined as the total number of smolt equivalents available from fry plants upstream of Vernon Dam. This number is calculated by:

$SE_F = 0.0675$ x (two year previous fry)

Two year previous fry is defined as the total number of fry stocked upstream of the Vernon Dam two years previous.

SE_P is defined as the total number of smolt equivalents available from parr plants upstream of the Vernon Dam. This number is calculated by:

SE_P = [(0.25 x (yearling parr)) + (0.11 x (two-year previous under yearling)]

Yearling parr is defined as the total number of 1+ parr stocked upstream of the Vernon Dam during the previous calendar year.

Two-year previous under yearling parr is defined as the total number of 0+ parr stocked two years previous.

SE_S is defined as the total number of smolt equivalents available from smolt stocked upstream of Vernon Dam. This number is calculated by:

$SE_S = 1$ x (smolts stocked)

Smolts stocked is defined as the total number of smolts stocked upstream during the current monitoring year.

SE_N is defined as the total number of smolt equivalents available from natural reproduction upstream of Vernon Dam. This number is calculated by:

$SE_N = 0.58 \times 7000 \times 0.01 \times$ (adult salmon)

0.58 represents 58% of the run as female.
7000 represents the average number of eggs per female.
0.01 represents a 1% survival of eggs to the smolt stage.

Adult salmon is defined as the number of adult salmon passed through the Vernon Fishway three years previous.

American shad: The plant shall revert to closed cycle if the annual American shad impingement limit, as determined by the U.S. Fish and Wildlife Service, is exceeded and shall remain on closed cycle until November 15 of the current calendar year. If any anadromous American shad are impinged, the Vermont Department of Fish and Wildlife shall be notified.

1. If 50% or more of the annual limit have been exceeded during the current year, impingement sampling frequency shall increase to daily sampling upon the impingement of any American shad and continue until three consecutive daily samples not containing these fishes are obtained. Sampling would then revert back to weekly sampling.

2. If the above criterion is not met, impingement sampling shall remain on a weekly schedule.

The maximum number of American shad which can be impinged by Entergy Nuclear Vermont Yankee, LLC during a calendar year is determined by:

Impinged American shad limit = 1 x number of American shad

The number of American shad is defined as the number of American shad passed at the Vernon fish ladder or otherwise introduced above Vernon Dam during the calendar year.

Aquatic Biota Evaluation:

The above task-oriented monitoring program defines a minimal data collection study on the water quality and biota adjacent to the plant. In order to demonstrate that the operation of the plant assures the protection and propagation of a balanced and indigenous population of shellfish, fish and other wildlife, including their respective habitats, additional objective specific studies and data evaluation may be required. These additional study topics would be as a result of changes observed during the task-oriented program and/or Environmental Advisory Committee (EAC) concerns raised for fish or other biota.

The Vermont Department of Fish and Wildlife may, on its own volition or at the recommendation of the EAC, modify the fish sampling protocol if it has been determined that the impact on biota adjacent to the plant may be adversely affected or the protection and propagation of the biota is not likely to be assured. The modifications shall be made in writing and submitted to the DEC and Entergy Nuclear

Vermont Yankee, LLC.

Objective specific investigations would be defined and reviewed by the EAC annually. A draft proposal for the following years studies, if any, would be submitted by Entergy Nuclear Vermont Yankee, LLC to the EAC for review by October 1 of the current year. A progress report on studies conducted during the current year would be submitted by Entergy Nuclear Vermont Yankee, LLC to the EAC by February 1. Proposed changes to the draft proposal would by submitted by March 1.

Macroinvertebrate Investigation:
During 2002-03 the permittee shall complete a study on the macroinvertebrate populations in the Vernon Pool. Specifics of the study shall be coordinated between the Department of Environmental Conservation and Entergy Nuclear Vermont Yankee, LLC prior to commencement of the study.

The Department may amend this permit to include other specific EAC investigations.

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WASTEWATER MANAGEMENT DIVISION
103 SOUTH MAIN STREET
WATERBURY, VERMONT 05671-0405

FACT SHEET
(October 2005, revised March 2006)

AMENDED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

NPDES NO: VT0000264
FILE NO: 13-17
PERMIT NO: 3-1199
PROJECT ID NO: NS75-0006

NAME AND ADDRESS OF APPLICANT:

Entergy Nuclear Vermont Yankee
320 Governor Hunt Road
Vernon, VT 05302

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Entergy Nuclear Vermont Yankee
320 Governor Hunt Road
Vernon, Vermont

RECEIVING WATER: Connecticut River

CLASSIFICATION: Class B. Class B waters are suitable for bathing and recreation, irrigation and agricultural uses; good fish habitat; good aesthetic value; acceptable for public water supply with filtration and disinfection.

I. Proposed Action, Type of Facility, and Discharge Location

The above named applicant (Applicant) applied on February 20, 2003 to the Vermont Department of Environmental Conservation (Department) for an amendment of their permit to discharge into the designated receiving water. The Applicant is engaged in the operation of a nuclear electrical generating station. The discharge is from the outfall of the facility to the Connecticut River. The Department has made a decision to amend the discharge permit. The amendment approves a 1° F increase in the thermal discharge from the facility (S/N 001) at the compliance point downstream during the period of June 16 through October 14. The Applicant's request for increased thermal limitations during the period of May 16 through June 15 is denied as discussed below.

II. Description of Discharge

A quantitative description of the discharge in terms of significant effluent parameters is based on state and federal laws and regulations, the discharge permit application, and the recent self-monitoring data.

III. Limitations and Conditions

The effluent limitations of the S/N 001 discharge and the monitoring requirements may be found on the following pages of the permit:

Effluent Limitations:	Pages 2, 4, and 5 of 25
Monitoring Requirements:	Pages 2, 4, and 5 of 25

IV. Permit Basis and Explanation of Effluent Limitation Derivation for S/N 001

Facility Description and Background:
The Applicant owns and operates a nuclear power station in Vernon, Vermont. The facility is located on the west shore of Vernon Pool, an impoundment of the Connecticut River created by Vernon Dam. The dam and Vernon Station, a hydroelectric facility, are located approximately 0.75 miles downstream from the Vermont Yankee Nuclear Power Station (Facility). The Facility, which began operation in 1972, is classified as a Boiling Water Reactor (BWR) with a rated core thermal power level of 1593 MW, providing a gross electrical output of 537 MW. The remainder of the energy, 1056 MW, is removed as heat by the circulating water system as it passes by the condenser and discharges to the Connecticut River (S/N 001), or to the atmosphere via mechanical draft cooling towers.

The S/N 001 discharge is made up of the main condenser cooling water and service water. Open/Hybrid cycle flow is permitted at 543 MGD, daily maximum, and closed cycle flow is permitted at 12.1 MGD. This amendment does not propose a change in the flow limitations or any other limitations with the exception of temperature.

Description of Entergy's Permit Amendment Request:
The Applicant's February 20, 2003 application requested an amendment to the existing thermal effluent limitations which would allow it to increase the temperature of the Connecticut River by 1°F as determined at Station 3 (located 0.65 miles downstream from Vernon Dam) relative to upstream river temperatures (Station 7, approximately 4 miles upstream). This request was for the period May 16 through October 14 (summer period) only and does not affect the so-called winter period (October 15 through May 15).

The existing and requested thermal effluent limitations are listed below.

Existing Thermal Effluent Limitations:

Station 7 Temperature:	Increase in Temperature Above Ambient at Station 3:
Above 63° F	2° F
>59° F, ≤63° F	3° F
≥55° F, ≤59° F	4° F
Below 55° F	5° F

Requested Thermal Effluent Limitations:

Station 7 Temperature:	Increase in Temperature Above Ambient at Station 3:
Above 78°F	2°F
>63°F, ≤ 78°F	3°F
>59°F, ≤63°F	4°F
≤59°F	5°F

In support of its application, the Applicant submitted the following principle documents at the time of application as well as additional follow-up documentation to the Agency of Natural Resources' (Agency) requests for further information.

1. "§316(a) Demonstration In Support of a Request for Increased Discharge Temperature Limits at Vermont Yankee Nuclear Power Station During May Through October", dated April 2004, Normandeau Associates.

2. "Hydrothermal Modeling of the Cooling Water Discharge from the Vermont Yankee Power Plant to the Connecticut River", April 2004, Applied Science Associates, Inc.

3. Water temperature data pertaining to thermal conditions below the Vernon Dam during the period May 16 through October 14, 2004, Normandeau Associates (electronic copy).

4. "Adult American Shad Hourly Count Data and the Corresponding Hourly Water Temperature Data for the Vernon Dam Fishway on the Connecticut River, 1991-2001", January 2004 and March 2004, Normandeau Associates.

Legal and Regulatory Basis for ANR's Review:
The Agency's review of thermal discharges is governed by §316(a) of the Clean Water Act (CWA) and relevant portions of the Vermont Water Quality Standards, effective July 2, 2000 (VWQS). CWA §316(a) provides for the establishment of alternative thermal effluent limitations. EPA has adopted regulations pursuant to §316(a) at 40 CFR §125.70 through 125.73. 40 CFR §125.73 includes the "Criteria and standards for the determination of alternative effluent limitations under 316(a)" and §125.73(a) states that:

> "Thermal discharge effluent limitations or standards established in permits may be less stringent that those required by applicable standards and limitations if the discharger demonstrates to the satisfaction of the director that such effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife on the body of water into which the discharge is made."

For existing discharges, such as Entergy's, EPA's §316(a) regulations also provide for a retrospective analysis of the existing discharge. Specifically, 40 CFR §125.73(c)(1)(i) requires that any such retrospective analysis show:

> "That no appreciable harm has resulted from the normal component of the discharge (taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to a balanced, indigenous community

of shellfish, fish, and wildlife in and on the body of water into which the discharge is being made);"

Section 3-01 B.1. of the VWQS establishes temperature criteria for all state waters and establishes conditions for the assimilation of thermal wastes. Specifically, Section 3-01 B.1.d. Assimilation of Thermal Wastes states:

"The Secretary may, by permit condition, specify temperature limits that exceed the values specified above in order to authorize discharges of thermal wastes when it is shown that:

(1) The discharge will comply with all other applicable provisions of these rules;
(2) A mixing zone of 200 feet in length is not adequate to provide for assimilation of thermal waste; and
(3) After taking into account the interaction of thermal effects and other wastes, that the change or rate of change in temperature will not result in thermal shock or prevent the full support of uses or the receiving waters."

The Agency has also determined that Section 1-03 Anti-Degradation Policy is applicable to this application (see below for further discussion).

Findings of ANR's Review Process

The proposed changes to the thermal effluent limitations reflected in the draft permit are the result of the Agency's partial approval of the Applicant's 2004 §316(a) demonstration request. The Agency found that during the period from June 16 through October 14 the limits will "assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife". However the Agency could not make the same finding for the period May 16 through June 15 based on existing data.

The Agency's review of the application consisted of two parts consistent with the Applicant's submittals. First, the hydrothermal modeling was reviewed. The modeling was designed to predict the spatial and temporal changes in the Connecticut River as a result of requested increases in the thermal effluent limitations. Second, the Agency reviewed the §316(a) Demonstration Report which evaluated the impacts of the proposed temperature increases on the Connecticut River biota (Demonstration). Reviewers of the Applicant's submittals and application materials included staff from the Vermont Department of Fish and Wildlife and the Vermont Department of Environmental Conservation (Reviewers). In addition the Agency solicited and received substantive input from the New Hampshire Fish and Game Department and the US Fish and Wildlife Service throughout the course of the review. The Agency also selected Versar, a Maryland based third-party consultant to assist the Agency with its review. Due to their extensive experience in the review of §316(a) demonstration studies, Versar conducted an analysis and provided a report to the Agency on the hydrothermal modeling portion of the Demonstration.

The Reviewers concurred with the Applicant's retrospective analysis that the existing discharge, under the existing permitted thermal effluent limitations, resulted in "no appreciable harm" to the aquatic biota of the Connecticut River within the area influenced by the Applicant's thermal discharge during the period May 16 through October 14. However, in order to approve the requested increase in temperature a *predictive* determination also needed to be made that the proposed limits would "assure the protection

and propagation of a balanced indigenous population of shellfish, fish, and wildlife". The Reviewers agreed that the temperature increase would assure this balanced indigenous population during the period of June 16 through October 14 but concluded there was limited information regarding whether migrating salmon smolt would be impacted by the increased thermal effluent limitations during the period of May 16 through June 15, the later part of the smolt outmigration period. The Reviewers concluded that more information (i.e. actual field studies) was needed to make this determination and therefore the Agency has not granted this portion of the Applicant's amended request.

In addition, in response to comments received during the public notice period, the Agency has included a 85° F upper temperature limit at downstream Station 3 (the downstream monitoring station) during the period of June 16 through October 14. The condition will require that the permittee reduce the thermal output of the discharge to the extent that the average hourly temperature at Station 3 does not exceed 85° F.

In accordance with the VWQS, Section 1-01 B.1.d. the discharge must also not prevent the 'full support of uses' which is defined as "the achievement of the level of water quality necessary to consistently maintain and protect existing and designated uses." Designated uses are described in the Management Objectives for each class of water. For Class B waters, Section 3-04 A. Management Objectives of the VWQS includes the following designated uses: Aquatic Biota, Wildlife, and Aquatic Habitat; Aesthetics; Public water supply; Irrigation of crops and other agricultural uses; Swimming and other primary contact recreation; and Boating, fishing, and other recreational uses. The §316(a) Demonstration specifically documents that the use Aquatic Biota, Wildlife, and Aquatic Habitat is fully supported by the increase in thermal effluent limits. The Demonstration also indirectly addresses recreational fishing in that there will continue to be a balanced indigenous population of fish available for the angler. Based on the information provided to the Agency, it has made a determination that the proposed increase in thermal effluent limits will maintain a level of quality that fully supports all designated uses. In addition, at this time, the Secretary has not identified any uses in the area affected by the project that require designation as an existing use. All aquatic biota, aquatic habitat, wildlife, and recreational uses in the affected area will be maintained and protected. There are no uses such as recognized swimming holes or other unique recreational activities nor rare, threatened or endangered species that will be affected by the project that would warrant further consideration by the Secretary for designation as an existing use.

Anti-Backsliding: §402(o) of the Clean Water Act requires that a permit cannot be amended to contain effluent limitations that are less stringent than the comparable effluent limitations in the prior permit. §402(o)(2)(D) makes an exception from the general prohibition for less stringent effluent limitations when the permittee has received a modification pursuant to §316(a) of the Act.

As noted above, the Agency has reached a tentative decision to amend the Applicant's permit and made a finding that the Applicant's request meets the requirements for thermal discharges pursuant to §316(a) and Section 3-01 B.1.d of the VWQS and therefore the exception to the anti-backsliding requirements apply to this proposed discharge.

Antidegradation:

Section 1-03.B. Existing Uses

Section 1-03.B. of the Vermont Water Quality Standards requires that existing uses of waters and the level of water quality necessary to protect those existing uses shall be maintained and protected regardless of the water's classification. Determinations of what constitutes an existing use are made during the basin planning process or on a case-by-case basis during consideration of an application. Based on the information provided by the Applicant and further outlined below, the Agency has concluded that the proposed discharge meets the Policy established in Section 1-03.B. of the VWQS.

For purposes of the analysis, the area of the proposed discharge is defined as an approximately 1.5-mile segment of the Connecticut River that spans from the lower Vernon Pool to the Vernon Dam Tailwaters. The thermal discharge is located approximately 0.75 miles upriver from the Vernon Dam. The affected area spans to Station 3 (0.65 miles downstream from Vernon Dam).

Although the Applicant believes that an Anti-Degradation analysis is not required for the requested increase in thermal limits, at the Agency's request the Applicant presented an Anti-Degradation Policy Analysis. The Applicant's analysis considers each of the five factors that the Secretary must consider in the evaluation of existing uses and concludes that all existing uses will be maintained and protected. In doing so, the Applicant has assumed that all aquatic biota, wildlife, plant life, and recreational uses of the area affected by the discharge are existing uses. The Agency does not explicitly find herein that the mere presence of aquatic biota, wildlife, plant life, or incidental recreational use of a waterbody automatically constitutes an existing use. There are no uses such as recognized swimming holes or other unique recreational activities nor rare, threatened or endangered species that will be affected by the project that would warrant further consideration by the Secretary for designation as an existing use. However, the Agency does agree with the Applicant that all uses of the affected area whether designated as existing uses or recognized as designated uses for Class B waters will be maintained and protected for the summer period for which the Agency is granting amended thermal limits.

a. *Aquatic biota that utilize or are present in the waters;*

In support of this amendment, the Applicant examined the aquatic biota through the use of a retrospective and predictive demonstration project for the proposed discharge. In the development of this §316(a) Demonstration Project, the Applicant targeted representative important species (RIS) that were indicative of the overall ecological health of the aquatic biota and then analyzed the proposed discharge's affect on those RIS. The Applicant focused upon macroinvertebrate and fish communities in its demonstration and then drew inferences to the potential impacts to the wildlife and plankton communities. The Applicant's Demonstration provides a sound basis for the conclusion that there have been no adverse impacts from the existing thermal discharge on benthic macroinvertebrates or RIS. Most population levels and compositions have remained unchanged from 1991 to 2002 in the affected area and upstream in the unaffected area. Those fish species that have experienced a decline (juvenile American shad and White suckers) have experienced declines consistent with overall declines noted for the adjacent upstream Connecticut River and not in the waters only affected by the existing discharge. The Applicant's predictive

analysis for the Demonstration indicates that the approved temperature increase will create insignificant changes in the thermal structure of the receiving waters affected by the project's discharge and that as a result the use of the waters by all species present will be maintained and protected.

The Departments of Environmental Conservation and Fish and Wildlife from the State of Vermont, Department of Fish and Game from the State of New Hampshire, the United States Fish and Wildlife Service and a third party consultant with expertise in thermal and aquatic biota modeling from power plant discharges (Versar) reviewed the Demonstration. The Agency has concluded that the predictive Demonstration provided by the applicant reasonably assures a balanced aquatic community of fish and benthic macroinvertebrates.

The Agency has concluded that there will be no significant impact from the proposed discharge on the aquatic biota that are present in the area affected by the proposed discharge. The Agency therefore agrees with the Applicant's analysis that the use of the waters by all species present will be maintained and protected.

b. *Habitat that supports existing aquatic biota, wildlife, or plant life.*

An analysis of the waters has shown that biological growth in the area affected by the proposed discharge is generally limited by food and nutrients (as well as habitat considerations such as substrate) supplied more than by temperature and therefore there will be no significant enhancement of biological productivity.

Although some biota may be displaced temporarily from the area affected by the proposed temperature increase, these species are mobile and there is sufficient habitat available for use by the species so that the habitat required for these species is adequately available. The data provided by the Applicant on the retrospective use of the waters affected by the proposed discharge shows that the discharge has not significantly limited the habitat used by the aquatic biota, wildlife or plant life in the affected area.

The Agency has concluded that the affected area will continue to provide habitat that supports existing aquatic biota, wildlife, and plant life.

c. *The use of the waters for recreation or fishing*

Class B waters are designated to achieve and maintain the following uses: swimming and other primary contact recreational activities and boating, fishing and other recreational uses. VWQS Section 3-04.A.5. and 6.

The Agency has concluded that the proposed increase in thermal discharge will permit the waters to achieve and maintain their uses for swimming and other primary contact recreational activities to the extent that such activities are occurring. The Agency has also concluded that the proposed discharge will maintain and achieve the boating uses of the affected waters.

As described in paragraphs (a) and (b) above, based on the Agency's review of the Applicant's Demonstration, we have concluded that the receiving water will achieve and maintain its uses for fishing as a result of maintaining and protecting the uses for aquatic biota.

d. *The use of the waters for water supply, or commercial activity that depends directly on the preservation of an existing high level of water quality.*

The waters in the area of the proposed discharge are not used for water supply purposes and there is no commercial activity that directly depends on the preservation of an existing high level of water quality, therefore this subsection is not applicable to the proposed discharge.

e. *With regard to the factors considered under (a) and (b), evidence of the use's ecological significance in the functioning of the ecosystem or evidence of the use's rarity.*

The area affected by the proposed discharge serves as a transit corridor for migratory fishes, namely Atlantic salmon and American shad. The affected area is a transit corridor for Atlantic salmon, and the area is used by American shad as a spawning and nursery area during part of the first year of life until they emigrate downstream in the fall. Studies provided by the Applicant show that the population of American shad, while declining, is declining at a rate consistent with the decline above and below the discharge.

The receiving water does not contain any state or federally listed threatened or endangered species based on surveys from 1967 to 2000 and a recent specific search in 1997 for listed mussels. Although two listed species of mussels (the dwarf wedge mussel and the brook floater) occur in the Connecticut River, they do not occur in the area affected by the project. The triangle floater mussel, which is not threatened or endangered, does occur both upstream and downstream as well as in the affected area and has been subject to extensive monitoring by the Applicant.

A pair of nesting bald eagles was found in 1999 on Stebbins Island (located in New Hampshire) approximately 1.4 miles downstream from the Vermont Yankee facility. The bald eagle is federally listed as threatened and listed as endangered in Vermont. The bald eagle will not be impacted by the proposed thermal increase.

Based on the information provided by the Applicant and the information contained within the Demonstration, the Agency has concluded that the proposed discharge will not significantly affect the water's ecological significance or the rarity of this water and will not impact any use of the waters by rare, threatened or endangered species.

Section 1-03.C. High Quality Waters.

Waters whose existing ambient water quality exceeds the minimum water quality criteria are "high quality" and are therefore required to meet the standards contained in Section 1-03.C of the VWQS unless the discharge is determined to be insignificant. In determining whether a socioeconomic analysis is required for a discharge, the Agency examines whether the discharge will degrade a high quality water. In making the assessment for this proposed discharge, the Agency examined the following:

The proposed discharge will affect a nearly 1.5 mile span from the discharge to approximately Station 3. In the applicant's Demonstration, when examining the average operating condition (conditions occurring at least 50 percent of the time) the Applicant's Demonstration showed that approximately three percent of the Vernon Pool volume and approximately three percent of the bottom area will see a one degree F rise in temperature.

The Applicant's proposed discharge will be 81 degrees F for less than 14 hours between the June 16 and October 14 summer period.

The Agency has concluded that the magnitude, duration, and spatial extent of the proposed thermal discharge on the receiving waters and the expected impact on the aquatic biota as described above is insignificant and therefore does not require a socioeconomic analysis.

In examining the potential for the thermal discharge to increase pollutants or otherwise degrade the water quality of the segment, the Agency has determined that the proposed discharge will not have an affect on the amount of phosphorus in the River; the proposed increase will not have an affect on the levels of nitrates in the River; the proposed discharge will not have an affect on sludge deposits or solid refuse; the proposed discharge will not impact water taste, odor, or color; the proposed discharge will not affect toxic substances; the proposed discharge will not affect radioactive substances; the proposed discharge will not have an impact on turbidity in the waters; and the proposed discharge will not have an effect on the levels of *Escherichia coli*.

The Agency has concluded that the proposed discharge may result in slight but insignificant increases of plant, plankton and bacteria communities. These slight increases will have commensurately slight effects on the levels of settleable solids, floating or total suspended solids. The slight rise in biological activity may also have a slight or negligible affect on the alkalinity of the waters and the waters pH.

The increase in thermal levels in the waters affected by the proposed discharge will also have a slight effect on dissolved oxygen. Since there is an inverse relationship between temperature and the levels of dissolved oxygen that water is capable of holding, there will be a slight decrease in the levels of dissolved oxygen in the waters. The decrease, however, will be immeasurable.

The possible additive or synergistic effects of the pollutants associated with the activity in combination with other previously approved activities or the potential of the thermal discharge to stress sensitive biological resources such as indigenous species, rare species, and threatened and endangered species are insignificant.

While the Agency has concluded that the socio-economic balancing test is not necessary for this discharge because the discharge will not have significant impact on the water quality of the receiving waters, the Applicant has nevertheless provided information in support of that test. The Applicant asserts that its facility provides baseload unit of power in the Vermont market. In addition, this power source prevents Vermont from turning to the "spot market" during peak summer periods thereby preventing power purchases at a premium. Also, the Applicant asserts that it employs 495 permanent workers and 125 contractors at the Vermont facility. In addition to these permanent workers, every 18 months during refueling, the Applicant brings in between 600 to 1000 contractors to the area to refuel the reactors.

Most significantly for this analysis, this amendment allows less frequent operation of the Applicant's cooling towers. The operation of the cooling towers diverts 12 megawatts of power for transmission during the peak summer season. Reduced cooling tower use allows the facility's equipment to operate more efficiently and reduces wear on equipment.

When comparing the socioeconomic benefits of the Applicant's proposed discharge with the

insignificant effects that the proposed discharge will have on water quality and uses in the area, the Agency concludes that the requirements of Section 1-03.C.2. would be met if such an analysis was required.

V. Procedures for Formulation of Final Determinations

The public comment period for receiving comments on this draft amended permit was from October 24 through December 7, 2005. During the comment period interested persons submitted their written views on the draft permit. All written comments received by 4:30 PM on December 7, 2005 were retained by the Department and considered in the formulation of the final determination to issue, deny or modify the draft permit.

The Department also held a hearing on November 30, 2005 at the Brattleboro Middle School (All Purpose Room), 109 Sunny Acres Drive, Brattleboro, Vermont at 6:00 P.M. All statements, comments, and data presented at the public hearing were retained by the Department and considered in the formulation of the final determination to issue, deny, or modify the draft amended permit.

Comments received during the public notice period are responded to in the attached Responsiveness Summary.

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RESPONSIVENESS SUMMARY FOR
DRAFT AMENDED DISCHARGE PERMIT No. 3-1199
for
Entergy Nuclear Vermont Yankee

The above referenced draft amended permit was placed on public notice for comment from the period of October 24 through December 7, 2005. A hearing was held on November 30, 2005 in Brattleboro, Vermont. The draft permit proposed to amend the existing permit to include an increase in thermal effluent limitations during the period of June 16 through October 14.

Comments on the proposed permit were received during the November 30, 2005 public hearing and during the 45 day public notice period. The following is a summary of the relevant comments received and the Agency's responses to those comments. Similar comments were grouped together or combined into one comment. Comments received that were not relevant to the proposed amended permit were not responded to by the Agency. A copy of any or all comments received can be obtained by contacting the Agency's Wastewater Management Division at 802-241-3822.

1. **Comment:** The 316a Demonstration Report documents that the existing thermal discharge has had a negative impact on a wide range of species including American Shad, Atlantic Salmon, Spottail Shiner, Smallmouth Bass, Yellow Perch, Walleye, Largemouth Bass, Fallfish, White Sucker, and White Perch in the Connecticut River.

   Comment: The existing discharge has caused "appreciable harm" to the biological community in the Connecticut River.

   Comment: The Agency and Entergy say the American shad are at the same rate of decline, as sampled, above and below the discharge area. Therefore what is the harm if we throw some more hot water and chemicals at them? The error here is not to view the ecosystem as bumbling along in isolated species and individuals rather to view it as a whole system –interrelated and symbiotic.

   Response: The 316a Demonstration Report does not document that the existing thermal discharge has had a negative impact on any species. Data analyses presented in Entergy's 316a Demonstration Report show statistically significant population trends for four of the nine Representative Important Species (RIS) (American shad, smallmouth bass, walleye, white sucker) but do not show evidence of a detrimental thermal effect on the fish community. Trends for several species (smallmouth bass, walleye, white sucker) do not exhibit the consistency expected if these populations were responding to any thermal affects induced by Vermont Yankee's discharge. This suggests that the changes observed over the 12-year period (1991-2002) may be due to factors or mechanisms acting upon individual populations differently. These changes cannot be attributed to thermal affects. The Connecticut River is a complex biological system in structure and functional processes. This coupled with hydroelectric and nuclear power generation influences and the presence of both reservoir and riverine habitat add to the difficulty of teasing apart cause and effect sources solely related to the thermal discharge.

   The significant negative (decreasing) trend in American shad in lower Vernon pool does not demonstrate adverse affects as a result of the currently permitted thermal discharge. Shad trends based on electrofishing samples reflect the abundance of juvenile fish in the lower Vernon pool. At this time the abundance of adult fish in the river *above* Vernon dam is best measured by annual

passage counts through the Vernon ladder and has not indicated a significant decline that can be attributed to the discharge thermal regime.

Since 1993 total adult shad passage counts through the Vernon and Turners Falls fish ladders have followed similar declining trends. Total passage counts at Vernon in 1991 and 1992 were in excess of 30,000 fish per year, the highest count years for that facility on record. An ongoing problem with shad passage at the Turners Falls facility has been recognized and has been under study by Northeast Utilities and federal and state fishery agencies. Alternate fishway entrance designs have been tested and may have promise of improving passage there within the near future. Poor passage performance of the Cabot Station fish ladder is similarly being addressed. Adult shad passage at the Vernon ladder is in very large part a function of the numbers of fish passed above Turners Falls. Despite the decreasing Vernon passage trend, the Vernon ladder is thought to be an effective passage mechanism and has typically passed a high proportion (1991-2002 average 66.6%) of the shad passed above Turners Falls.

In addition to reduced numbers of spawning fish passed into Vernon pool, the sex ratio of the run through the ladder has been heavily skewed to males. The 10-year average (1990-2001, excluding 2000) is 79% males. This sex ratio is equivalent to the sex ratio at Turners Falls. The sex ratio of the adult shad run at the Holyoke fish lift was approximately 50:50. The cause of the sex ratios at Turners Falls is unknown, but it has been postulated that higher energetic costs to gravid female shad and possible size selectivity of the ladder designs may be factors. Both factors, reduced passage through the Turners Falls gatehouse ladder and a male dominated sex ratio, may account for the observed declining abundance of juvenile shad in Vernon pool. Based on the data Entergy has been required to collect and analyze, the data does not show that VY has caused prior appreciable harm.

Finally, shad trends have exhibited a regional decline since the peak passage counts at Vernon Dam in 1991 and 1992. The record adult shad runs occurred during the first two years of Vermont Yankee operating under their current thermal limits (although similar limits were included in the 1986 permit as part of an experimental program – Project S.A.V.E.). These years correspond with very high estimated run return years to the lower Connecticut River (1.2 million fish in 1991; 1.63 million in 1992). The 12-year (1981-1992) average return to the river was 1 million fish followed by a 12-year (1993-2004) average of 547,000 fish. Additionally, after 1990 commercial shad landings and stock abundance estimates for the Atlantic coast as a whole declined through 1995; thereafter, estimates have increased steadily. These data indicate declining shad abundance at Vernon may reflect larger issues affecting shad stocks regionally as well as run sizes entering the Connecticut River.

2. **Comment:** The 316a Demonstration fails to consider cumulative effects.

Comment: Entergy failed to conduct a cumulative assessment of the thermal impacts of the discharge together with "all other significant impacts on the species affected." Applicants must conduct such assessments as required under 40 CFR §125.73.

Response: The 316a Demonstration *has* considered cumulative effects as required under 40 CFR §125.73 which states "This demonstration must show that the alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of the balanced indigenous community...".

The discharge permit has required extensive ecological monitoring for over thirty years. This monitoring by its very nature includes the assessment of other sources (including the Vermont Yankee cooling water intake structure) upstream of the Vermont Yankee discharge. The 2004 Demonstration assessed the monitoring data from the 1990's through 2002 (i.e. data not included in the previous 1978 and 1990 demonstrations). That assessment indicated the absence of prior appreciable harm, and the Agency agreed, during the annual period of June 16 – October 14.

By way of the predictive analysis, assessment of the proposed thermal increase was obtained by a computer simulation model which was calibrated and confirmed from data collected from a set of continuous monitoring thermistors placed in the Vernon pool during May through October 2002. Other data used included flow and temperature from permanent instruments. The purpose of this study was to determine what effects, if any, the proposed increase would have on the *existing* thermal structure of the river. Again, this data, by its nature, included the cumulative effects of other sources upstream of the discharge.

A similar predictive analysis for the tailwater reach (i.e., dam to Station 3) was not part of the computer simulation model used to assess thermal impacts in lower Vernon pool. Nonetheless, the Agency inspected available tailwater temperature data collected by Entergy in 2004 for the May 16-October 14 period. Specifically, the Agency wanted to determine from the data whether Entergy's assertion of complete mixing in the tailwater was valid. Data were successfully registered at 7 of the 12 monitoring stations distributed among four transects located within the 1.5 mile reach downstream of the dam. The loss of specific sampling stations in part or in entirety, particularly sites located nearest to the dam and fish ladder, prevented a more comprehensive analysis; however, inspection of the available data did not reveal any significant temperature variations outside the accuracy of the thermistors or natural variation. The data indicated fairly uniform temperatures from top to bottom within the water column at those stations yielding complete data sets. As concluded for lower Vernon pool, thermal conditions in the tailwater represent cumulative effects of Vermont Yankee's discharge as well as other thermal contributions to the system within the watershed.

3. **Comment:** The 316a Demonstration Report omits an important indicator species, the dwarf wedge mussel, from the list of Representative Important Species (RIS). In 1990 the dwarf wedge mussel was listed as endangered under the Endangered Species Act. Currently there are only 20 known small populations including one in the Connecticut River near Claremont, NH. The mussel depends on host fish species for its survival. They are species specific and will only live if they find the correct host. This particular mussel depends on two host species, the tessellated darter and the mottled sculpin.

In 1993 the U.S. Fish and Wildlife Service approved a recovery plan for the wedge mussel that calls for the attempt to reestablish populations throughout its historical range including the Connecticut River. Reestablishing a population in or near Vernon Pool would require the presence of one of the host species. The tessellated darter is a fish species that has consistently been collected from the lower Vernon Pool. Although the nearest population of the wedge mussel is relatively far north of the Vermont Yankee, the fact that the species is endangered and depends on the tessellated darter for its survival reveals that the tessellated darter should have been and should now be included as a RIS; as part of the recovery of the wedge mussel throughout the Connecticut River. Without the inclusion of the tessellated darter as a RIS, the information presented "is too incomplete to provide a clear assessment," and thus is unacceptable and in violation of the decision making criteria for determining the acceptability of the RIS determination.

Response: The list of RIS evaluated in the 316a Demonstration was approved by the fisheries biologists from Vermont Fish and Wildlife Department, New Hampshire Fish and Game Department, as well as the US Fish and Wildlife Service. If the fish biologists from these agencies believed that the tessellated darter (or the dwarf wedge mussel) was an appropriate RIS, it would have been included and evaluated. Further, there are no known existing populations of the dwarf wedge mussel in Vernon pool. In fact, the Agency has no information that there has ever been a population of this mussel in Vernon Pool.

4. **Comment:** Entergy uses a flawed methodology to measure river temperature that grossly understates the localized impact on the biological community most directly affected by the discharge and makes it impossible to directly estimate the possibility that species will experience thermal shock in the lower Vernon Pool or in the fish ladder.

   Response: The purpose of the temperature monitor at Station 3 is to gauge compliance with the temperature limits in the permit not to *directly* measure the impact on aquatic biota. It is the on-going biological monitoring, as required by the permit, which is the mechanism used to determine impacts on the biological community of the Connecticut River. The evaluation of this monitoring data, whether via a 316a demonstration study or during periodic reviews, is what ultimately determines whether or not the biological community is impacted by Entergy's thermal discharge. Review of the 2004 316a Demonstration, which evaluated the aquatic biota in great detail indicated that there is a balanced, indigenous population present.

   Including a temperature monitor at the point of discharge would not serve any useful purpose. Extensive hydrothermal modeling as part of the recent 316a Demonstration has demonstrated (three dimensionally) how the thermal plume, with the proposed increase in thermal limits, will impact Vernon pool. This was evaluated using average (occurs 50% of the time) and extreme-case (occurs 1% percent of the time) in-river conditions that would result from the proposed increase in thermal discharge limits.

5. **Comment:** Entergy has failed to insure protection and propagation of the balanced indigenous population (BIP). As explained in Part VI.E. of our comment letter, the existing discharge has already caused appreciable harm to the biological community in the river. It necessarily follows that Entergy cannot show that the requested variance will assure the protection and propagation of the Balanced Indigenous Population (BIP).

Comment: Section 316(a) and EPA regulations require that applicants must prove that thermal effluent standards are more stringent than necessary to "insure protection and propagation of a balanced, indigenous population of fish, shellfish, and wildlife in and on the body of water". The legislative history of 316(a) makes clear that Congress intended that there be "a very limited waiver for major sources of thermal effluents that could establish beyond any question" that the BIP would be protected. Entergy has not made this stringent burden of proof.

Comment: Entergy has not demonstrated that thermal restrictions under the proposed permit are conservative in assuring "protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife in and on the [affected] body of water" as required by §316(a) and EPA regulations generally.

Comment: The effect on habitat that supports existing aquatic biota, wildlife, or plant life must be considered but the application and the Agency have only been able to conclude that biota that don't like hot water can swim away to suitable habitat elsewhere and those that like hot water (and

chemicals) will thrive. The applicant has failed to demonstrate under 316a that the permit remains and/or was ever protective of "a balanced indigenous community of shellfish, fish, and wildlife".

Comment: The methodology that Entergy is using to measure the effect of temperature increases in the river do not accurately reflect the impact on the Vernon Pool and Vernon Dam Fishway. Entergy's upstream monitoring location (Station 7) is a relatively narrow part of the river. Lower Vernon Pool is a broad, slow moving reservoir. Ambient temperature in the pool may frequently be higher than at Station 7. Entergy does not account for this in determining their thermal discharge. Station 3 (downstream compliance point) is also located in a relatively narrow section of the river that will likely warm up at different rates than the lower Vernon Pool or at or very near the fish ladder at Vernon Dam. These are areas where direct biological harm from increased water temperatures is most likely to occur. Thus, there is no sound scientific basis on which to draw any conclusions regarding the true effects of the proposed temperature increase.

Response: The Department disagrees that Entergy has failed to insure protection of the BIP. The conclusion of the 2004 316a Demonstration, with which the Agency concurs, is that the existing and proposed discharge assures "protection and propagation of a balanced indigenous population" during the June 16 through October 14 time period.

The Agency disagrees that the effect on habitat was not considered. The effect on habitat for each Representative Important Species (RIS) fish was considered on a species by species basis using the modeling of the thermal plume and the indicator thermal effects parameters selected from the literature (See Section 5.2 of the 2004 316a Demonstration). Based on that analysis no significant habitat exclusion for RIS was predicted as a result of the new thermal limits. Based on the predictive analysis there is no evidence that the BIP will fail to be protected.

The 316(a) Demonstration Report predicts changes in habitat availability in lower Vernon pool and duration (hours) exceeding specified temperatures for certain life history parameters at Station 3 under the proposed amended temperature permit limits. These changes are too small to predict with any confidence that balanced populations of RIS will not be maintained under the proposed thermal limits. The Agency is incorporating a temperature cap which will ensure the temperatures will not exceed 85°F, as discussed in Response 6. In addition, the RIS monitoring program specified in all future permits, as in the past, will be evaluated by the EAC and Agency and modified as appropriate with the intent that any significant changes in RIS populations will be able to be detected.

Entergy Vermont Yankee bears the burden of demonstrating to the satisfaction of the Agency that the proposed thermal effluent limitations are "more stringent than necessary to assure the projections and propagation of a balanced, indigenous population of shellfish, fish, and wildlife." The Agency has determined that the 316(a) Demonstration and the materials that the applicant has produced in support of the amendment request meet the applicable standards, as discussed in more detail in this Response Summary.

6. **Comment:** The permit fails to set an upper bound on the temperature, leaving the river vulnerable to extreme thermal shock. The existing discharge permit places no upper bound on the temperature of the river at which Entergy must stop adding waste heat through its cooling water discharge. The draft amended permit fails to address this shortcoming.

   ANR should require that Entergy not raise the ambient water temperature beyond 85°F at any point within the Connecticut River. If and when such limit is reached, Entergy should be required to take

all necessary steps—including reducing power output—to avoid raising the ambient water temperature any further.

Significantly, according to Entergy's own study as part of their 316(a) Demonstration of temperature impacts on fish, water temperatures above 88°F are the avoidance temperatures for all RIS found in the Vernon Pool except one.

Comment: Allowing an unlimited increase in water temperature inside the Vernon Pool cannot be said to enhance or protect the quality of the river, and in fact, just the opposite is true.

There is no showing that the temperature increase will not result in thermal shock to the biological community within Vernon Pool, or to species that migrate through this area such as Atlantic salmon or American shad.

Comment: What is the upper temperature limit of the discharge? Currently no temperature limit has been named at which Vermont Yankee must stop discharging waste heat. The CRWC recommends that the temperature upper limit be set no higher than 85°F at the discharge point. Not having an upper limit is unacceptable. The discharge temperature should have an appropriate maximum.

Response: Designation of an upper temperature limit has merit as added protection to the balanced indigenous populations within the affected project area. Under the proposed permit temperature limits, Entergy predicts "the maximum temperature at Station 3 might exceed 85°F for an average of only 6 hours per summer season and would never exceed 86°F" (Entergy's *Comments to the ANR Regarding the Draft Vermont Yankee NPDES Permit Amendment*, 7 December 2005). As cited by Entergy, Luxenberg (1990) analyzed the 22-year thermal history (1968-1989) of the Connecticut River within the project area during which maximum average hourly temperatures at Station 3 exceeding 84°F occurred on three occasions: July 21, 1968; August 5, 1979; and August 14, 1988. Over the same period of record maximum average hourly temperature values never exceeded 85°F. The 316a Demonstration Report assessed temperature effects on the RIS, including exclusionary (avoidance and upper incipient lethal) temperatures for each species. A discharge upper temperature limit of 85°F approximates the avoidance temperature for most RIS and is below the upper incipient lethal temperature for all species except Atlantic salmon which is unlikely to be migrating through the project area at times when temperatures might approach or exceed 85°F. Therefore the Agency has included in the final permit an upper temperature limitation for the period June 16 through October 14 (see Section I.A6.c., page 5 of 25) which requires Entergy to modify the operation of the cooling water system such that the average hourly temperature at Station 3 (downstream monitoring station) does not exceed 85°F.

7. **Comment:** The downstream compliance point should not be located downstream of the dam. The water temperatures in the pool are not used at all in connection with deciding what the change has been. The notion that there is a one degree temperature change is just false because it is measured 0.65 miles downstream of the dam. This information is given to the public and the way it appears makes it seem much more benign and much less hazardous to aquatic life than in actuality it is.

Response: The permittee's application, fact sheet to the proposed permit, and public notice document clearly state that compliance with the 1° F temperature increase is determined downstream at Station 3. There is no attempt on the Agency's part to misinform the public. The

compliance point has been identified in the Vermont Yankee permit over a period of 30 years and several five year permit cycles.

While it is true that the water temperature in Vernon Pool is not "used in connection with deciding what the change has been", decades of ecological monitoring as well as recent hydrothermal modeling has demonstrated that fish habitat and/or passage is available in the pool such that a balanced, indigenous population is maintained. A discussion of the habitat impacts due to the thermal increase is found in Response 5.

8. **Comment:** Entergy should be required to install temperature sensors at the point of discharge as well as every several hundred feet down river to 'Station 3'. Baseline and Delta T must be measured before 'Station 3'.

Response: The commenter has not provided a reason as to *why* temperature sensors should be included at the point of discharge as well as every several hundred feet to Station 3. Provided that future ecological monitoring continues to demonstrate that there is a balanced, indigenous population, the Agency is satisfied with the current regime to determine permit compliance.

9. **Comment:** The Draft Amended Permit does not comply with Vermont WQS. The thermal mixing zone is illegal.

Comment: The Draft Amended Permit does not comply with Vermont WQS. Entergy's discharge violates the 200 foot limit on thermal mixing zones. There is no showing in the record that a mixing zone of 200 feet in length is not adequate to provide for assimilation of thermal waste The analysis found in the 1978 §316(a) Demonstration fails to explain why a mixing zone of 200 feet is inadequate to provide for the assimilation of thermal wastes. It states that, "[r]ecording temperature systems were installed at Monitor 3, 0.65 miles down River from the Vernon Station, in December 1967 and at Monitor 7, 4.25 miles up the river from Vernon Station, in December 1969...River water temperatures have been recorded at these locations since the monitors were installed." (1978 Demonstration, 4-2) It appears from the lack of analysis in the record that the only reason Station 3 is used as the extent of the mixing zone is that Station 3 was already installed 1.4 miles downstream of Entergy when the facility was built.

There apparently was a June 10, 1968 order issued by the Water Resources Board (a document which, according to the WRB, was destroyed) which apparently established a mixing zone to the foot of the Vernon Dam as the downstream extent of the thermal mixing zone. There is no document in the record that establishes a larger mixing zone. Nevertheless, the permit contains a mixing zone that extends 0.65 miles below Vernon Dam (to Station 3).

Response: Consistent with Section 316(a) of the CWA, the Secretary of the Agency may approve an alternative effluent limitation in excess of the thermal limitations established by the Vermont Water Quality Standards, provided that:

(1) The discharge will comply with all other applicable provisions of these rules;
(2) A mixing zone of 200 feet in length is not adequate to provide for assimilation of thermal waste; and
(3) After taking into account the interaction of thermal effects and other wastes, that the change or rate of change in temperature will not result in thermal shock or prevent the full support of uses or the receiving waters."

Section 3-01 B.1.d. Assimilation of Thermal Wastes. Essentially, section 3-01 B.1.d. provides that an alternative standard may be set forth in a permit condition provided that the three criteria set forth above are met. First, the thermal discharge shall "comply with all other applicable provisions of the VWQS." Second, the mixing zone must be inadequate to assimilate the thermal discharge. Third, similar to Section 316(a) of the CWA, ANR must evaluate the "interaction of other pollutants" with the thermal discharge and determine that the discharge "will not result in thermal shock or prevent the full support of uses."

As set forth in the fact sheet to the permit, the Agency has made specific findings regarding the impacts of the proposed discharge related to applicable water quality provisions, the interaction of the proposed thermal discharge with other wastes and the possibility of thermal shock. In addition, as described below, the Agency has also determined that a mixing zone of 200 feet is inadequate for assimilation in this matter and that the temperature change will not cause thermal shock or prevent the full support of uses.

The 1978 Demonstration Study as well as additional thermal plume studies conducted as part of the 1990 Demonstration Study demonstrate that an area within a 200 foot radius of the discharge point was not adequate to assimilate the thermal discharge under previous more conservative temperature limitations. It is apparent that a 200 foot mixing zone was inadequate to accommodate previous (lower) thermal limits. It follows also that it is inadequate to accommodate requests for higher thermal limits. Nonetheless, both the 2004 Hydrothermal Modeling Report and the 2004 Demonstration Study reconfirm through the use of color coded graphical presentations that the thermal discharge under both the existing limitations and the increased thermal limits can not be assimilated in a 200 foot radius from the discharge point.

The extensive biological monitoring in the Connecticut River and the Demonstration Study demonstrate that the existing and proposed discharge will assure the protection and propagation of a balanced indigenous biological community which supports the finding that the proposed discharge will not result in thermal shock or prevent the full support of uses (June 16 through October 14). As explained in the response to Comment 2., the biological monitoring by its very nature assesses the cumulative impacts of all environmental stressors.

10. **Comment:** The Draft Amended Permit does not comply with Vermont WQS. Entergy's discharge violates the 'Protect and Enhance' policy. Beyond the fact that the record contains no document authorizing a 1.4 mile thermal mixing zone for Entergy's discharge, ANR cannot make the showings required by Vermont Water Quality Standards to create such a large mixing zone. ANR is required to show that the discharge will comply with all other applicable provisions of Vermont WQS. This showing is not present in the record. In particular, ANR must show that the discharge will "protect and enhance the quality, character, and usefulness of the Connecticut River" and "assure the maintenance of water quality necessary to sustain existing aquatic communities." (10 VSA § 1250) Additionally, ANR must show that Vermont's Antidegradation policy is being followed and that this "high quality" water is being protected and maintained. Allowing an unlimited increase in water temperature inside the Vernon Pool cannot be said to enhance or protect the quality of the Connecticut River, and in fact, just the opposite is true.

Comment: High Quality Waters must be maintained and protected. The high temperature discharge plume would degrade the quality of the Connecticut River and 1) reduce available habitat for desirable species spawning and habitat; 2) promote predation by heat tolerant species on juvenile shad and other desirable species; 3) interfere with anadromous fish migration; and 4) reduce resident populations of indigenous species.

Response: Although 10 V.S.A. §1250 (and Section 1-02 of the Vermont Water Quality Standards) calls for the protection and enhancement of the state's waters, it also recognizes that discharges will occur and must be controlled. The regulatory scheme requires the maintenance of water quality necessary to sustain existing aquatic communities and manage waters to promote beneficial and environmentally sound development. The Vermont Water Quality Standards and 316a of the Clean Water Act allow for the discharge of controlled thermal waste when it can be demonstrated that there will be the full support of uses and a balanced indigenous population in the receiving waters, respectively. As set forth in the fact sheet to the permit (see pages 3 – 10), the proposed thermal increase satisfies the Anti-Degradation Policy and other requirements of the Vermont Water Quality Standards. As set forth in Response 9., a mixing zone of 200 feet is inadequate to assimilate the thermal waste.

11. **Comment:** The public has been denied the opportunity to review and comment on key documents and information being relied upon by the Agency. Two key documents are missing from the record. One is a letter from the Water Resources Board regarding the intake structure and the other is a document authorizing the thermal mixing zone.

    Comment: The draft permit relies on information not contained in the record. It does not contain sufficient information to provide the public with a meaningful opportunity to comment and thus is in violation of section 1259(b) of the Vermont Water Pollution Control Act (VWPCA) which states that "any records, reports, or information obtained under this permit program shall be available to the public for inspection and copying".

    The Connecticut River Watershed Council (CRWC) demands that a new public notice and opportunity to comment be issued which will conform to the VWPCA and give the public a meaningful opportunity to comment.

    The public does not have a fair opportunity to comment where key documents which ANR has relied upon to issue this permit are missing from the record, and have in fact been destroyed.

    Response: The documents referred to in this comment are not relevant to this amended permit request. The Agency evaluates each permit application and amendment request for compliance with the applicable state and federal requirements in place at the time of the permit application. The comment apparently refers to documents which were issued in 1968 to 1969 by the Water Resources Board. Initially the Agency believed that copies of these documents were destroyed by a fire according to the keeper of the records. However, the 1968 Water Resources Board Final Order of Permit and an October 2, 1969 letter regarding the intake structure were eventually located and have been supplied to the commenters. The failure of the Agency to initially produce two documents which are almost forty years old, and predate revisions to the Vermont Water Quality Standards as well as statutory requirements, does not in any way prejudice the public.

12. **Comment:** The public has not had an opportunity to comment on the information provided by the Environmental Advisory Committee (EAC). The EAC is made up of state and federal representatives. With its limited representation there is no input from the public; either as members of the EAC or via public hearings. The EAC has provided comments to the ANR relating to the 316a Demonstration Report. These comments have not been made public. The EAC is subject to the Vermont Open Meeting Law. ANR has failed to comply with the Open Meeting Law and has deprived the public of the opportunity to review and comment on the information and recommendations of the EAC on the current draft amendment.

Comment: The EAC is subject to the Vermont Open Meeting law (Title 1, Chapter 5, §312). Meetings must be open to the public and minutes must be taken. The public must have access to the minutes.

Comment: The EAC has provided comments to the ANR relating to the 316(a) Demonstration variance request yet these comments have not been made public. Without this information the public cannot provide meaningful comments on the draft permit.

CRWC requests that the information from the EAC to the ANR be made public and that the comment period be reopened to allow CRWC and the public to comment.

Comment: The EAC was created under the original permit with the responsibility for reviewing the scientific data and to provide technical and policy advice to the ANR and Entergy. With its limited representation (several state and federal agencies) there is no input from the public either as members or via public hearings. The EAC meets with no public notice of their meetings.

There are no 'non-governmental organizations', no regional planning agencies, and no potentially affected municipalities represented on the EAC as there should be.

Response: The Environmental Advisory Committee (EAC) is not a public body as defined by 1 V.S.A. §310(3). The statute defines a public body as "any board, council or commission of any agency . . . or any committee of any of the foregoing boards, councils or commissions . . ."

Here, the EAC was created as a condition of a permit for the sole purpose of soliciting technical and scientific input from the staff of the Agency and other state and federal agencies and organizations. The participation of staff outside the Agency is purely voluntary. This committee is not required by any statute or regulation and does not have any regulatory decision or policy making authority nor is it required by any authority for purposes of securing funding. The EAC does not perform any governmental function and the ultimate responsibility for determining permit conditions lies with the Agency.

In accordance with 1 V.S.A. §312(g) there are exemptions to the procedural requirements and the public's right to attend the meetings of a public agency. Section 312(g) provides that "[r]outine day-to-day administrative matters that do not require action by the public body, may be conducted outside a duly warned meeting, provided that no money is appropriated, expended, or encumbered." EAC activities are focused on the type of day to day work typical for Agency scientific staff, that of reviewing and assessing technical and scientific monitoring data in order to determine whether a permittee is in compliance with the applicable state and federal standards. The inclusion of public non-governmental entities and non-scientists in this process would politicize the process of scientific exchange and defeat the purposes of the EAC. Finally, the EAC has no control over the appropriation, expenditure, or encumbrance of public funds.

Although the EAC does not need to comply with the procedural requirements regarding public meetings, the correspondence of the active participants is a matter of public record and is available to the public. The Agency has not withheld any EAC documentation and has upon request, provided members of the public with the opportunity to review any documentation, including memoranda, notes and e-mails between active members of the EAC and Agency staff.

13. **Comment:** EPA regulations require that applicants must use a "representative important species" (RIS) approach to evaluating the effect of the thermal discharge on the biotic community (40 CFR §125.71(b)). However, the RIS chosen by Entergy is biased in favor of heat tolerant species and does not provide an accurate measure of the impact on the indigenous biological community 40 CFR §125.71(c)).

Response: The representative important species (RIS) utilized in the 316a Demonstration were selected by the Agency at the suggestion of the Environmental Advisory Committee (EAC). The list, which was attached in a February 5, 2003 memo from the Agency to Entergy, included those fish selected for the previous 1990 demonstration (Atlantic salmon, American shad, smallmouth bass, white perch, walleye, yellow perch, and spottail shiner) as well as other species (sea lamprey, largemouth bass, black crappie, and white sucker) to represent the community of resident and anadromous fish present. The inclusion of the four additional species assures representation of both lentic and lotic habitats (i.e. above and below Vernon Dam).

Specifically, for the amendment under consideration, the EAC reviewed the appropriateness of the six original species for assessing the potential impacts of the proposed temperature limits on the aquatic community recognizing that the existence of the Vernon hydroelectric power station has essentially partitioned the river within the Vermont Yankee project area into two distinct riverine environments, i.e. the upstream impoundment (lentic) and the downstream flowing water section (lotic). Each of these environments is characterized by its own fish community based on individual species habitat requirements. From a list of 33+ species observed within the project area the EAC consulted EPA's 316(a) guidance document to select appropriate RIS representative of different trophic levels within each environment. Consequently, the list of RIS adopted for the current assessment was expanded to two guilds: lentic community (impoundment), including largemouth bass, yellow perch, spottail shiner and white sucker; and lotic community (tailwater), including smallmouth bass, walleye, fallfish and white sucker. American shad and Atlantic salmon were included in both guilds because of their utilization of entire project area during migrations and, in the case of shad, for spawning and juvenile habitats. EPA recommends an appropriate suite of RIS not be less than two or greater than 15 species.

If the RIS appear to over-represent "heat tolerant" species, that is because the greater Connecticut River is dominated by warm water fishes. Past development of the river for hydroelectric generation has been a significant habitat altering force shaping the fish communities that inhabit the river today. During the RIS selection process other species (i.e. American eel and sea lamprey) were also considered but eliminated because they tended to shift community representation to more temperature tolerant species. Atlantic salmon, a cold water species, was included among the RIS.

14. **Comment:** Section 1-03 C. of the VWQS requires that "high quality waters" be protected and maintained. The Connecticut River has been designated a high quality water. It is also classified as a coldwater fishery. Vermont Yankee's thermal discharge is impairing these waters by reducing available spawning and nursery habitat, interfering with migration of anadromous species, promoting an increase in predation on juvenile shad by heat tolerant species, and decreasing the abundance of several indigenous species of resident fish.

Response: As pointed out under Response 13., the fish communities of the Connecticut River have been dominated by warm water species preceding the development of the Vermont Yankee Nuclear Power Station. Nonetheless, the river is a critical seasonal migration corridor for several anadromous fishes, including Atlantic salmon. The primary reason for the designation of the river

as a cold water fish habitat is to recognize this important function. The temperature limits as approved by the Agency protect and maintain this function.

15. **Comment:** While Entergy has documented the decline in the American shad population near Vermont Yankee, they have failed to conduct the laboratory or fieldwork necessary to demonstrate that their thermal discharge is not a cause of this harm.

Response: Based on the data Entergy has been requested to collect and analyze, no prior appreciable harm can be found. However, as pointed out under Response #1, the exact cause(s) for the apparent decline in American shad abundance cannot be determined at this time and there is no evidence that the decline is linked to the Vermont Yankee thermal discharge. There are possible influences on the data gathered such as reduced passage through Turners Falls, a male dominated sex ratio, and the overall regional decline of shad. This apparent reduction in juvenile shad production in Vernon pool has exacerbated efforts to sample the population and obtain shad abundance estimates by collection methods used in the past (i.e. electrofishing).

In 2000, the Agency, at the suggestion of the EAC approved significant modification and expansion of juvenile shad monitoring in the pool. Sampling procedures moved from primarily electrofishing and mid-water trawling to beach seining and mid-water trawling. Inconsistency of collection efforts and resulting abundance indices employed, including spatial (pool versus tailwater) and temporal (pre-2000 versus post-2000) variations, presents comparative data analysis challenges. Considerable research by the scientific community is needed to increase our general understanding of the thermal effects on shad behavior and physiology. More specific studies are recommended to better assess any impacts of the Vermont Yankee thermal discharge on shad migrating through and out of the project area. Such studies have been recommended by the United States Fish and Wildlife Service, New Hampshire Fish and Game Department, and the Connecticut River Atlantic Salmon Commission.

The discharge permit provides for Entergy to conduct objective-specific studies to investigate and assess thermal effects on the fish community. The Agency recognizes this as an ongoing need to assure balanced, indigenous communities are maintained within the area influenced by the Vermont Yankee thermal discharge. The Agency can and will adjust the Applicant's permit conditions in the future, if necessary, to address any new data regarding impacts on shad.

16. **Comment:** If Vermont does not grant this permit amendment can the EPA over-ride the decision?

Response: Once the decision is signed and finalized, EPA cannot "over-ride" the final decision. EPA does review draft permits prepared by Vermont and can file objections to a draft permit if EPA finds the draft permit does not comply with federal law and regulations. The EPA objection process can result in permit issuing authority reverting to EPA if the objections are not adequately addressed. In this case, the Agency is aware that the EPA has reviewed the draft permit and has chosen not to file an objection to its issuance.

17. **Comment:** At what point downstream of the discharge will the water temperature be at ambient? The permit does not meet the intent of the law governing mixing zones because there is no identified length from the point of discharge to the return of the ambient temperature condition.

Response: By "ambient" we understand the commenter to mean the upstream ambient temperature. Where the downstream temperature reaches the ambient upstream temperature will vary depending on specific conditions such as river flow, water temperature, air temperature, etc.

During summer conditions the downstream river temperatures may never equal upstream temperatures, even in river systems unaffected by thermal discharges, because of the strong influence of solar radiation on river temperatures. During winter conditions however it may be theoretically possible for downstream river temperatures to equal upstream ambient temperatures due to low levels of solar radiation and the resulting cooling effects of air temperatures. (Also, see responses to mixing zone comments.) However, even during winter conditions the location where the Connecticut River returns to upstream ambient conditions is highly variable.

18. **Comment:** Vermont Yankee has made imprudent overuse of historic flow and temperature data in predicting the effects of its proposed temperature increase. CRWC believes that a river temperature of 78°F, which is the high temperature benchmark used by Vermont Yankee, could easily be exceeded in the future given unpredictable temperature extremes. Not only is the weather changing but the ownership of the hydro dams above and below the discharge has changed as well. Where previously Vermont Yankee could make a phone call and plead for additional flow through the Bellows Falls and Vernon dams under an informal arrangement with the previous owner operating from Wilder, Vermont, Entergy would now have to talk to an automated center in Maine that controls flow and the process is much more complicated. We request that the Agency consider this issue further.

Response: It is not correct to say that Entergy must call an automated center in Maine; Entergy still calls staff in Wilder directly as necessary. Provided that Entergy continues to meet the requirements dictated by their discharge permit, the Agency is satisfied with the arrangement Entergy has with the dam's owner.

19. **Comment:** WRC staff contacted ANR staff seeking technical information. We were informed that Agency personnel wouldn't respond to technical questions during the public comment period. This makes providing informed comment difficult.

Response: In order to ensure an open and unbiased process, the Agency does not discuss issues relating to a draft permit or hold 'closed door meetings' with individuals or a limited number of participants during the public notice period. This period of time (not less than 30 days) is an opportunity for interested parties to provide comment for consideration in an equal manner, either as verbal comments during the public hearing or as written comments during the duration of the public comment period.

20. **Comment:** Is the 'Trend Analysis' section in the proposed permit new or revised? What is its significance?

Response: It is a new requirement of the permit. During the Agency's review of the 316a Demonstration it was requested that the Applicant provide a time series trend analysis with respect to collection of fish and macroinvertebrates. The analysis was completed as part of the Demonstration. In order for future analyses to be consistent with the trend analysis used in the Demonstration, the Agency included the analysis as a new specific requirement in the permit.

21. **Comment:** Further warming of the river will be worse for the environment. Economic gain (i.e. minimizing the costs of operating the cooling towers) for project proponents is not adequate grounds for the Agency to permit degradation of water quality by allowing this increase in thermal limits.

Comment: The permit amendment is unnecessary. Vermont Yankee wants to use the river rather than the cooling towers. There is no compelling reason stated in the application, other than a tiny increase in revenue, which requires Entergy to seek permission to increase the temperature and frequency of its discharges to the river. .

Response: The issue at hand is not whether the permit amendment is necessary or unnecessary. Section 316(a) of the Clean Water Act allows an increase "whenever the owner or operator...can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, the State) may impose an effluent limitation under such sections for such plant, with respect to the thermal component of such discharge (taking into account the interaction of such thermal component with other pollutants), that will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water." The Agency has made a determination that the permittee has demonstrated to the satisfaction of the Agency that the previously permitted thermal effluent limitations during the period of June 16 through October 14 are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made.

22. **Comment:** I question whether the Agency is making political decisions at the influence of the governor with regard to this amendment. My concern is whether this is a political decision rather than a scientific decision.

Response: The increase of 1° F above the existing thermal limits is based on the technical and scientific data submitted in the application and reviewed by an independent third party consultant for the Agency (Versar, Inc.), Agency staff, and EAC members representing other governmental jurisdictions (federal and State of New Hampshire).

23. **Comment:** The Connecticut River Atlantic Salmon Commission (CRASC) is concerned about the impacts of proposed thermal discharges on the restoration of American shad, Atlantic salmon, sea lamprey, and American eel. We are also concerned relative to potential impacts to migration of juvenile Atlantic salmon, American shad, and sea lampreys during the period May 16 through June 30 and juvenile shad during the period September 1 to October 14. Entergy has not demonstrated that the proposed discharges will protect these fish.

Atlantic salmon smolts migrate downstream past Vermont Yankee from early April through mid-June. Smolts are undergoing physiological changes during migration to adapt to salt water. Research in the Connecticut River has shown that smolts exposed to high temperatures loose their salinity tolerance and other smolt characteristics, which negatively impacts their survival. Additionally, migration delays due to high water temperature avoidance could also decrease the number of smolts successfully reaching the ocean. The existing thermal discharges may be harmful to smolts and any increase in temperature could exacerbate this situation. Without studies specifically designed to evaluate the conditions at Vermont Yankee, and until we now otherwise, the Commission cannot support a 1° F increase in temperature.

Comment: Adult American shad migrate to the VT/NH portion of the Connecticut River from mid-May to late June and spawn when water temperatures are near 70° F. Research has shown that

shad migrations and spawning are strongly influence by temperature. Increases in temperature cause the shad to expend their energy reserves resulting in higher mortality or interruption to their migration. Further increases in temperature could impact shad energetics migration. Juvenile shad spend the summer in the Vernon pool before migrating to the ocean in fall. Thermal discharges during fall are also a concern because of possible impacts to behavior and physiology during out migration.

Response: The Agency shares CRASC's concerns and has taken the position not to approve the 1° increase during the May 16-June 15 period requested by Entergy. In fact any future evaluation of the proposed limits will need to be based on predictive analyses following the pending two-year smolt out-migration study (objective specific study) required of Entergy by the Agency. Past smolt studies were conducted largely to address passage issues associated with Vernon dam and hydroelectric operations there. Additionally, no up-to-date studies evaluating possible affects of VY's permitted discharge on smolt behavior and physiology have been conducted. The May 16-June 15 period is consistent with the smolt out-migration window identified by CRASC and the fishery agencies and is the period the hydroelectric companies on the Connecticut River are held to for providing downstream migrating smolt passage. These dates also encompass the median dates when 95% of the upstream passage of shad (June 15) and sea lamprey (June 13) are expected to occur at the Vernon ladder based on a 12-year passage history (1990-2001). The earliest and latest 95% end point dates for shad was June 2 and June 29, respectively. Similar endpoints for lamprey fell within these dates. On average over the same years 82% and 81% of the season total shad and lamprey passage, respectively, has occurred by June 15.

The juvenile shad out-migration issue for the September 1-October 14 period is more challenging due to the lack of site specific data and the inherent problems with assessing *in situ* juvenile shad behavioral and physiological responses to the current and proposed temperature limits. Observations reported by O'Leary and Kynard (1986) suggest the proposed temperature limits could delay the onset and duration of juvenile shad out-migration from Vernon and Turners Falls pools. By how much has not been quantified nor whether the delay is substantial enough to reduce fish survival due to thermal effects before entering the estuary. No doubt additional information is needed to fully evaluate the impacts of current and proposed temperature limits on shad out-migration and survival. Unlike salmon smolts for which there is an abundance of information and accepted study protocols, shad are a fish species that are currently difficult to study and scientists are working to increase our general knowledge of these fish.

As outlined in the final permit cover letter to Entergy and in Response 15, the Agency will require an objective specific study relative to juvenile shad outmigration. The EAC will identify the necessary objective-specific study Entergy needs to conduct to evaluate the thermal effects of the discharge on juvenile shad behavior and survival. The Agency will continue to adjust the terms of the Applicant's permit as necessary, to address any new data regarding impacts to shad. However, based on the data Entergy has been asked to collect and analyze, no prior appreciable harm can be found.

24. **Comment:** The documentation provided to date by Entergy and existing research is insufficient to document that the proposed temperature increase of 1° F during the period of June 16 through October 14 will not harm anadromous fish. Further studies of the effects of temperature increases on Atlantic salmon and American shad are necessary before any change in the thermal discharge is approved.

Response: Based on the data collected and analyzed by Entergy, the Agency has concluded that no prior appreciable harm has been demonstrated. As stated previously the Agency, with input from other fishery agencies, will be reviewing and adjusting Entergy's permit monitoring requirements as necessary during the permit renewal period(s) such that the resulting data and its presentation have greater statistical power to detect any changes that may be occurring in the RIS populations and fish community at large. Also, Entergy is required to conduct objective-specific fish studies to better assess issues affecting salmon and shad.

25. **Comment:** CRASC would like the opportunity to review and comment on future study designs and reports related to diadromous fish impacts associated with the operation of Vermont Yankee.

Response: As with any draft permit issued by the Agency CRASC and other members of the public are welcome to review the Agency's files which are public information and submit documentation to the Agency. The Agency maintains an electronic notice bulletin board with a listing of all permit applications. With respect to the special studies language in the permit (assuming this is what CRASC is referring to with the words "future study designs"), the EAC defines and recommends special studies as is deemed appropriate and, if the Agency concurs, it will require that the permittee complete these studies. It is the Agency's understanding that key fishery agencies represented on EAC, and providing advice to this Agency on the issue of anadromous fish, are also members of CRASC (VTDFW, NHDFG and USFWS) and therefore the issues raised by these agencies would be the same or similar to those held by CRASC. However if CRASC has particular suggestions regarding future studies, in addition to those raised by the EAC, CRASC can submit the suggestions to the Agency. The Agency will consider forwarding any suggestions to the EAC for their review.

26. **Comment:** The permit should acknowledge the pending uprate and 20% increased heat. Falsely segregating the permit amendment and Vermont Yankee's extended power uprate (EPU) is tantamount to mischaracterizing the amendment in order to avoid EPA strictures against increased use of once-through cooling. EPA has engaged in Clean Water Act, Section 316 rule making over the past few years that seeks to move power plants, especially new construction, away from once-through cooling and toward best practices, based on least impact. Entergy has made significant modifications to the facility and it is therefore, in a sense, all new and should be approached for purposes of discharge regulation as a rebuilt or new facility.

Response: The permittee has indicated that their request for a 1° F increase in thermal limits is requested regardless of the outcome of the uprate request from the Public Service Board. The increase will allow decreased use of the cooling towers during the period of time June 16 through October 14. The 316(a) regulation including §40 CFR Part 125, Subpart H does not include language that "seeks to move power plants, especially new construction, away from once-through cooling and toward best practices, based on least impact". (Because the commenter does not specifically cite a regulation the Agency can only assume the commenter is referring to Section 316(a) of the Clean Water Act and its supporting regulation at §40 CFR Part 125, Subpart H which does not differentiate between 'new' and 'existing' facilities.)

27. **Comment:** Increase of once-through cooling will increase the discharge volume of chemical and radiological pollutants without: 1) investigation and assessment of concentrations at the point of discharge and across the mixing zone; 2) investigation and assessment of bio-accumulation in the river environment; and 3) demonstration or exploration of alternatives and competing cost-benefit analyses.

Response: The permit identifies the chemicals that the facility may discharge and their maximum concentrations (see Discharge Permit 3-1199, Part I.A.15.). Any proposed increase in dosage rate or a substantial change in the chemicals identified must be reviewed and approved by the Agency to assure that no adverse impact will occur. There is no proposed change in chemicals or the amounts to be used with this permit amendment.

28. **Comment:** Vermont Water Quality Standards, as established in policy under Section 1-03.B. have not been met. The monitoring station is 0.65 miles below the dam. Migrating fish are likely to encounter less homogenized water flow at the dam and fish ladder where water is not thoroughly temperature blended. This water is apt to pour over the dam as a warm water lens and upset spawning behaviors or stop migration altogether.

Response: It has been Entergy's contention, based on their professional judgment, that complete thermal mixing occurs in the Vernon Dam tailrace waters; however, the 316a Demonstration Report provides no data to substantiate this conclusion. At the insistence of the fishery agencies, Entergy submitted, for Vermont Fish and Wildlife Department review, water temperature data for the period of May 16-October 14, 2004 collected from the Vernon tailwater (under memorandum to VFWD, March 31, 2005). The dataset consisted of measurements recorded at 7 out of the 12 monitoring sites distributed among four transects located within a 1.5 mile reach situated immediately downstream of the dam. Because the loss of specific sampling stations in part or entirety, especially sites nearest the dam, the dataset does not provide a complete representation of conditions throughout the tailwater. Nonetheless, review of the available data (over 300,000 individual measurements) did not reveal any significant temperature variations outside the accuracy limits of the thermistors and fell within the range of natural variation. The available data indicate fairly uniform mixing of water column temperatures from top to bottom. The magnitude of elevated river temperature changes and extent to which the thermal plume continues downriver below Station 3 is of interest to the fishery agencies because of the possible influence it may have on anadromous fishes. This will be an information need the fishery agencies will likely consider as part of a study protocol in the future.

29. **Comment:** It has not been demonstrated that High Quality Waters, as assumed for the Connecticut River, will not be degraded in violation of the Water Quality Standards, Section 1-03.C. The Agency claims that "The possible additive or synergistic effects of the pollutants associated with the activity...are insignificant." This is not supported by sampling, laboratory, or theoretical data. An analysis of the discharge of chlorinated or bromated organic matter has not been provided.

Response: The Agency's finding that the Anti-Degradation provisions of the Vermont Water Quality Standards have been met is supported by the Anti-Degradation Policy Analysis submitted by Entergy which in turn is supported by the 2004 Demonstration Study and the 2003 Hydrothermal Modeling Study. Additionally the analysis of biocide (bromine and chlorine) concentration discharged from the Vermont Yankee facility has been a permit requirement for many years and is conducted on a daily basis during periods of use. Likewise standards establishing discharge limitations on these chemicals have been included in the permit for many years. No increases in these effluent limitations have been proposed as a result of Entergy's request to increase its thermal discharge.

30. **Comment:** Consideration of the impact of the cooling water intake structure (CWIS) is required by EPA regulation in considering a power plant discharge application. No documents recording authorization of the CWIS are available thus concerned citizens as well as regulators are denied the means to assess the impact of the CWIS and operation as it pertains to this permit.

Comment: The amendment does not appear to quantify acceptable levels or anticipated levels of entrainment or river biota. Therefore, it cannot claim that no harm will result from the amended discharge.

Comment: The amendment does not appear to quantify acceptable levels or anticipated levels of impingement or river biota; nor does it make any claims as to effects of the projected increase of water temperature and the presence of biocides and other discharged chemicals on biota at the screens. Therefore, it cannot claim that no harm will result from the amended discharge.

Response: The impact of entrainment and impingement by the Vermont Yankee facility on the biological community is demonstrated by the historical and on-going biological monitoring in the Connecticut River and by historical and on-going monitoring specifically targeting impingement and entrainment. As stated in the Agency's response to Comment 2., monitoring of the biological community by its very nature reflects the cumulative impacts of all environmental stressors, including impingement and entrainment. Based on that monitoring record and the information provided in the 2004 Demonstration Study the Agency has concluded there is a balanced indigenous population present in the area of the discharge.

Specific monitoring of the Vermont Yankee intake structure targeting entrainment and impingement of all trophic levels of the biological community has been a requirement of the discharge permit since 1978. That data does not support the conclusion that either entrainment or impingement has a measurable adverse impact on the biological community. In fact entrainment monitoring of planktonic organisms was discontinued in 1995 because historical monitoring had demonstrated impacts were not sufficient to warrant additional monitoring. Pursuant to recently adopted EPA 316(b) regulations, Entergy will be required to complete a comprehensive demonstration study on the cooling water intake structure with respect to impingement and entrainment as part of its permit renewal.

With respect to the discharge of biocides as stated previously the permit contains effluent limitations and requirements which regulate the discharge of biocides and other chemicals and which have proven effective in maintaining a balanced indigenous population. These limitations and requirements remain in effect and have not been increased or changed as a result of Entergy's permit amendment request.

31. **Comment:** We question the extent to which the Vermont Water Quality Standards apply to the Connecticut River which is not solely a water of the State of Vermont. The discharge affects New Hampshire's waters and so the NH Water Quality Standards also apply.

Response: During the multi-year application review process, staff from the state of New Hampshire's Fish and Game Department and, to a lesser degree, staff from the Department of Environmental Services were involved in the process. The New Hampshire staff were relied upon by this Agency to represent their respective departments with any concerns regarding state (and federal via the Fish and Wildlife Service) regulations pertaining to NH waters. (Vermont has no authority to enforce other states' regulations). In addition, Versar, Inc., the Agency's independent consultant who was hired to review the 316a Demonstration, also evaluated the Demonstration for compliance with the applicable regulations.