

**Advisory Committee on Reactor Safeguards  
Plant License Renewal Subcommittee Meeting  
Vermont Yankee Nuclear Power Station**

June 5, 2007  
Rockville, MD

-SCHEDULE-

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Topics	Presenters	Time
Opening Remarks	M. Bonaca, ACRS	10:30 pm - 10:35 pm
Staff Introduction	P.T. Kuo, NRR	10:35 pm - 10:40 pm
Vermont Yankee License Renewal Application A. Application Background B. Description of Vermont Yankee C. Operating History D. Scoping Discussion E. Application of GALL F. Commitment Process	Entergy Nuclear Vermont Yankee Ted Sullivan, John Dreyfuss, et. al	10:40 pm - 12:00 pm
Lunch Break		12:00 pm - 1:00 pm
Vermont Yankee License Renewal Application (Con't)	Entergy Nuclear Vermont Yankee Ted Sullivan, John Dreyfuss, et. al	1:00 pm - 2:00 pm
SER Overview A. Scoping and Screening Results B. Onsite Inspection Results	NRR -J. Rowley Region I - R. Conte M. Modes	2:00 pm - 2:30 pm
Aging Management Program Review and Audits	NRR - J. Rowley	2:30 pm - 3:00 pm
Break		3:00 pm - 3:15 pm
Time-Limited Aging Analyses	NRR - J. Rowley	3:15 pm - 4:15 pm
Subcommittee Discussion	M. Bonaca, ACRS	4:15 pm - 5:00 pm

**NOTE:**

- Presentation time should not exceed 50 percent of the total time allocated for a specific item. The remaining 50 percent of the time is reserved for discussion.
- 50 copies of the presentation materials to be provided.

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
SUBCOMMITTEE ON PLANT LICENSE RENEWAL  
VERMONT YANKEE NUCLEAR POWER STATION  
JUNE 5, 2007  
ROCKVILLE, MARYLAND**

**- STATUS REPORT -**

**PURPOSE**

The purpose of this meeting is to review the License Renewal Application (LRA) for Vermont Yankee Nuclear Power Station (VYNPS), and the associated Draft Safety Evaluation Report (SER) with Confirmatory Items dated March, 2007. The Subcommittee will hear presentations by and hold discussions with representatives of the staff and Entergy Nuclear Operations, Inc.

**BACKGROUND**

VYNPS is located in the town of Vernon, Vermont, in Windham County approximately five miles south of Brattleboro, Vermont. The NRC issued the VYNPS construction permit on December 11, 1967, and the operating license on February 28, 1973. VYNPS is a General Electric boiling water reactor of a Mark 1 BWR design. General Electric supplied the nuclear steam supply system and Ebasco originally designed and constructed the plant. The VYNPS licensed power output is 1912 megawatt thermal with a gross electrical output of approximately 612 megawatt electric. The current facility operating license for VYNPS expires at midnight, March 21, 2012.

**DISCUSSION**

By letter dated January 27, 2006, Entergy Nuclear Operations, Inc. (ENO or the applicant) submitted the LRA in accordance with Title 10, Part 54, of the *Code of Federal Regulations*, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

ENO requests renewal of the VYNPS operating license (Facility Operating License Number DPR-28) for a period of 20 years beyond the current expiration at midnight March 21, 2012. The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) reviewed the license renewal application (LRA) for Oyster Creek Generating Station in accordance with the NRC regulations and NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated September 2005. Title 10, Section 54.29, of the *Code of Federal Regulations* (10 CFR 54.29) provides the standards for issuance of a renewed license.

The licensee stated that it had not identified any Technical Specification (TS) changes necessary to support issuance of the renewed operating license.

The staff used the following Interim Staff Guidance (ISG) in the Vermont Yankee LRA review: Nickel-alloy components in the reactor coolant pressure boundary (**LR-ISG-19B**) and Corrosion of drywell shell in Mark I containments (**LR-ISG-2006-01**).

The SER presents the status of the staff's review of information submitted through March 23, 2007, the cutoff date for consideration in the SER. The SER contains no open items, six confirmatory items which must be resolved before the staff can make a final determination on the LRA, 3 proposed license conditions and 49 commitments. The staff presents its final conclusion on the LRA review in an update to this SER.

### **CONFIRMATORY ITEMS**

As a result of its review of the LRA, including additional information submitted to the staff through March 23, 2007, the staff identified the following confirmatory items (CIs). An item is considered confirmatory if the staff and the applicant had reached a satisfactory resolution, but the resolution has not been submitted to the staff. Each CI has been assigned a unique identifying number. The items identified in this section have been properly closed by the technical personnel.

#### **CI 2.3.3.2a-1**

License renewal drawing LRA-G-191159-SH-01-0, at location H-11, depicts pipe section 2"-SW-566C as within the scope of license renewal. The license renewal boundary flag for 2"-SW-566C is located on an unisolable section of pipe. The actual location of the license renewal scope boundary for this pipe section is not clear. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components meet the requirements of 10 CFR 54.4(a)(2).

#### **CI 2.3.3.2a-2**

LRA Section 2.1.2.1.2 states in part that nonsafety-related piping systems connected to safety-related systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to conservatively include the first seismic or equivalent anchor. In addition, if isometric drawings were not readily available to identify the structural boundary, connected lines were included to a point beyond the safety/nonsafety interface, like a base-mounted component, flexible connection, or the end of a piping run (*i.e.*, a drain line).

It is not clear whether the nonsafety-related piping systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to include the first seismic or equivalent anchor. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2).

#### **CI 2.3.3.12-1**

LRA Section 2.3.3.12 indicates that the John Deere Diesel (JDD) is installed in compliance with 10 CFR 50, Appendix R, requirements. However, due to a lack of available drawings and/or detailed description of the diesel equipment listed in LRA Table 2.3.3-12, it is difficult to determine if any AMR category components may have been omitted from the table. It is recommended that the JDD be inspected to assure all AMR category components are included in the list of LRA Table 2.3.3-12. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(3).

#### **CI 2.3.3.13a-1**

The LRA states that the augmented off-gas system is within the scope of license renewal based on requirements of 10 CFR 54.4(a)(2) because of the potential for physical interaction with

safety-related components described in LRA Table 2.3.3.13-A. The determination of whether a component meets the requirements of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on license renewal drawings nor was a detailed description provided in the LRA. Consequently, any omission of augmented off-gas components subject to an AMR cannot be determined. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components meet the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-1.

#### **CI 2.3.3.13e-1**

The LRA states that the circulating water system is within the scope of license renewal based on the potential for physical interaction with safety-related components as required by 10 CFR 54.4(a)(2) and described in LRA Table 2.3.3.13-A. The applicant did not provide drawings highlighting in-scope components required by 10 CFR 54.4(a)(2), stating that the drawings would not provide significant additional information because they do not indicate proximity of components to safety-related equipment and do not identify structural/seismic boundaries. Without license renewal drawings and/or detailed description of the circulating water system, the omission of components subject to an AMR cannot be determined (see LRA Table 2.3.3-13-9). The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-9.

#### **CI 2.3.3.13m-1**

The LRA states that the reactor water clean up system is within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) because of the potential for physical interaction with safety-related components as described in LRA Table 2.3.3.13-A. The determination of whether a component meets the requirements of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on license renewal drawings nor was a detailed description provided in the LRA. Consequently, any omission of the reactor water clean up components subject to an AMR cannot be determined. The staff requested that the NRC Regional Inspection Team perform an inspection to ensure that the license renewal scope boundaries for these components satisfy the requirements of 10 CFR 54.4(a)(2) and all the components subject to an AMR are included in LRA Table 2.3.3-13-36.

### **PROPOSED LICENSE CONDITIONS**

Following the staff's review of the LRA, including subsequent information and clarifications provided by the applicant, the staff identified three proposed license conditions.

The first license condition requires the applicant to include the UFSAR supplement required by 10 CFR 54.21(d) in the next UFSAR update, as required by 10 CFR 50.71(e), following the issuance of the renewed license.

The second license condition requires future activities identified in the UFSAR supplement to be completed prior to the period of extended operation.

The third license condition requires that changes to storage requirements be approved by the staff as required by 10 CFR Part 50, Appendix H.

## **COMMITMENTS**

Commitments made by the licensee are listed in detail in Appendix A to the SER. The licensee made 49 commitments related to the AMPs to manage aging effects of structures and components prior to the periods of extended operation. The following are a summary:

1. Guidance for performing examinations of buried piping will be enhanced to specify that coating degradation and corrosion are attributes to be evaluated.
2. Fifteen (15) percent of the top guide locations will be inspected using enhanced visual inspection technique, EVT-1, within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first 6 years and at least two-thirds within the first 12 years of the period of extended operation. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.
3. The Diesel Fuel Monitoring Program will be enhanced to ensure ultrasonic thickness measurement of the fuel oil storage tank bottom surface will be performed every 10 years during tank cleaning and inspection.
4. The Diesel Fuel Monitoring Program will be enhanced to specify UT measurements of the fuel oil storage tank bottom surface will have acceptance criterion  $> 60\%$   $T_{nom}$ .
5. The Fatigue Monitoring Program will be modified to require periodic update of cumulative fatigue usage factors (CUFs), or to require update of CUFs if the number of accumulated cycles approaches the number assumed in the design calculation.
6. A computerized monitoring program (e.g., FatiguePro) will be used to directly determine cumulative fatigue usage factors (CUFs) for locations of interest.
7. The allowable number of effective transients will be established for monitored transients. This will allow quantitative projection of future margin.
8. Procedures will be enhanced to specify that fire damper frames in fire barriers will be inspected for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.
9. Procedures will be enhanced to state that the diesel engine subsystems (including the fuel supply line) will be observed while the pump is running. Acceptance criteria will be enhanced to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage.
10. Fire Water System Program procedures will be enhanced to specify that in accordance with NFPA 25 (2002 edition), Section 5.3.1.1.1, when sprinklers have been in place for 50 years a representative sample of sprinkler heads will be submitted to a recognized testing laboratory for field service testing. This sampling will be repeated every 10 years.
11. The Fire Water System Program will be enhanced to specify that wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current

- operating term and during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.
12. Implement the Heat Exchanger Monitoring Program as described in LRA Section B.1.14.
  13. Implement the Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program as described in LRA Section B.1.17.
  14. Implement the Non-Environmental Qualification Instrumentation Circuits Test Review Program as described in LRA Section B.1.18.
  15. Implement the Non-Environmental Qualification Insulated Cables and Connections Program as described in LRA Section B.1.19.
  16. Implement the One-Time Inspection Program as described in LRA Section B.1.21. Include destructive or non-destructive examination of one (1) socket welded connection using techniques proven by past industry experience to be effective for the identification of cracking in small bore socket welds. Should an inspection opportunity not occur (e.g., socket weld failure or socket weld replacement), a susceptible small-bore socket weld will be examined either destructively or non-destructively prior to entering the period of extended operation.
  17. Enhance the Periodic Surveillance and Preventive Maintenance Program to assure that the effects of aging will be managed as described in LRA Section B.1.22.
  18. Enhance the Reactor Vessel Surveillance Program to proceduralize the data analysis, acceptance criteria, and corrective actions described in the program description in LRA Section B.1.24.
  19. Implement the Selective Leaching Program as described in LRA Section B.1.25.
  20. Enhance the Structures Monitoring Program to specify that process facility crane rails and girders, condensate storage tank (CST) enclosure, CO tank enclosure, N tank enclosure and restraining wall, CST pipe trench, diesel generator cable trench, fuel oil pump house, service water pipe trench, man-way seals and gaskets, and hatch seals and gaskets are included in the program.
  21. Guidance for performing structural examinations of wood to identify loss of material, cracking, and change in material properties will be added to the Structures Monitoring Program.
  22. Guidance for performing structural examinations of elastomers (seals and gaskets) to identify cracking and change in material properties (cracking when manually flexed) will be enhanced in the Structures Monitoring Program procedure.
  23. Guidance for performing structural examinations of PVC cooling tower fill to identify cracking and change in material properties will be added to the Structures Monitoring Program procedure.
  24. System walkdown guidance documents will be enhanced to perform periodic system engineer inspections of systems in-scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. inspections of nearby systems that could impact the subject system will include SSCs that are in-scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(2).
  25. Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.1.29.
  26. Procedures will be enhanced to flush the John Deere Diesel Generator cooling water system and replace the coolant and coolant conditioner every three years.
  27. At least 2 years prior to entering the period of extended operation, for the locations

identified in NUREG/CR-6260 for BWRs of the VY vintage, VY will implement one or more of the following:

(1) Refine the fatigue analyses to determine valid CUFs less than 1 when accounting for the effects of reactor water environment. This includes applying the appropriate Fen factors to valid CUFs determined in accordance with one of the following:

1. For locations, including NUREG/CR-6260 locations, with existing fatigue analysis valid for the period of extended operation, use the existing CUF to determine the environmentally adjusted CUF.
2. More limiting VY-specific locations with a valid CUF may be added in addition to the NUREG/CR- 260 locations.
3. Representative CUF values from other plants, adjusted to or enveloping the VY plant-specific external loads may be used if demonstrated applicable to VY.
4. An analysis using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) may be performed to determine a valid CUF.

(2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic nondestructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC).

(3) Repair or replace the affected locations before exceeding a CUF of 1.0. Should VY select the option to manage the aging effects due to environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.

28. Revise program procedures to indicate that the Instrument Air Program will maintain instrument air quality in accordance with ISA S7.3
29. VYNPS will perform one of the following:
  1. Install core plate wedges, or,
  2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate hold down bolting accordance with BWRVIP-25 and submit the inspection plan and analysis to the NRC two years prior to the period of extended operation for NRC review and approval.
30. Revise System Walkdown Program to specify CO<sub>2</sub> system inspections every 6 months.
31. Revise Fire Water System Program to specify annual fire hydrant gasket inspections and flow tests.
32. Implement the Metal Enclosed Bus Program. Details are provided in an LRA Amendment 16, Attachment 3 and LRA Amendment 23, 7.
33. Include within the Structures Monitoring Program provisions that will ensure an engineering evaluation is made on a periodic basis (at least once every five years) of groundwater samples to assess aggressiveness of groundwater to concrete. Samples will be monitored for sulfates, pH and chlorides.
34. Implement the Bolting Integrity Program. Details are provided in an LRA Amendment 16, Attachment 2 and LRA Amendment 23, Attachment 5.
35. Provide within the System Walkdown Training Program a process to document biennial refresher training of Engineers to demonstrate inclusion of the methodology for aging management of plant equipment as described in EPRI Aging Assessment Field Guide or comparable instructional guide.
36. If technology to inspect the hidden jet pump thermal sleeve and core spray thermal sleeve welds has not been developed and approved by the NRC at least two years prior to the

- period of extended operation, VYNPS will initiate plant-specific action to resolve this issue. That plant-specific action may be justification that the welds do not require inspection.
37. Continue inspections in accordance with the Steam Dryer Monitoring Program, Revision 3 in the event that the BWRVIP-139 is not approved prior to the period of extended operation.
  38. "The BWRVIP-116 report which was approved by the Staff will be implemented at VYNPS with the conditions documented in Sections 3 and 4 of the Staff's final SE dated March 1, 2006, for the BWRVIP-116 report."
  39. "If the VYNPS standby capsule is removed from the reactor vessel without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation, if necessary."
  40. This Commitment has been deleted and replaced with Commitment 43
  41. This Commitment has been deleted and replaced with Commitment 43
  42. Implement the Bolted Cable Connections Program. Details are provided in LRA Amendment 23, Attachment 7.
  43. Establish and implement a program that will require testing of the two 13.8 kV cables from the two Vernon Hydro Station 13.8 kV switchgear buses to the 13.8 kV / 69 kV step up transformers before the period of extended operation and at least once every 10 years after the initial test.
  44. Guidance for performing examinations of buried piping will be revised to include the following. "A focused inspection will be performed within the first 10 years of the period of extended operation, unless an opportunistic inspection (or an inspection via a method that allows an assessment of pipe condition without excavation) occurs within this ten-year period."
  45. Enhance the Service Water Integrity Program to require a periodic visual inspection of the RHRSW pump motor cooling coil internal surface for loss of material.
  46. Enhance the Diesel Fuel Monitoring Program to specify that fuel oil in the fire pump diesel storage (day) tank will be analyzed according to ASTM D975-02 and for particulates per ASTM D2276. Also, fuel oil in the John Deere diesel storage tank will be analyzed for particulates per ASTM D2276.
  47. Enhance the Diesel Fuel Monitoring Program to specify that fuel oil in the common portable fuel oil storage tank will be analyzed according to ASTM D975-02, per ASTM D2276 for particulates, and ASTM D1796 for water and sediment.
  48. Perform an internal inspection of the underground Service Water piping before entering the period of extended operation.
  49. Revise station procedures to specify fire hydrant hose testing, inspection, and replacement, if necessary, in accordance with NFPA code specifications for fire hydrant hoses.

### **SCOPING & SCREENING AND AUDIT OF AMPs & AMRs**

The staff reviewed the information in LRA Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," and determines that the applicant's scoping and screening methodology was consistent with the requirements of 10 CFR 54.21(a)(1) and the staff's positions on the treatment of safety-related and nonsafety-related SSCs within the scope of license renewal and on SCs subject to an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

On the basis of its review, the staff concludes, pending resolution of Confirmatory Items 2.3.3.2-1, 2.3.3.2-2, 2.3.3.12-1, 2.3.3.13a-1, 2.3.3.13e-1, and 2.3.3.13m-1, that the

applicant has adequately identified those systems and components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

The staff's scoping and screening methodology inspection has been completed, with an exit meeting scheduled May 24, 2007. The report will be issued shortly after the exit meeting. The audit of the AMPs and AMRs is documented in a report by Information Systems Laboratories, Inc., dated March 30, 2007.

### TLAAs

Based on VYNPS's current licensing basis, UFSAR, and design-basis documents, the following categories of Time Limited Aging Analyses (TLAAs) were considered:

- reactor vessel neutron embrittlement analyses
- metal fatigue analyses
- Environmental qualification analyses for electrical components
- containment liner plate, metal containment, and penetrations fatigue analyses
- reflood thermal shock of the reactor vessel internals
- BWRVIP-05, RPV circumferential welds analysis
- BWRVIP-25, core plate rim hold-down bolts loss of preload analysis
- BWRVIP-38, shroud support fatigue analysis
- BWRVIP-47, lower plenum fatigue analysis
- BWRVIP-48, vessel ID diameter attachment welds fatigue analysis
- BWRVIP-49, instrument penetrations fatigue analysis
- BWRVIP-74, reactor vessel
- BWRVIP-76, core shroud

On the basis of its review, the staff concluded that the applicant provided an acceptable list of TLAAs, as required by 10 CFR 54.21(c)(1). The staff confirmed, in accordance with 10 CFR 54.21(c)(2), that no exemption to the requirements of 10 CFR 50.12 had been granted based on a TLAA.

### **EXPECTED SUBCOMMITTEE ACTION**

The Subcommittee Chairman will provide a report to the Full Committee during the June 2007 ACRS meeting.