

Attachment 6

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 263 – Supplement No. 33

Extended Power Uprate

Revised Steam Dryer Monitoring Plan

U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of Energy Nuclear Vermont Yankee LLC

Docket No. 50-271 Official Exhibit No. ES-05-14

OFFERED by Applicant/Licensee Intervenor _____

NRC Staff Other _____

IDENTIFIED on 7/23/08 Witness/Panel NEC 3

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VERMONT YANKEE NUCLEAR POWER STATION REVISED STEAM DRYER MONITORING PLAN

Introduction and Purpose

This plan describes the course of action for monitoring and evaluating the performance of the Vermont Yankee Nuclear Power Station (VYNPS) steam dryer during power ascension testing and operation above 100% of the original licensed thermal power (OLTP), i.e., 1593 MWt, to the full 120% extended power uprate (EPU) condition of 1912 MWt to verify acceptable performance. Unacceptable dryer performance is a condition that could challenge steam dryer structural integrity and result in the generation of loose parts or cracks or tears in the dryer that result in excessive moisture carryover. During reactor power operation, performance is demonstrated through the measurement of a combination of plant parameters. The comparison of measured plant data against defined criteria, based on the steam dryer structural analysis of record, will provide predictive capabilities toward determining steam dryer structural integrity under EPU conditions.

The Steam Dryer Monitoring Plan (SDMP) is applicable during initial power ascension to 1912 MWt and continues after full EPU conditions, as specified below. A license condition for steam dryer monitoring is proposed to require operational surveillances as well as visual inspections of the steam dryer, which will be conducted during specific scheduled refueling outages following achievement of full uprate conditions.

Entergy will accept a license condition for VYNPS that is based on the SDMP.

Scope

The SDMP is primarily an initial power ascension test plan designed to assess steam dryer performance from 100% OLTP to 120% OLTP (i.e., 1912 MWt). Assuming that a license amendment authorizing EPU is granted during the next operating cycle, power ascension will be achieved in one step: Elements of this plan will be implemented before EPU power ascension testing, and others may continue after power ascension testing.

Operating Specifications

When initially operating at a power level above 1593 MWt, the parameters identified in Table 1- which are indicative of steam dryer integrity - shall be monitored at the frequencies specified and shall meet applicable performance criteria specified in Table 2. The surveillance requirements of Table 1 will be effective during power ascension to any power level that was not previously attained. Any change to the performance criteria, required actions, or surveillance requirements in Tables 1 or 2 can only be made in accordance with the proposed steam dryer license condition (see Table 3).

Initial EPU power ascension testing above 100% OLTP will be conducted in 2.5% of OLTP steps and 5% of OLTP plateaus. The initial power ascension will include hold points at each 2.5% step and at each 5% plateau. The maximum power increase will not exceed a nominal 5% of OLTP in a 24-hour period.

Table 2 establishes the criteria for verifying acceptable steam dryer performance based on moisture carryover and main steam line pressure data. If the Level 1 or Level 2 performance

criteria are exceeded, the actions and completion times specified shall be met for the given condition. Reactor power operation that results in moisture carryover and steam pressures that are less than the Level 2 performance criteria in Table 2 is representative of fully acceptable steam dryer performance.

Additionally, if the performance criteria in Table 2 are exceeded, the following actions will be taken depending upon the criteria exceeded:

1. Either suspend reactor power ascension (Level 2 Acceptance Criteria) or reduce reactor power (Level 1 Acceptance Criteria), initiate a Condition Report, and evaluate the cause of any exceedance of the performance criteria.
2. Prior to increasing reactor thermal power to a level higher than any previously attained, the plant conditions relevant to steam dryer integrity and associated evaluation results shall be reviewed by the on-site safety review committee, and a recommendation shall be made to the General Manager, Plant Operations prior to increasing power for each 5% power plateau.
3. Strain gage pressure and moisture carryover data collected at each 5% power plateau will be made available to the NRC through its resident inspector.
4. Each initial increase in reactor thermal power to the next higher 5% power plateau above 100% OLTP must be authorized by the General Manager, Plant Operations.

Table 1
Steam Dryer Surveillance Requirements During Reactor Power
Operation Above a Previously Attained Power Level

Parameter	Surveillance Frequency
1. Moisture Carryover	Every 24 hours (Notes 1 and 2)
2. Main steam line pressure data from strain gages	Hourly when initially increasing power above a previously attained power level. AND At least once at every 2.5% (nominal) power step above 100% OLTP. (Note 3)
3. Main steam line pressure data from pressure transducers	At least once at every 2.5% (nominal) power step above 100% OLTP. (Note 3) AND Within one hour after achieving every 2.5% (nominal) power step above 100% OLTP.

Notes to Table 1:

1. If a determination of moisture carryover cannot be made within 24 hours of achieving a 5% power plateau, an orderly power reduction shall be made within the subsequent 12 hours to a power level at which moisture carryover was previously determined to be acceptable. For testing purposes, a power ascension step is defined as each power increment of 2.5% (nominal) over OLTP, i.e., at thermal power levels of approximately 102.5%, 105%, 107.5%, 110%, 112.5%, 115%, 117.5%, and 120% OLTP. Power level plateaus are nominally every 5% of OLTP greater than 100% (i.e., approximately 80 MWt).
2. Provided that the Level 2 performance criteria in Table 2 are not exceeded, when steady state operation at a given power exceeds 168 consecutive hours, moisture carryover monitoring frequency may be reduced to once per week.
3. The strain gage surveillance shall be performed hourly when increasing power above a level at which data was previously obtained. The surveillance of both the strain gage data and main steam line pressure data is also required to be performed once at each 2.5% power step above 100% OLTP and within one hour of achieving each 2.5% step in power, i.e., at thermal power levels of approximately 102.5%, 105%, 107.5%, 110%, 112.5%, 115%, 117.5%, and 120% OLTP. If the surveillance is met at a given power level,

additional surveillances do not need to be performed at that power level where data had previously been obtained.

If valid strain gage data cannot be recorded hourly or within one hour of initially reaching a 2.5% power step from at least three of the four main steam lines, an orderly power reduction shall be made to a lower power level at which data had previously been obtained. Any such power level reduction shall be completed within two hours of determining that valid data was not recorded.

Table 2
Steam Dryer Performance Criteria and Required Actions

Performance Criteria Not to be Exceeded	Required Actions if Performance Criteria Exceeded and Required Completion Times
<p><u>Level 2:</u></p> <ul style="list-style-type: none"> • Moisture carryover exceeds 0.1% <p>OR</p> <ul style="list-style-type: none"> • Moisture carryover exceeds 0.1% and increases by > 50% over the average of the three previous measurements taken at > 1593 MWt <p>OR</p> <ul style="list-style-type: none"> • Pressure data exceed Level 2 Spectra¹ 	<ol style="list-style-type: none"> 1. Promptly suspend reactor power ascension until an engineering evaluation concludes that further power ascension is justified. 2. Before resuming reactor power ascension, the steam dryer performance data shall be reviewed as part of an engineering evaluation to assess whether further power ascension can be made without exceeding the Level 1 criteria.
<p><u>Level 1:</u></p> <ul style="list-style-type: none"> • Moisture carryover exceeds 0.35% <p>OR</p> <ul style="list-style-type: none"> • Pressure data exceed Level 1 Spectra¹ 	<ol style="list-style-type: none"> 1. Promptly initiate a reactor power reduction and achieve a previously acceptable power level (i.e., reduce power to a previous step level) within two hours, unless an engineering evaluation concludes that continued power operation or power ascension is acceptable. 2. Within 24 hours, re-measure moisture carryover and perform an engineering evaluation of steam dryer structural integrity. If the results of the evaluation of dryer structural integrity do not support continued plant operation, the reactor shall be placed in a hot shutdown condition within the following 24 hours. If the results of the engineering evaluation support continued power operation, implement steps 3 and 4 below. 3. If the results of the engineering evaluation support continued power operation, reduce further power ascension step and plateau levels to nominal increases of 1.25% and 2.5% of OLTP, respectively, for any additional power ascension. 4. Within 30 days, the transient pressure data shall be used to calculate the steam dryer fatigue usage to demonstrate that continued power operation is acceptable.

¹ The EPU spectra shall be determined and documented in an engineering calculation or report. Acceptable Level 2 spectra shall be based on maintaining $\leq 80\%$ of the ASME allowable alternating stress (S_a) value at 10^{11} cycles (i.e., 10.88 ksi). Acceptable Level 1 Spectra shall be based on maintaining the ASME S_a at 10^{11} cycles (i.e., 13.6 ksi).

Data Collection

During initial EPU power ascension, plant data will be measured and recorded, as a minimum, at power steps corresponding to approximately 102.5%, 105%, 107.5%, 110%, 112.5%, 115%, 117.5%, and 120% OLTP. In addition, Entergy will monitor pressure data from the main steam strain gages hourly during initial power ascension. The plant will be held at each 5% power plateau to allow sufficient time to evaluate data measurements relative to performance criteria. Depending upon actual performance, smaller power increase increments may be used. Data collected will consist of:

- Dynamic pressure measurements taken from four pressure transducers installed on transmitters associated with each main steam line venturi.
- Measurements taken from strain gages located on each of the four main steam lines between the reactor pressure vessel nozzles and the closest inboard safety/safety relief valve.
- Moisture carryover measurements will be made during power ascension testing above 100% OLTP in accordance with SIL 644¹.
- Plant data that may be indicative of off-normal dryer performance will be monitored during power ascension (e.g., level, steam flow, feed flow, etc.). Plant data can provide an early indication of unacceptable dryer performance.

Evaluations

Data collected at each power ascension step will be evaluated relative to the performance criteria.

In addition, other reactor operational parameters that may be influenced by steam dryer integrity (e.g., steam flow distribution between the individual steam lines) will be monitored with the intent of detecting structural degradation of the steam dryer during plant operation (e.g., flow distribution between individual main steam lines). The enhanced monitoring of selected plant parameters will be controlled by plant procedures.

If any of the performance criteria in Table 2 are exceeded, the plant conditions relevant to steam dryer integrity and the associated evaluation results shall be reviewed by the on-site review committee at every 5% power plateau and prior to increasing power. Permission to ascend in power will be granted by the General Manager, Plant Operations.

Reporting to NRC

1. **Steam Dryer Visual Inspections:** The results of the visual inspections of the steam dryer conducted during the next three refueling outages shall be reported

¹ GE Nuclear Energy, Services Information Letter, SIL No. 644, Revision 1, "BWR Steam Dryer Integrity," November 9, 2004

to the NRC staff within 60 days following startup from the respective refueling outage.

2. SDMP: The results of the SDMP shall be submitted to the NRC staff in a report within 60 days following the completion of all EPU power ascension testing. In addition the final full EPU power performance criteria spectra (limit curve) will be submitted to the NRC staff within 120 days. Contemporary data and results from dryer monitoring will be available on-site for review by NRC inspectors as it becomes available. The written report on steam dryer performance during EPU power ascension testing will include evaluations or corrective actions that were required to obtain satisfactory dryer performance. The report will include relevant data collected at each power step, comparisons to performance criteria (design predictions), and evaluations performed in conjunction with dryer integrity monitoring.

Long Term Actions

The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Fall 2005, Spring 2007 Fall 2008 and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspection conducted during the Spring 2004 refueling outage and will meet the recommendations of SIL 644, Rev. 1.

Following completion of power ascension testing, moisture carryover measurements will continue to be made periodically, and other plant operational parameters that may be affected by steam dryer structural integrity will continue to be monitored, in accordance with GE SIL 644 and plant procedures.

Equipment associated with temporarily installed pressure monitoring sensors and strain gages may be removed from service following the achievement of one operating cycle after issuance of the EPU license amendment and satisfaction of the license condition requiring steam dryer inspection.

Table 3
PROPOSED STEAM DRYER LICENSE CONDITION

1. When operating above 1593 MWt (i.e., at extended power uprate conditions), the operating limits, required actions, and surveillances specified in the Steam Dryer Monitoring Plan (SDMP) shall be met. The following key attributes of the SDMP shall not be made less restrictive without prior NRC approval:
 - a. During initial power ascension testing above 1593 MWt, each test plateau increment shall be approximately 80 MWt;
 - b. Level 1 performance criteria; and
 - c. The methodology for establishing the stress spectra used for the Level 1 and Level 2 performance criteria.

Changes to other aspects of the SDMP may be made in accordance with the guidance of NEI 99-04².

2. During each of the three scheduled refueling outages (beginning with the Spring 2007 refueling outage), a visual inspection shall be conducted of all accessible, susceptible locations of the steam dryer, including flaws left "as-is" and modifications.
3. The results of the visual inspections of the steam dryer conducted during the three scheduled refueling outages (beginning with the Spring 2007 refueling outage) shall be reported to the NRC staff within 60 days following startup from the respective refueling outage. The results of the SDMP shall be submitted to the NRC staff in a report within 60 days following the completion of all EPU power ascension testing.
4. The requirements of Item 1 above shall be implemented upon issuance of the EPU license amendment and shall continue until the completion of one full operating cycle at EPU. If an unacceptable structural flaw (due to fatigue) is detected during the subsequent visual inspection of the steam dryer, the requirements of Item 1 above shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.
5. This license condition shall expire upon satisfaction of Items 2, 3 and 4 above, provided that a visual inspection of the steam dryer does not reveal any new unacceptable flaw or unacceptable flaw growth that is due to fatigue.

² Nuclear Energy Institute, "Guidelines for Managing NRC Commitment Changes," NEI 99-04, Revision 0, July 1999