

September 2, 2004

LICENSEE: Entergy Nuclear Operations, Inc.
FACILITY: Vermont Yankee Nuclear Power Station
SUBJECT: SUMMARY OF JULY 21 and 22, 2004, MEETINGS WITH ENTERGY
NUCLEAR OPERATIONS, INC. ON STEAM DRYER ANALYSIS FOR
VERMONT YANKEE NUCLEAR POWER STATION (TAC NO. MC0761)

On July 21 and 22, 2004, Category 1 meetings were held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Entergy Nuclear Operations, Inc. (Entergy) at NRC Headquarters in Rockville, Maryland.

The purpose of the July 21, 2004, meeting was to discuss the methodology being used by Entergy's contractor, General Electric Nuclear Energy (GENE), for the structural analysis of the Vermont Yankee Nuclear Power Station (VYNPS) steam dryer. This analysis is being used to support Entergy's license amendment request for a 20% power uprate at VYNPS. The power uprate request was submitted by Entergy to the NRC on September 10, 2003. The purpose of the July 22, 2004, meeting was to discuss some of the specific issues related to the VYNPS steam dryer analysis, including the steam dryer inspection and modifications performed during the Spring 2004 outage, and testing and monitoring planned for the steam dryer. A portion of each meeting was closed to the public in order to discuss proprietary information associated with GENE's analysis. The lists of attendees for the July 21 and 22, 2004, meetings are provided as Attachments 1 and 2, respectively.

Open Portion of Meeting on July 21, 2004

Mr. Richard Ennis, Project Manager for VYNPS in the NRC's Office of Nuclear Reactor Regulation (NRR) Division of Licensing Project Management (DLPM), provided introductory remarks. Mr. Ennis explained that although the steam dryer is a non safety-related component, industry experience with steam dryer cracking has raised concerns because of the potential for loose dryer parts to impact the performance of safety-related components. Mr. Ennis emphasized that the NRC needs to fully understand the analysis, design, and monitoring that Entergy plans for the VYNPS steam dryer as part of the staff's evaluation of the request to operate at a higher power level.

Mr. Craig Nichols, Entergy's VYNPS power uprate Project Manager, provided an overview of the information to be discussed during both meetings.

Mr. Dan Pappone, of GENE, presented information regarding the steam dryer structural analysis methodology as shown in slides 1 through 14 of Attachment 3. Mr. Pappone emphasized that industry experience with steam dryer failures is that steam line velocity is a good indicator of the pressure loads on the dryer. He noted that the VYNPS steam line velocities after the proposed power uprate would be about the same as the steam line velocities before power uprate at the Quad Cities and Dresden plants.

Members of the public were in attendance. There were no comments or questions from the public and no Public Meeting Feedback forms were received by the NRC staff. There were no action items resulting from this meeting.

Open Portion of Meeting on July 22, 2004

Mr. Ennis provided introductory remarks similar in nature to his introductory remarks during the meeting on July 21, 2004.

Mr. Nichols presented information regarding the VYNPS steam dryer activities related to the proposed power uprate as shown in the Attachment 4 slides. The following major topics were discussed during the presentation:

- Mr. Nichols discussed the VYNPS steam dryer inspection and steam dryer modifications that were performed during the Spring 2004 refueling outage. The same type inspection (i.e., consistent with GENE SIL-644 recommendations) will be performed during the next refueling outage. The modifications that were performed to strengthen the dryer incorporated the latest GENE modifications consistent with the lessons-learned from Quad Cities.
- Mr. Nichols stated that VYNPS steam dryer monitoring would take measurements consistent with GENE SIL-644 recommendations.
- Mr. Nichols discussed an acoustical monitoring program that will be used to get VYNPS specific data in order to show the GENE analysis is bounded by the VYNPS specific data. Entergy is using the same vendors as Exelon for this effort. Instrumentation was installed for the acoustic monitoring program during the recent forced outage. Data was collected during the subsequent plant startup for power levels between 80% and 100% power. Additional data would be collected following the proposed power uprate at power levels above the current 100% level during a controlled power ascension program.

Following the presentation by Mr. Nichols, the NRC staff provided the following questions and comments:

- Mr. Tad Marsh, Director of DLPM in the NRC's Office of NRR, raised concerns regarding the acoustic monitoring program use of data external to the dryer (e.g., main steam lines) in predicting the effects on the steam dryer. He asked if Entergy had considered instrumenting the steam dryer. Mr. Nichols stated that Entergy believes that the acoustic model can predict the pressure wave going back to the dryer. He stated that instrumenting the existing dryer would be difficult due to ALARA concerns. He said that during the modifications performed to strengthen the dryer during the Spring 2004 outage, underwater welding was performed and the dose to workers was approximately 15 rem. In addition, he stated it would be difficult to route new wiring out of the reactor vessel due to a lack of electrical penetrations.

- Mr. Gene Imbro, Chief of the Mechanical and Civil Engineering Branch (EMEB) in the Division of Engineering (DE) in the NRC's Office of NRR, stated that the staff still needs more information to have reasonable assurance that the steam dryer analysis is acceptable. Some of the specific concerns relate to the extrapolation of data from 100% power to 120% power, the adequacy of the GENE steam dryer scale model testing, and the lack of existing plant data on the face of the steam dryer hood. Mr. Imbro also stated that the NRC was considering whether, if the VYNPS power uprate was approved, the NRC may require a mid-cycle inspection of the dryer. Mr. Marsh discussed that the NRC was also considering if hold points, with interaction between the NRC and the licensee, may be required during a controlled power ascension.
- Mr. Tom Scarbrough, NRC Senior Mechanical Engineer in NRR/DE/EMEB, asked what work still needs to be done to support the VYNPS power uprate evaluation of the steam dryer. Mr. Nichols stated that the GENE analysis is done and Entergy will continue to evaluate any industry experience for applicability to VYNPS. Plant testing and monitoring of the steam dryer would be done during power ascension at uprated power conditions.
- Mr. John McCann, Entergy Director of Licensing, stated that Entergy would supplement the power uprate application with information regarding the acoustic monitoring program and power ascension program. They will not wait for an NRC request for additional information to provide this information.
- Mr. Gene Imbro stated that the NRC's contractor, Argonne National Labs, was reviewing the recent Entergy submittals related to the steam dryer analysis and that the staff and the contractors were still planning a trip to San Jose to audit the GENE analysis for VYNPS.
- Mr. Bill Ruland, the NRC's Program Manager for power uprates in NRR/DLPM, stated that Entergy should consider defining the specific acceptance criteria for what is acceptable in terms of steam dryer cracking. The criteria should be developed to provide clear justification of why certain type of cracking may be acceptable to be left in service following a steam dryer inspection. The criteria should define what is considered an unacceptable failure of the dryer.

Members of the public were in attendance. There were no comments or questions from the public. Public Meeting Feedback forms were not received.

The following are the action items resulting from this meeting:

1. Entergy noted that they are currently developing a plant specific acoustic analysis model for use in validating that the load definition for the steam dryer in the analysis of record is sufficiently conservative. This effort is scheduled for completion by the end of August, 2004. Entergy agreed to provide the results to the NRC and schedule a meeting to discuss with the NRC.
2. Entergy agreed to provide additional details on the power ascension test plan including plans for monitoring the steam dryer, as well as other plant systems and components, for flow induced vibration (FIV). This would include the acceptance criteria that will be used.

3. Entergy agreed to supply computational fluid dynamic output plots showing velocity profiles and streamlines.
4. Entergy agreed to provide a discussion of the effects of potential bi-stable flow on the steam dryer dynamics.
5. Entergy agreed to supply the basis for the stress intensity limit of 5 ksi-in^{1/2} limit for the drain channel cracks.
6. Entergy agreed to supply a discussion of the FIV and extended power uprate operating condition effect on crack growth.
7. Entergy agreed to provide a commitment to perform detailed inspections of the steam dryer during the next two refueling outages, in accordance with SIL-644, Supplement 1.
8. Entergy agreed to provide the results of the inspections scheduled for the next two outages to the NRC and discuss any changes to the long term monitoring plan once these inspections are completed.
9. Entergy agreed to supply the acceptance criteria that will be used in evaluating the structural integrity of the dryer.
10. A number of technical questions associated with the GENE analysis (e.g. damping values) were discussed and it was agreed that additional discussions would occur during the NRC's audit in San Jose.

Please direct any inquires concerning this meeting to me. I can be reached at (301) 415-1420, or rxe@nrc.gov.

/RA/

Richard B. Ennis, Senior Project Manager, VY Section
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Office of Nuclear Reactor Regulation

Docket No. 50-271

Attachments:

1. List of Attendees for July 21, 2004
2. List of Attendees for July 22, 2004
3. GENE Slides for July 21, 2004
4. Entergy Slides for July 22, 2004

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Package Accession No.: ML

Meeting Summary Accession No.: ML042220022

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