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RELATED CORRESPONDENCE

October 23, 2006

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ADJUDICATIONS STAFF

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
ENTERGY NUCLEAR VERMONT	)	
YANKEE, LLC and ENTERGY	)	Docket No. 50-271-LR
NUCLEAR OPERATIONS, INC	)	
	)	ASLBP No. 06-849-03-LR
(Vermont Yankee Nuclear Power Station)	)	

VERMONT DEPARTMENT OF PUBLIC SERVICE INITIAL DISCOVERY DISCLOSURES PURSUANT TO 10 C.F.R. § 2.336

Pursuant to 10 C.F.R. § 2.336, the Vermont Department of Public Service ("Vermont") hereby makes the following initial disclosures. In accordance with 10 C.F.R. § 2.336(d), Vermont will supplement these disclosures.

(a)(1) Experts

Vermont has not yet determined the person or persons it will rely upon as a witness with respect to the admitted contentions except for the state nuclear engineer, William K. Sherman. Mr. Sherman's address and telephone number are as follows:

William K. Sherman
State Nuclear Engineer
Vermont Department of Public Service
112 State Street - Drawer 20
Montpelier, VT 05620-2601
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The basis for Mr. Sherman's opinion thus far is included in his affidavits filed with Vermont's Initial Contentions and its Reply as well as the information contained in these

Template = SECY-035

SECY-02

disclosures.

(a)(2)(i) Documents and Data Compilations

Documents provided in hard copy with this transmittal

Related to NEC Contention 3

1. SIL No. 644, Rev. 1 dated November 9, 2004 - *BWR steam dryer integrity*.

2. DPS Responses to Discovery in PSB Docket 7195, Partial Production dated July 21, 2006.

3. DPS Responses to Discovery in PSB Docket 7195, Final Production dated July 21, 2006.

Related to NEC Contention 1

4. Letter from Rani Franovich of the NRC Division of License Renewal to Patricia Kurkul of NOAA's National Marine Fisheries Service Re: Request for List of Protected Species Within the Area Under Evaluation for the Vermont Yankee Nuclear Power Station License Renewal Application Review. May 5, 2006.

5. Letter from Rani Franovich of the NRC Division of License Renewal to Marvin Moriarty of the U.S. Fish and Wildlife Service Re: Request for List of Protected Species Within the Area Under Evaluation for the Vermont Yankee Nuclear Power Station License Renewal Application Review. May 5, 2006.

6. Letter from Rani Franovich of the NRC Division of License Renewal to Marvin Moriarty of the U.S. Fish and Wildlife Service Re: Amended Request for a List of Protected Species Within the Area Under Evaluation for the Vermont Yankee Nuclear Power Station License Renewal Application Review. July 21, 2006.

Related to Vermont Contention 1

7. Calculations of Mr. William Sherman, "For the Reply to Answers to Petition to Intervene" and hand-written calculations.

Documents provided on the 2 CDs with this transmittal

Related to NEC Contention 3

CD #1:

8. Memorandum of Understanding between the Vermont Department of Public Service and Entergy Nuclear Vermont Yankee, dated February 14, 2006 re Steam Dryer.

9. Petition of Vermont DPS for investigation into Vermont Yankee Steam Dryer. June 21, 2006.

10. Prefiled Testimony and Exhibits of William K. Sherman on behalf of the Vermont Department of Public Service dated June 21, 2006.

11. Vermont Public Service Board Docket 7195 - Prefiled Testimony of Raymond Shadis on behalf of NEC dated August 7, 2006.

12. Vermont Public Service Board Docket 7195 - Prefiled Testimony of Rico Betti with exhibits on behalf of Entergy dated August 7, 2006.

13. Vermont Public Service Board Docket 7195 - Prefiled Testimony of John Dreyfuss with exhibits on behalf of Entergy dated August 7, 2006.

14. Vermont Public Service Board Docket 7195 - Prefiled Testimony of Marcos Herrera with exhibits on behalf of Entergy dated August 7, 2006.

15. Vermont Public Service Board Docket 7195 - Initial Brief of Entergy dated 8/30/06.

16. Vermont Public Service Board Docket 7195 - Initial Brief of DPS dated 8/30/06.

17. Vermont Public Service Board Docket 7195 - Initial Brief of NEC dated 8/30/06.

18. Vermont Public Service Board Docket 7195 - Reply Brief of Entergy dated 9/8/06.

19. Vermont Public Service Board Docket 7195 - Reply Brief of DPS dated 9/8/06.

20. Vermont Public Service Board Docket 7195 - Board's Final Order.

21. Vermont Public Service Board Docket 7195 - Ratepayer Protection Plan.

22. Vermont Public Service Board Docket 7195 - Cover Letter dated 10/10/06 for Ratepayer Protection Plan compliance filing.

CD #2

23. Vermont Public Service Board Docket 7195 - Transcript of Deposition of William K. Sherman taken on 7/25/06.

24. Vermont Public Service Board Docket 7195 - Transcript of Deposition of William K. Sherman taken on 7/26/06.

25. Vermont Public Service Board Docket 7195 - Transcript of Technical Hearing of 8/17/06.

26. Vermont Public Service Board Docket 7195 - Transcript of Technical Hearing of 8/17/06.

(a)(2)(ii) Tangible Things (e.g. books, publications and treatises)

Related to Vermont Contention 1

27. *Marks' Standard Handbook for Mechanical Engineers*, Eighth Edition. Theodore Baumeister, Editor-in-Chief. McGraw-Hill Book Company.

28. Yankee Atomic Electric Company: *Vermont Yankee Summary Report of Plant Environmental Conditions for Environmental Qualification Program, Rev. 0.* By D.E. Yasi. March 19, 1984.

(a)(2)(iii) Documents Available Publically on ADAMS or NRC Website

Related to NEC Contention 2

29. Draft Regulatory Guide DG-1144: *Guidelines for Evaluating Fatigue Analyses Incorporating the Life Reduction of Metal Components Due to the Effects of the Light-Water Reactor Environment for New Reactors.* July 2006.

30. NUREG/CR-6909, ANL-06/08: *Effect of the LWR Coolant Environments on the Fatigue Life of Reactor Materials. Draft Report for Comment.* Argonne National Laboratory.

Related to Contentions Vermont 1, NEC 2, 3, and 4

31. NUREG/CR-6679; BNL-NUREG-52587: *Assessment of Age-Related Degradation of Structures and Passive Components for U.S. Nuclear Power Plants.* Brookhaven National Laboratory.

32. Nuclear Energy Institute: *Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - the License Renewal Rule.* June 2005. ADAMS ML051860406.

Additional Information

The Vermont Department of Public Service has no privileged and protected documents that require disclosure at this time. There may be information not in the custody of the Vermont Department of Public Service but in the possession of the Vermont Agency of Natural Resources that is relevant to NEC Contention 1[1]. If a party would like to examine the publically available

[1]The Department moved to adopt the originally filed NEC Contention 1 and that motion was granted. NEC, on August 7, 2006, moved for leave to amend or file a new contention that would effect NEC Contention 1. The ASLB has not ruled on that motion. The Department has

information at the VANR, the Department would arrange to have such an examination take place. Finally, please call undersigned counsel if you need any assistance in accessing any of the information not provided in hard copy or electronically.

Respectfully submitted,

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not moved to adopt the new or amended contention.

October 23, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket No. 50-271-LR
ENTERGY NUCLEAR VERMONT	)	
YANKEE LLC AND ENTERGY NUCLEAR	)	ASLBP No. 06-849-03-LR
OPERATIONS, INC.	)	
(Vermont Yankee Nuclear Power Station)	)	

CERTIFICATE OF DISCLOSURE

1. My name is William K. Sherman. I am employed by the Vermont Public Service Department ("Department") in the position of State Nuclear Engineer. I have held this position since November, 1988. My duties include ongoing State regulatory oversight of the Vermont Yankee Nuclear Power Station ("Vermont Yankee"), as well as advising the Department and other State agencies on issues related to Vermont Yankee and nuclear power.

2. To the best of my knowledge, information and belief, the Vermont Department of Public Service Initial Disclosure of 10/23/06 Pursuant to 10 C.F.R. § 2.336, transmits all materials required to be disclosed pursuant to 10 C.F.R. § 2.336 that were identified as relevant to the admitted contentions through a search of the information and documentation under the Department of Public Service's possession, control and custody as of the date of this certification.

William K. Sherman
William K. Sherman
State Nuclear Engineer

Subscribed and sworn to before me this 23rd day of October, 2006.

Susan M. Pittsley
Susan M. Pittsley
Notary Public
My commission expires 02-10-07

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the Department of Public Service Initial Discovery Disclosures Pursuant to 10 C.F.R. § 2.336 and Certification of Disclosure were served on the persons listed below by deposit in the U.S. Mail, first class, postage prepaid, on the 23rd day of October, 2006, and by electronic mail and where indicated by an asterisk on this 23rd day of October, 2006. The double asterisks indicates that only the Disclosure List and not the actually documents or CDs were sent to Justices Karlin, Wardwell, and Elleman.

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Respectfully submitted,

Sarah Hofmann
Director for Public Advocacy
Vermont Department of Public Service

GE Nuclear Energy

SIL
Services Information Letter

BWR steam dryer integrity

SIL No. 644
Revision 1

November 9, 2004

SIL No. 644 ("BWR/3 steam dryer failure"), issued August 21, 2002, described an event at a BWR/3 that involved the failure of a steam dryer cover plate resulting in the generation of loose parts, which were ingested into a main steam line (MSL). The most likely cause of this event was identified as high cycle fatigue caused by a flow regime instability that resulted in localized high frequency pressure loadings near the MSL nozzles. SIL No. 644 Supplement 1, issued September 5, 2003, described a second steam dryer failure that occurred at the same BWR/3 approximately one year following the initial steam dryer failure. This second failure occurred at a different location with the root cause identified as high cycle fatigue resulting from low frequency pressure loading. SIL No. 644 included focused recommendations. For BWR/3-style steam dryers, it recommended monitoring steam moisture content (MC) and other reactor parameters, and for those plants operating at greater than the original licensed thermal power (OLTP), it recommended inspection of the cover plates at the next refueling outage. SIL No. 644 Supplement 1 broadened the earlier recommendations for BWR/3-style steam dryer plants and provided additional recommendations for BWR/4 and later steam dryer design plants planning to or already operating at greater than OLTP.

Following this revised guidance, inspections were performed on plants operating at OLTP, stretch uprate (5%), and extended power uprate conditions. These inspections indicate that steam dryer fatigue cracking can also occur in plants operating at OLTP.

The purpose of this Revision 1 to SIL No. 644 is to describe additional significant fatigue cracking that has been observed in steam dryer hoods subsequent to the issuance of SIL No. 644 Supplement 1 and to provide inspection and monitoring recommendations for all BWR plants based on these observations. In that the occurrence of fatigue cracking has been observed in several BWRs, this revision contains inspection and monitoring recommendations that apply to all plants. SIL No. 644 Revision 1 voids and supercedes SIL No. 644 and SIL No. 644 Supplement 1.

Discussion

Instances of fatigue cracking in the steam dryer hood region have been observed recently in several BWR plants. The cracking has led to failure of the hood and the generation of loose parts in two BWR/3 plants. Details of the cracking in these plants are described below. These observations have potential generic significance for all BWR steam dryers that will be discussed in the generic implications section below.

BWR/3-Style Dryer Observations

Lower horizontal cover plate failure occurred in a BWR/3 in 2002. In this failure, almost the entire lower horizontal cover plate came completely loose, with some large pieces falling down onto the steam separators and one piece being ingested into the main steamline and lodging in the flow restrictor. This failure was accompanied by a significant increase in moisture content, along with changes in other monitored reactor parameters. The cause of this failure was attributed to the higher fluctuating pressure loads at extended power uprate (EPU) operation. In particular, there may have been a potential resonance condition between a high frequency fluctuating pressure loading (in the 120-230 Hz range) and the natural frequency of the cover plate. Appendix A provides a more detailed description of this event.

The same BWR/3 experienced extensive through-wall cracking in the outer bank hood on the 90° side in May 2003. On the opposite side of the steam dryer (270° side), incipient cracking was observed on the inside of the outer hood cover plate. Several internal braces were detached and found on top of the steam separators. No damage was found on the inner banks of the dryer. Again, the failure was accompanied by a significant increase in moisture content. Of the other monitored reactor parameters, only the flow distribution between the individual steamlines was affected. The cause of this failure was attributed to high cycle fatigue resulting from low frequency oscillating pressure loads (<50 Hz) of higher amplitude at EPU operation and the local stress concentration introduced by the internal brackets that anchor the diagonal internal braces to the dryer hoods. Appendix B provides a more detailed description of this event.

In November 2003, a hood failure occurred in the sister unit to the BWR/3 that had experienced the previously noted failures. This unit was also operating at EPU conditions. The observed hood damage and associated root cause determination were virtually the same as the May 2003 failure described above. During the event, the moisture content exceeded the previously defined action level. However, the monitored plant parameters (primarily individual steamline flow rates) showed only subtle changes and were well within the previously defined action levels for the plant. This failure resulted in the generation of loose parts from the outer vertical hood plate. In addition, inspections during the repair outage showed fatigue cracking in the inner hood vertical braces below where the lower ends of the diagonal braces were attached. The cracking of these braces was attributed to poor fit-up of the parts during the dryer fabrication. The diagonal braces should have terminated on the vertical braces where they were butted up against the drain trough, which would have transferred the diagonal brace loads directly to the drain trough. Instead, the diagonal braces terminated on the vertical braces above the top of the drain trough and the diagonal brace loads were transmitted through the unsupported section of the vertical braces, thus overstressing the vertical braces.

In October 2003 and December 2003, inspections were made of the steam dryers of the sister units to the BWR/3s described above at another site. These units had also been operating at EPU conditions. Incipient cracking was observed on the inside of the outer hood vertical plates on each of the outer dryer banks. At one location, the cracking had grown through-wall. The cracking was also attributed to high cycle fatigue resulting from low frequency pressure loading.

In March 2004, inspections were performed of the repairs made to the BWR/3 dryer in 2003. Incipient fatigue cracks were found at the tips of the external reinforcing gussets that were added as part of the 2003 repairs. Fatigue cracks were also found in tie bars that were reinforced during the 2003 repairs. The cracking in these repairs was attributed to local stress concentration introduced by the as-installed repairs. In both cases, the local stress concentrations had not been modeled in sufficient detail in the analyses that supported the repair design. Fatigue cracks were also found in perforated plate insert modifications that were made in 2002 as part of the extended power uprate implementation. These cracks were also attributed to the displacements and stresses imposed by the dryer banks that caused the tie bar cracking.

In April 2004, inspections were made of a BWR/3-style dryer (square hood) in a BWR/4 plant in preparation for implementing an extended power uprate during the upcoming cycle. This inspection found cracking at two diametrically opposed locations on the exterior steam dam near the lifting lug. Both cracks were similar in length. The cause of the cracking was not identified. It has been postulated that the crack initiation was due to high residual stresses generated during the dryer fabrication process. The structural analysis of the steam dryer for EPU conditions did not predict these locations as highly susceptible to fatigue cracking. Two other symmetrical locations in the steam dryer that experienced the same loading conditions did not exhibit any evidence of cracking. These observations point to the likelihood of the presence of an additional contributing factor aside from the pressure loads during normal operation. Specifically, the evidence indicates that a high residual stress condition was probably developed by the original dryer fabrication welding sequence. Other "cold spring" type loading could also have been generated during the fabrication process. After the cracking developed, the residual stresses would have been relieved and the crack growth would have subsided.

BWR/5-Style Dryer Observation

In March 2004, inspection of the steam dryer at a BWR/5 revealed a fatigue crack in the hood panel to end plate weld. The hood crack occurred in the weld joint between the 1/8" curved hood and the 1/4" end plate on the second dryer bank. This particular weld location is vulnerable to fatigue cracking because of the small weld size associated with the thin 1/8" hood material. Fabrication techniques (e.g., feathering the 1/8" plate during fit-up) may further reduce the weld size. Fatigue cracking has been observed in the second bank hood-end plate weld at several other plants with the curved BWR/4-5 hood design at OLTP power levels. An undersized weld was determined to be the root cause of the cracking observed in at least two of the plants. Incorporating lessons learned from the weld cracks at the other plants, the dryer for this BWR/5 was built with an additional 1/4" fillet weld on the inside of the hood-end plate joint. This weld extended as high up in the hood as was practical for the welder to make (approximately 50") and spanned the probable initiation location for the earlier cracks. The weld crack at the subject BWR/5 occurred in the upper part of the 1/8" weld, above this reinforced section.

The weld joint between the 1/8" curved hood and the 1/4" end plate on the second dryer bank is a known high stress location for the BWR/4-5 curved hood dryer design; therefore, periodic inspection of this location was recommended by SIL No. 644 Supplement 1. The hood cracks at the other four plants occurred early in plant life, within the first three or four cycles of operation. In-plant vibration testing of one of the cracked dryers showed that the dynamic pressure oscillations were high enough that the 1/8" hood to end plate weld was vulnerable to fatigue cracking at pre-uprate power levels. The hood crack at the subject BWR/5 occurred after approximately 16 years of operation, the last nine of which were at a 5% stretch uprate power level. While power uprate operation does increase the loading on the dryer, the length of operating time at uprated power levels before the cracking was observed indicates that the weld was not grossly overstressed and that power uprate was only a secondary factor in the cracking observed at the subject BWR/5.

BWR Fleet Operating History

Steam dryer cracking has been observed throughout the BWR fleet operating history. The operating environment has a significant influence on the susceptibility of the dryer to cracking. Most of the steam dryer is located in the steam space with the lower half of the skirt immersed in reactor water at saturation temperature. These environments are highly oxidizing and increase the susceptibility to IGSCC cracking. Average steam flow velocities through the dryer vanes at rated conditions are relatively modest (2 to 4 feet per second). However, local regions near the steam outlet nozzles may be continuously exposed to steam flows in excess of 100 feet per second. Thus, there is concern for fatigue cracking resulting from flow-induced vibration and fluctuating pressure loads acting on the dryer.

In addition to the recent instances described above, steam dryer cracking has been observed in the following components at several BWRs: dryer hoods, dryer hood end plates, drain channels, support rings, skirts, tie bars, and lifting rods. These crack experiences have predominately occurred during OLTP conditions, and are briefly described below.

Dryer Hood Cracking

As discussed above, outer hood cracking has occurred recently in square hood design dryers. Additionally, other hood cracking has occurred in the BWR operating fleet. Cracking of this type was first found in BWR/2s in the inner banks. These hood cracks were attributed to high cycle fatigue. Other cracking has since been observed in other types of dryers including BWR/4s and attributed to high cycle fatigue as well. Susceptible plants were typically reinforced with weld material or plates.

Dryer End Plate Cracking

Cracking has been detected in end plates of the dryer banks at several BWRs. These cracks have been attributed to IGSCC based on the location and morphology of the cracks. These cracks have been followed over several cycles and shown to be stable when operating conditions (power levels) are not changed. Typically no repairs have been necessary.

Drain Channel Cracking

Drain channel cracking has been found in all types of BWRs. This cracking has been primarily categorized as being attributable to fatigue, although many cracks have been attributed to IGSCC. The steam dryers were originally fabricated using Type 304 stainless steel, a material susceptible to sensitization by welding processes and prone to crack initiation in the presence of cold work. Drain channel cracking has been associated with at least 17 plants. The occurrence of the cracking prompted GE to issue SIL No. 474 ("Steam Dryer Drain Channel Cracking" issued October 26, 1988) after cracks were discovered in the drain channel attachment welds during routine visual examination of dryers at several BWR/4, 5 and 6 plants. The cracks generally were through the throat of vertical welds that attach the side of the drain channel to the exterior of the 0.25-inch thick dryer skirt. The cracks were as long as 21 inches. The cracks are thought to have originated at the bottom of the drain channel where there is maximum stress in the welds. The appearance of the cracking and analysis of potential sources of stress on the welds indicate that high cycle fatigue initiated the cracks in drain channel welds. With the internal dryer inspections performed following the issuance of SIL No. 644, similar cracking has been observed in the internal drain channels of BWR/3-type steam dryers. Typically, drain channel cracks have been repaired by replacing and adding reinforcement weld material, stop-drilling the crack tip, or by replacing the drain channels.

Support Ring Cracking

Support ring cracking has been found in many BWRs. Cracking has been found in at least 19 plants, ranging from BWR/4s to BWR/6s. The cause of cracking has been IGSCC with a potential contributor being the cold working of the support ring during the fabrication process. These cracks are typically monitored for growth. To date, no repairs have been necessary since cracks have reached an arrested state.

Skirt

Skirt cracking has been found along with drain channel cracking. These cracks are either due to IGSCC or could be related to fatigue due to imposed local loads on the dryer. The cracking has also been found in the formed channel section of the dryer. The complex structural dynamic mode shapes of the dryer skirt, the stiffness added by the drain and guide channels, and residual weld stresses all contribute to the cracking observed in these components. Cracking in the dryer skirt region has been observed in plants operating at both OLTP and uprated power levels. Typically, repairs have been implemented at the time that cracking was found.

Tie Bar Cracking

Fatigue cracking has been observed in tie bars of plants operating at both OLTP and uprated power levels. In most cases, the potential for cracking is related to the cross section of the tie bar itself because the tie bar must withstand the displacements and stresses imposed by the dryer banks. Typically, repairs have been implemented at the time that cracking was found.

Lifting Rod

Several plants have exhibited damage in the lifting rods. This cracking has often been in tack welds or in lateral brackets and has been attributed to fatigue.

Other Crack Locations

Other locations have also exhibited cracking. These locations include the level screws or leveling screw welds, seismic blocks, dryer bank end plates and internal attachment welds, vertical internal hood angle brackets and bottom plates.

Generic Implications

The steam dryer is a non-safety component. However, the structural integrity of the dryer must be maintained such that the generation of loose parts is prevented during normal operation, transients, and accident events. With the exception of the significant outer hood cracking at the two BWR/3 plants, the dryer cracking observed in the BWR fleet to date is unlikely to result in the generation of loose parts provided that a periodic inspection program is in place. However, given that the steam dryers operate in an environment that is conducive to crack initiation and that many plants are pursuing power uprates and operating license extensions, further cracking in steam dryers should be anticipated. Therefore, the material condition of the dryer should be actively managed to ensure that structural integrity is maintained throughout the life of the dryer.

The experience described above has several generic implications with respect to the susceptibility of steam dryers to fatigue or IGSCC cracking.

- o Fatigue cracking may result from stress concentrations inherent in the design of the dryer. The design of the BWR/3-style steam dryers with a square hood and internal braces results in maximum stresses where the internal braces attach to the outer hood.

  The hood crack initiation at the BWR/3s described above occurred at these high stress locations. Also, the undersized hood-to-end plate welds on the BWR/5 curved hood dryers have cracked in several plants.

- o The actual dryer fabrication may have introduced stress concentrations that may lead to fatigue cracking. The poor fit-up of the diagonal and vertical braces in the BWR/3 dryer led to the cracking of the vertical braces. Feathering of the 1/8" plate during fit-up, and the corresponding reduction in weld area, was considered a contributing factor in the through-wall cracking of the hood-end plate weld in one of the BWR/5-style dryers. Residual stresses or "cold spring" introduced during the fabrication sequence may also lead to crack initiation.

- o The fabrication quality for each dryer may vary from one unit to the next, even if the dryers were built by the same fabricator to the same specifications.

- o The design of dryer repairs and modifications should consider the local stress concentrations that may be introduced by the modification design or installation. Repairs and modifications to the dryer should be inspected at each outage following the installation until structural integrity of the repairs and modifications can be confirmed.

- o Steam dryers are susceptible to IGSCC due to the material and fabrication techniques used in the dryer construction. Weld heat affected zone material is likely to be sensitized. Many dryer assembly welds have crevice areas at the weld root, which were not sealed from the reactor environment. Cold formed 304 stainless steel dryer parts were generally not solution annealed after forming and welding. Therefore, steam dryers are susceptible to IGSCC.

Parameter monitoring programs had been previously recommended with the intent of detecting structural degradation of the steam dryer during plant operation. The experience described above also has generic implications with respect to monitoring reactor system parameters during operation for the purposes of detecting steam dryer degradation.

- o The November 2003 BWR/3 hood failure demonstrated that monitoring steam moisture content and other reactor parameters does not consistently predict imminent dryer failure nor will it preclude the generation of loose parts. Monitoring is still useful in that it does allow identification of a degraded dryer allowing appropriate action to be taken to minimize the damage to the dryer and the potential for loose parts generation.
- o Monitoring the trends in parameter values may be more important than monitoring the parameter values against absolute action thresholds. An unexplained change in the trend or value of a parameter, particularly steam moisture content or the flow distribution between individual steamlines may be an indication of a breach in the dryer hood, even though the absolute value of the parameter is still within the normal experience range.
- o Statistical smoothing techniques such as calculating running averages using a large quantity of samples may be necessary to eliminate the process noise and allow the changes in the trend to be identified.
- o An experience base should be developed for each plant that correlates the changes in monitored parameters to changes in plant operation (rod patterns, core flow, etc.) in order to be able to distinguish the indications of a degraded dryer from normal variations that occur during the operating cycle.

Recommended Actions:

GE Nuclear Energy recommends that owners of GE BWRs consider the following:

A. For all plants:

A1. Perform a baseline visual inspection of all susceptible locations of the steam dryer within the next two scheduled refueling outages. Inspection guidelines showing the susceptible locations for each dryer type are provided in Appendix C.

a. Repeat the visual inspection of all susceptible locations of the steam dryer at least once every two refueling outages.

b. For BWR/3-style steam dryers with internal braces in the outer hood that are operating above OLTP, repeat the visual inspection of all susceptible locations of the steam dryer during every refueling outage.

c. Flaws left "as-is" should be inspected during each scheduled refueling outage until it has been demonstrated that there is no further crack growth and the flaws have stabilized.

Note: This recommendation does not supercede the inspection schedules for existing flaws for which plant-specific evaluations already exist.

d. Modifications and repairs to cracked components should be inspected during each scheduled refueling outage until the structural integrity of the modifications and repairs has been demonstrated. Once structural integrity of any modifications and repairs has been demonstrated, longer inspection intervals for these locations may be justified.

Note: This recommendation does not supercede the inspection schedules for existing modifications or repairs for which plant-specific evaluations already exist.

A2. Implement a plant parameter monitoring program that measures moisture content and other plant parameters that may be influenced by steam dryer integrity. Initial monitoring should be performed at least weekly. Monitoring guidelines are provided in Appendix D.

A3. Review drawings of the steam dryer to determine if the lower cover plates are less than 3/8 inch thick or if the attachment welds are undersized (less than the lower cover plate thickness). If this is the case, and the plant has operated above OLTP, review available visual inspection records to determine if there are any pre-existing flaws in the cover plate and/or the attachment welds.

B. In addition, for plants planning on increasing the operating power level above the OLTP or above the current established uprated power level (i.e., the plant has operated at the current power level for several cycles with no indication of steam dryer integrity issues), the recommendations presented in A (above) should be modified as follows:

B1. Perform a baseline visual inspection of the steam dryer at the outage prior to initial operation above the OLTP or current power level. Inspection guidelines for each dryer type are provided in Appendix C.

B2. Repeat the visual inspection of all susceptible locations of the steam dryer during each subsequent refueling outage. Continue the inspections at each refueling outage until at least two full operating cycles at the final uprated power level have been achieved. After two full operating cycles at the final uprated power level, repeat the visual inspection of all susceptible locations of the steam dryer at least once every two refueling outages. For BWR/3-style steam dryers with internal braces in the outer hood, repeat the visual inspection of all susceptible locations of the steam dryer during every refueling outage.

B3. Once structural integrity of any repairs and modifications has been demonstrated and any flaws left "as-is" have been shown to have stabilized at the final uprated power level, longer inspection intervals for these locations may be justified.

To receive additional information on this subject or for assistance in implementing a recommendation, please contact your local GE Nuclear Energy Representative.

This SIL pertains only to GE BWRs. The conditions under which GE Nuclear Energy issues SILs are stated in SIL No. 001 Revision 6, the provisions of which are incorporated into this SIL by reference.

Product reference

B11 — Reactor Assembly
B13 — Reactor System

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Appendix A

2002 BWR/3 Event

On June 7, 2002, while operating at approximately 113% of OLTP, the BWR/3 experienced a mismatch between the "A" and "B" reactor vessel level indication channels, a loss of approximately 12 MWt, and a reactor pressure decrease. Following the event, measurement indicated that the moisture content had increased by a factor of 10 (to a value of 0.27%). The reactor pressure decrease, reactor vessel level indication mismatch, and increase in moisture content comprised a set of concurrent indications suggesting a possible failure of the steam dryer. It was evaluated that there were no safety concerns associated with the observed conditions, and the plant continued to operate after implementing several compensatory measures (e.g., reactor water level setpoint adjustments, increased frequency of moisture content measurements).

Following the initial event, additional short duration (several minutes to ½ hour) perturbations occurred and the moisture content continued to increase. When the moisture content increased to approximately 0.7%, the power level was reduced to approximately 97% of OLTP. At this reduced power, the frequency of the plant perturbations decreased, along with the moisture content. Given the stable plant response at this lower power, the power was increased to 100% OLTP approximately one week later.

On June 30, subsequent to the power reduction to the OLTP level, a step change increase in the reactor steam dome pressure was noted. No changes in turbine control valve positions or pressure in the turbine steam chest were observed. Several additional perturbations occurred over the following week with the reactor steam dome pressure continuing to increase (to a total of 15 to 20 psi above normal conditions) along with a divergence of the measured total main steam line (MSL) flows compared to the total feedwater flow. The plant was shut down on July 12 to inspect the steam dryer.

Inspection Results:

Inspection of the steam dryer revealed that a ¼-inch stainless steel cover plate measuring approximately 120" x 15" had failed near the MSL "A" and "B" nozzles (Figure A-1). The failure of this cover plate allowed steam to bypass the dryer banks and exit through the reactor MSL nozzles, causing the observed increase in moisture content. The majority of the cover plate was found as a single piece on top of steam separators. However, a piece of the cover plate (approximately 16"x 6") had failed and was found lodged in and partially blocking the MSL "A" flow venturi contributing to the MSL flow imbalance and water level perturbations. Several smaller loose pieces (believed to have come from a startup pressure sensor bracket which may have been knocked off by the cover plate) were located at the turbine stop valve strainer basket. Minor gouges and scratches from the transport of foreign material were noted in the "A" steam nozzle cladding, the main steam piping and the MSL "A" flow venturi. All loose pieces were recovered. No collateral damage to other reactor vessel components was observed.

The cover plate was welded in place as part of the original equipment dryer assembly. No known prior repairs had been made to the cover plate. The cover plate is not connected or adjacent to the dryer modification performed at the previous outage; all flow distribution plates installed as part of the dryer modification were intact in the as-installed condition.

Metallurgical Evaluation:

Preliminary laboratory analysis has been completed. The main crack originated from the bottom side of the cover plate and propagated upward through both the plate base metal and weld metal. The transgranular, as opposed to intergranular, nature of the fracture surface and the relative lack of crack branching indicated that the failure was not caused by stress-corrosion cracking. The lack of macro and micro ductility features in and near the fracture indicated the cracking occurred over a period of time and not due to a mechanical overload. Additionally, there was no evidence that the failure was a result of an original manufacturing defect. Based on the available evidence, the most probable cause of the cover plate cracking was mechanical, high cycle fatigue.

Root Causes:

The results of the metallurgical analysis confirmed that the failure mechanism is high cycle fatigue. The cause of this high cycle fatigue is believed to be flow induced vibration. At this time there are two probable root causes of the cover plate failure:

1. Increased pressure oscillations on the steam dryer due to the increased steam flows at extended power uprate conditions, aggravated by the potential presence of a pre-existing crack in the cover plate.
2. A flow regime instability that results in localized, high cycle pressure loadings near the MSL nozzles. When the natural frequency of the installed cover plate coincides or nearly coincides with the frequency of the cyclic pressure forcing function, and the acoustic natural frequency of the steam zone, the resulting resonance or resonances can lead to high vibratory stresses and eventual high cycle fatigue failure of the cover plate.

Corrective Actions:

The cover plates on both sides of the dryer have been replaced with ½-inch continuous plates (this eliminates two intermediate welds on the original plates). The fillet weld connecting the plate to the support ring was increased to ⅜-inch and the weld to the vertical face of the dryer hood was increased to ½-inch. The plant has been returned to service with interim, enhanced monitoring of moisture content, reactor steam dome pressure, MSL flow rates and reactor water level. As an additional measure, the plant has implemented dynamic response monitoring of the MSLs to determine if higher flow induced vibration occurs as the steam flow is increased.

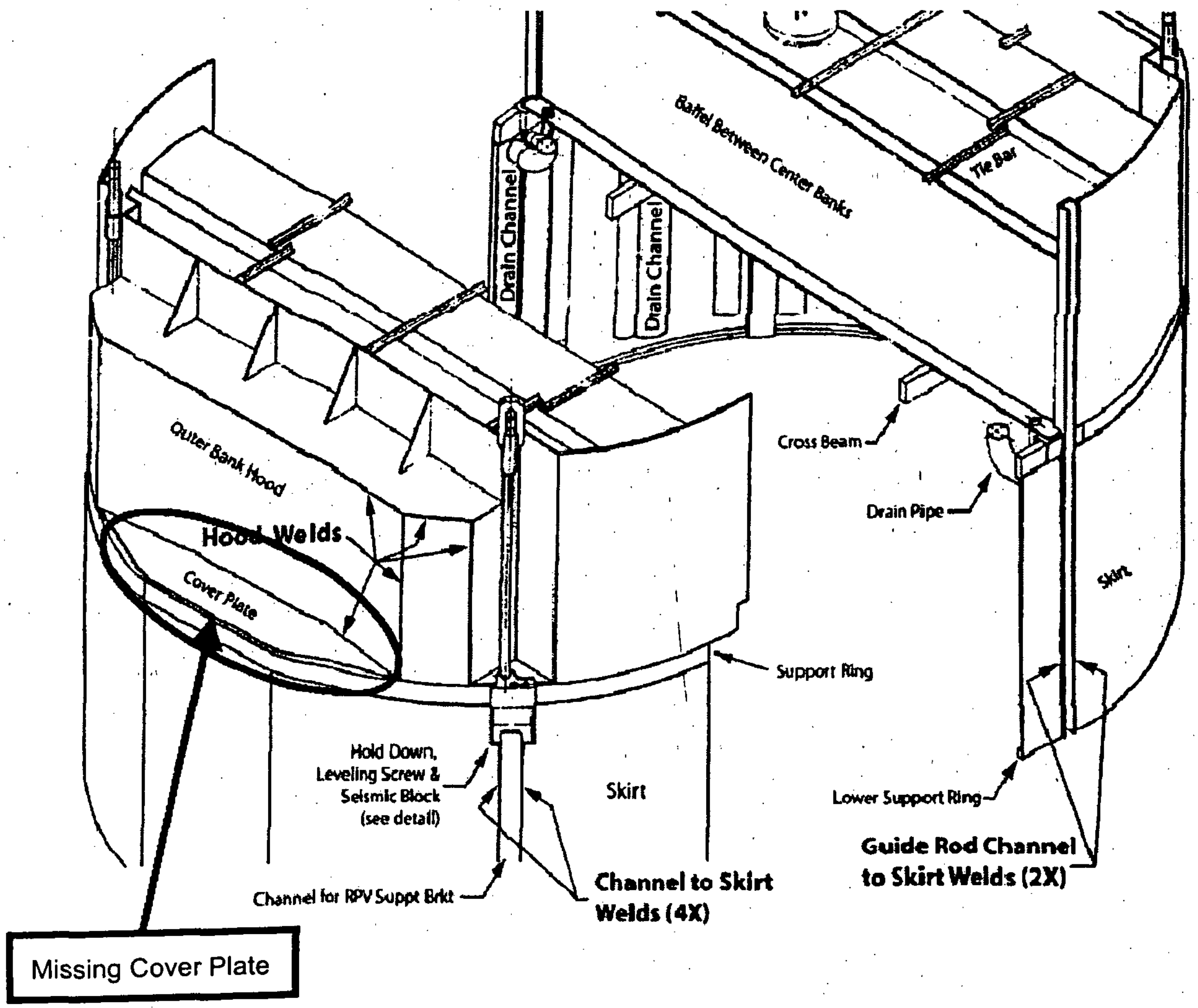


Figure A-1: Location of the 2002 Lower Cover Plate Failure

Appendix B

2003 BWR/3 Event

On April 16, 2003, with the plant operating at extended power uprate (EPU) conditions, an inadvertent opening of a pilot operated relief valve (PORV) occurred. The unit was shut down and the PORV replaced. On May 2, 2003, following return to EPU conditions, a greater than four-fold increase in the moisture content was measured. The moisture content continued to gradually increase until it exceeded a pre-determined threshold of 0.35% on May 28, 2003. The power level was reduced to pre-EPU conditions that resulted in a moisture content reduction to 0.2%. The moisture content remained steady at this value following the power reduction with no significant changes in other reactor operating parameters observed by the operators.

A detailed statistical evaluation of key plant parameters concluded that a subtle change in the MSL flows had occurred following the April 16, 2003 PORV event. Based on this information, concurrent with the moisture content increase, the utility elected to shut down the unit on June 10, 2003 and perform a steam dryer inspection.

Inspection results

A detailed visual inspection of the accessible external and internal areas of the steam dryer revealed significant steam dryer damage. The damage was most severe on the 90-degree side of the steam dryer, the side that was closest to the PORV that had opened. On the 90-degree side, a through-wall crack approximately 90 inches long and up to three inches wide was observed in the top of the outer hood cover plate and the top of the vertical hood plate (refer to Figures B-1 and B-2). Three internal braces in the outer hood were detached and one internal brace in the outer hood was severed. The detached braces were found on top of the steam separator. All detached parts were accounted for and retrieved. On the opposite side of the steam dryer (270-degree side), incipient cracking was observed on the inside of the outer hood cover plate and one vertical brace in the outer hood was cracked. No damage was found in the cover plates that had been replaced following the first steam dryer failure in 2002.

Three tie bars on top of the steam dryer connecting the steam dryer banks were also cracked. Tie bar cracking has been observed on several other steam dryers (including plants that have not implemented EPU); therefore, tie bar cracking is believed to be unrelated to the other damage noted above.

Root cause of steam dryer failure

Extensive metallurgical and analytical evaluations (e.g., detailed finite element analyses, flow induced vibration analyses, computational fluids dynamics analyses, $1/16^{th}$ scale model testing and acoustic circuit analyses) concluded that the root cause of the steam dryer failure was high cycle fatigue resulting from low frequency pressure loading. There are two potential contributing factors to the failure:

1. Continued operation for approximately 1 month following the failed cover plate in 2002 which resulted in additional stress loading on the vertical hood plate, and
2. Inadvertent opening of the PORV resulting in a decompression wave, which subjected the steam dryer to two to three times the normal pressure loading. (It is believed that there was incipient cracking in the steam dryer and the PORV event caused the cracks to open up).

The root cause identified in the first steam dryer failure was high cycle fatigue cause by high frequency pressure loading. The low frequency pressure loading was identified as the dominant cause in this failure. The low frequency pressure loading may have also been a significant contributing factor in the first failure.

Corrective Actions:

The following repairs and pre-emptive modifications were made to both the 90 and 270-degree sides of the steam dryer:

1. replaced damaged ½ inch outer hood plates with 1 inch plates
2. removed the internal brackets that attached the internal braces to the outer hood
3. added gussets at the outer vertical hood plate and cover plate junction
4. added stiffeners to the vertical welds and horizontal welds on the outer hood

The combined effect of these modifications was to increase the natural frequency of the outer hood, reduce the maximum stress by at least a factor of two, and reduce the pressure loading by reducing the magnitude of vortices in the steam flow near the MSLs.

Following the steam dryer modifications, the unit was returned to service on June 29, 2003.

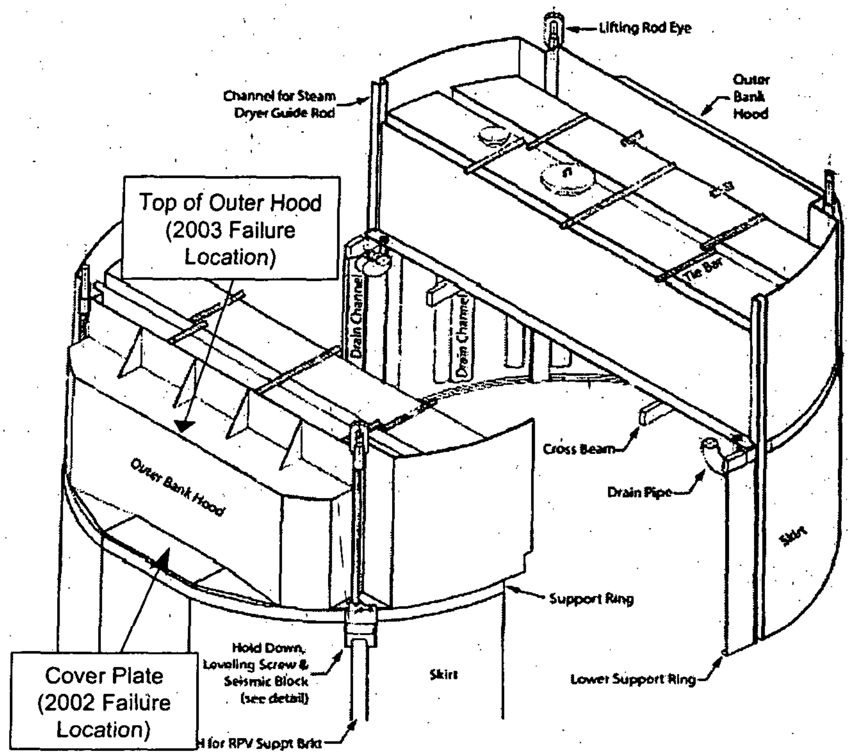


Figure B-1: Location of the 2003 Outer Hood Failure

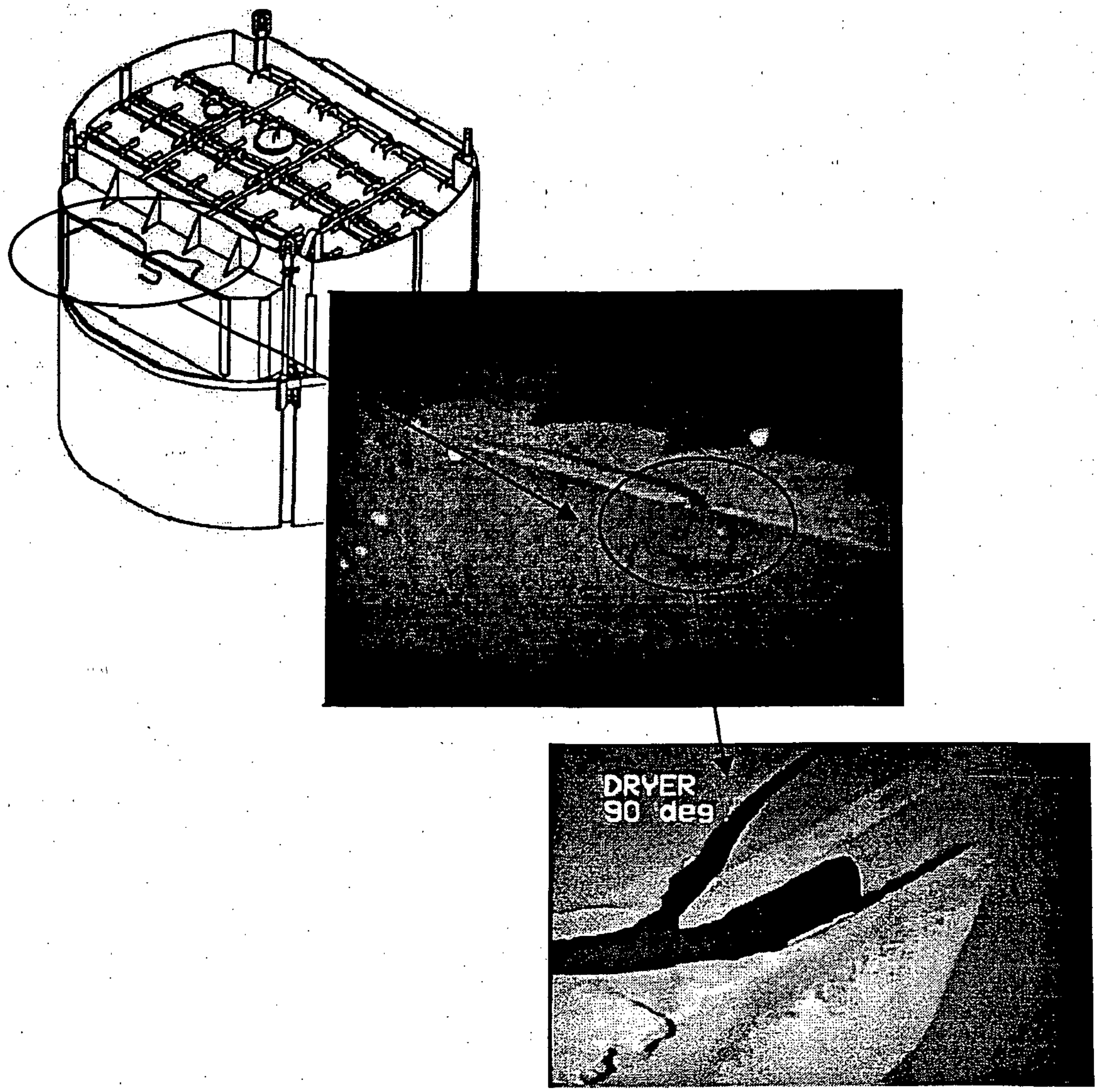


Figure B-2: Steam Dryer Damage 90 Degree Side

Appendix C

Inspection Guidelines

Overview

The steam dryers have been divided into four broad types with fourteen sub-groups: BWR/2 design, square hood design, slanted hood design and the curved hood design. The focus of the inspections for each dryer type is divided into two categories. The first category is directed at the outer surfaces of the dryer that are subject to fluctuating pressure loads during normal operation and are potentially susceptible to fatigue cracking. The second category is directed at the cracking that has been found in the drain channels and in inner bank end plates. These latter locations are not associated with any near term risk of loose part generation. They have often been associated with IGSCC cracking in the heat-affected-zones of stainless steel welds.

Inspection Techniques

Based on the current experience in inspecting the dryer components, VT-1 is the recommended technique to be employed for the inspections. VT-1 resolution, distance, and angle of view requirements should be maintained to the extent practical. In instances where component geometry or remote visual examination equipment limitations preclude the ability to maintain the VT-1 requirements over the entire length of the different weld seams, "best effort" examinations should be performed. In that cracking will be expected to have measurable length (several inches), field experience has confirmed that "best effort" approaches are sufficient to find the cracking that is present.

Steam Dryer Integrity Inspection Recommendations

The recommendations are divided into three categories: BWR/2 and square hood taken together, slanted hood and curved hood steam dryers. The inspection recommendations for each type of dryer will be detailed using schematics of the outer dryer structure. The key weld seams that must be inspected are outlined in red or green. High stress locations associated with structural integrity are outlined in red. Locations associated with field dryer cracking experience are outlined in green. Typical horizontal and vertical welds are shown thereby providing guidance for establishing a plant specific inspection plan. The weld numbering approach shown in the figures is only given as an example. Due to the many welds and size differences, each plant should employ their own weld numbering system. If an indication is detected, care should be exercised when inspecting the symmetrical locations on the dryer. If an indication is detected on the external surface of a plate or weld, consideration should be given to inspecting the location from the inside of the dryer in order to determine if the indication is through-wall.

Square Hood Design: applicable to BWR/2 plants and BWR/3 plants

Several square hood dryers were built with interior brackets and diagonal braces. These structures produce stress concentration locations, which have been found to aid in the initiation of fatigue cracking. These brackets exist in both the outer and the inner dryer banks. The recommended inspections follow.

Steam Dryer Bank Inspections

Figure C-1 provides the overview of the square dryer design. These dryers will require both an external and internal inspection. All dryers are symmetrical from this perspective. Outlined in red are the key weld seams that must be inspected. These welds, both horizontal and vertical outline the outer dryer bank. These locations considered as high stress locations. Figure C-2 displays a cross-section of the BWR/2 steam dryer with the outer bank peripheral welds highlighted. This configuration has no lower cover plate. However, the external locations that match those shown in Figure C-1 need to be inspected in a similar fashion to the other square hood dryers. Figures C-3 and C-4 provide the details of the weld seams as viewed from the dryer bank interior. As shown in Figure C-3, the outer bank welds need to be inspected from both the dryer exterior and the dryer interior. In addition, for the dryers where there are interior brackets that were present in the original design and are still present, the interior inspection must be conducted of the weld region where the bracket is joined to the hood vertical and top plates. Figure C-3 shows these locations for the outer banks hoods. Figure C-4 shows the brackets for the inner hood. In addition, Figure C-5 provides a cross section of the bracket-diagonal brace substructure. The intersection locations between the bracket and the top and outer hood are also outlined in red in these figures. In that the concern is primarily fatigue cracking, several inches of base material adjacent to welds should be examined as well as any obvious discontinuity, e.g., the exterior base material should be examined in the general area where there is an internal weld. This inspection examination region includes the heat-affected-zone and will therefore detect any IGSCC cracking. This figure also shows locations in green that exhibited cracking in the field. The region of inspection should be the same.

Tie Bar Inspections

In addition to the outer bank and interior bracket locations, tie bars also require inspection. Figure C-6 provides a schematic of the tie bars. These are located between each set of dryer banks.

Inspections Based on Field Experience

The other locations of interest are primarily associated with IGSCC in drain channels (shown for information in Figures C-7 and C-8). These components will be part of the internal examination. While these indications have been historically associated with BWR/4 through BWR/6 plants (SIL No. 474 "Steam Dryer Drain Channel Cracking" issued October 26, 1988), recent findings indicate that cracking can occur in these locations in square hood dryers. The additional weld seams associated with the outer side of the next set of inner banks should also be inspected in that this represents a steam path through the dryer. These areas are shown in green in Figure C-1. Cracking has been detected in these end panels in later design dryers. Finally, cracking at the steam dams as indicated in green in Figure C-6 has occurred in one BWR/4. These locations need to be included in the inspection plan for all of these plants. Finally, bank inner surface welds have cracked in the BWR/2. These locations, shown in Figure C-2 in green, also need to be inspected.

Slanted Hood Design: applicable to BWR/4 plants

The slanted hood steam dryers fall into three categories for which the primary difference is diameter and the number of banks. These dryers use 2 or 3 stiffener plates to strengthen each dryer bank. All inspections are on the external surface of the dryer. However, if an indication is detected on the external surface of a plate or weld, consideration should be given to inspecting the location from the inside of the dryer in order to determine if the indication is through-wall. The recommended inspections follow.

Steam Dryer Bank Inspections

Figure C-9 provides the overview of the slanted dryer design. All dryers are symmetrical from this perspective. Outlined in red are the key weld seams that must be inspected from the external surface. These welds, both horizontal and vertical outline the outer dryer bank as well as the cover plate between the outer hood vertical plate and the support ring. Additional red lines represent the outside projected location where the stiffener plates are welded to the outer hood vertical plate. These locations are considered as high stress locations. The man-way welds (on one side) are also shown as locations requiring inspection.

Tie Bar Inspections

In addition to the outer bank and interior bracket locations, tie bars also require inspection. Figure C-10 provides a schematic of the tie bar locations joining the tops of each set of banks. The primary concern is the presence of fatigue cracking through the bar base material cross-section at axial location where the tie bar is attached to the bank.

Inspections Based on Field Experience

Cracking has been detected in these end panels in later design dryers. Therefore, these additional weld seams associated with the outer side of the inner banks should also be inspected in that this represents a steam path through the dryer. These areas are shown in green in Figure C-9. Cracking has been observed in these locations in dryers of this design. The other locations of interest are primarily associated with IGSCC in drain channels (refer to SIL No. 474 "Steam Dryer Drain Channel Cracking" issued October 26, 1988), support ring, and lifting rod attachments.

Curved Hood Design: applicable to BWR/4-BWR/6 and ABWR plants

The curved hood steam dryers fall into five categories for which the primary differences are diameter and inner bank hood thickness. Similar to the slanted hood dryers, these dryers also have 2 or 3 interior stiffener plates to strengthen each dryer bank. All inspections are on the external surface of the dryer. However, if an indication is detected on the external surface of a plate or weld, consideration should be given to inspecting the location from the inside of the dryer in order to determine if the indication is through-wall. The recommended inspections follow.

Steam Dryer Bank Inspections

Figure C-11 provides the overview of the curved hood dryer design. All dryers are symmetrical from this perspective. Outlined in red are the key weld seams that must be inspected from the external surface. These welds, both horizontal and vertical outline the outer dryer bank as well as the cover plate between the outer hood vertical plate and the support ring. Additional red lines represent the outside projected location where the stiffener plates are welded to the outer hood vertical plate. Inspection locations also include outer plenum end plates and inner hood vertical weld seams for BWR/4 and BWR/5 plants with 1/8 inch thick hood plates on the inner banks. The location shown is the region where these thinner hood plates are attached to the stiffeners. All of these locations are considered as relative high stress locations. The man-way welds (on one side) are also shown as locations requiring inspection.

Tie Bar Inspections

In addition to the outer bank and interior bracket locations, tie bars also require inspection. Figure C-11 provides a schematic of the tie bar locations joining the tops of each set of banks. In that the attachment of the tie bars may have employed high heat input welds, the inspection should also include the entire welded region to assess the presence of IGSCC on the bank top plate. This region is adjacent to the region shown in red around the end of the inner bank tie bars.

Inspections Based on Field Experience

Cracking has been detected in the end panels in later design dryers. Therefore, these additional weld seams associated with the outer side of the inner banks should also be inspected in that this represents a steam path through the dryer. These areas are shown in green in Figure C-11. Cracking has been observed in these locations in dryers of this design. The other locations of interest are primarily associated with IGSCC in drain channels (refer to SIL No. 474 "Steam Dryer Drain Channel Cracking" issued October 26, 1988) and lifting rod attachments.

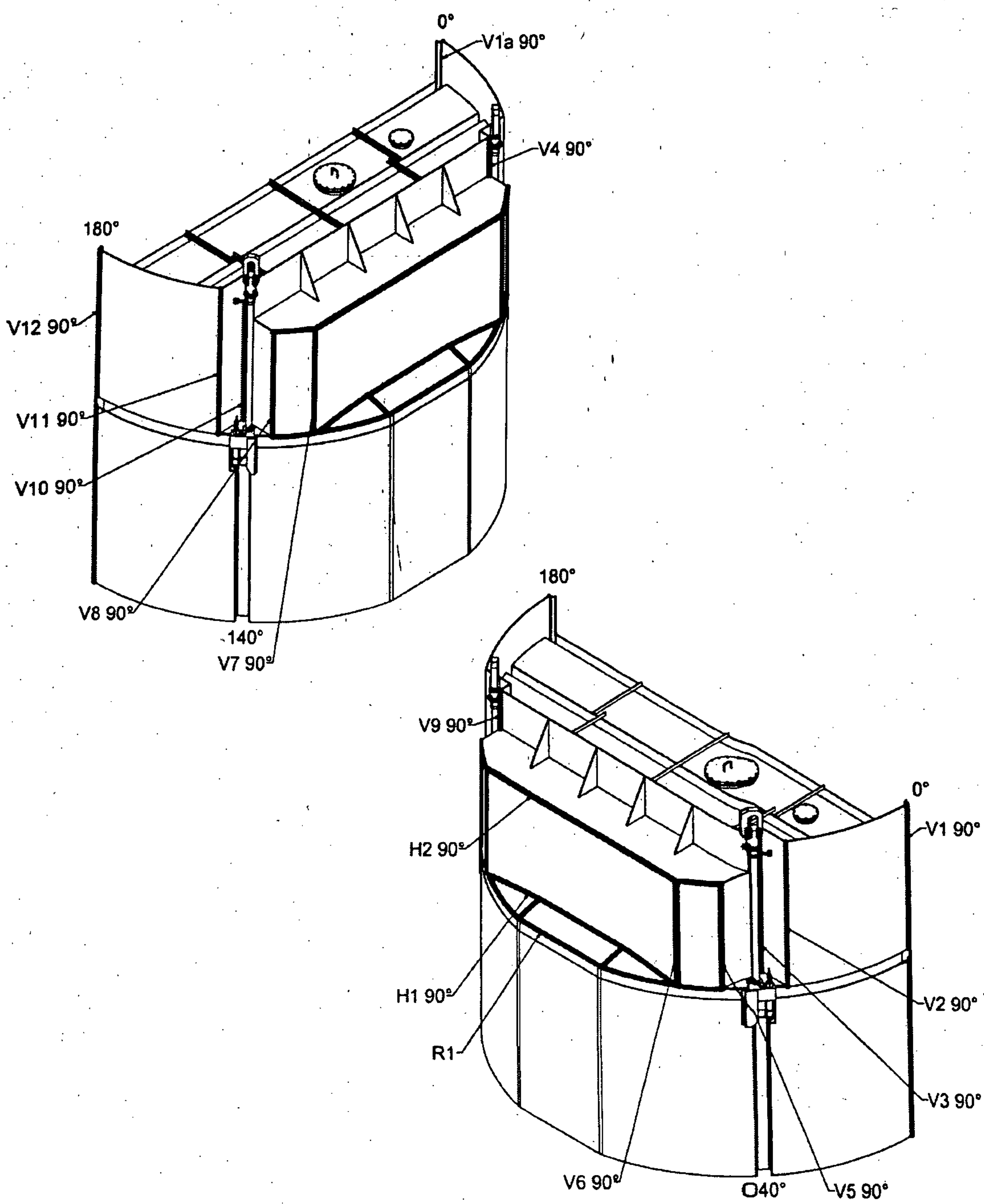


Figure C-1: Inspections: Outer Dryer Hood and Cover Plate (Square Hood Dryer)

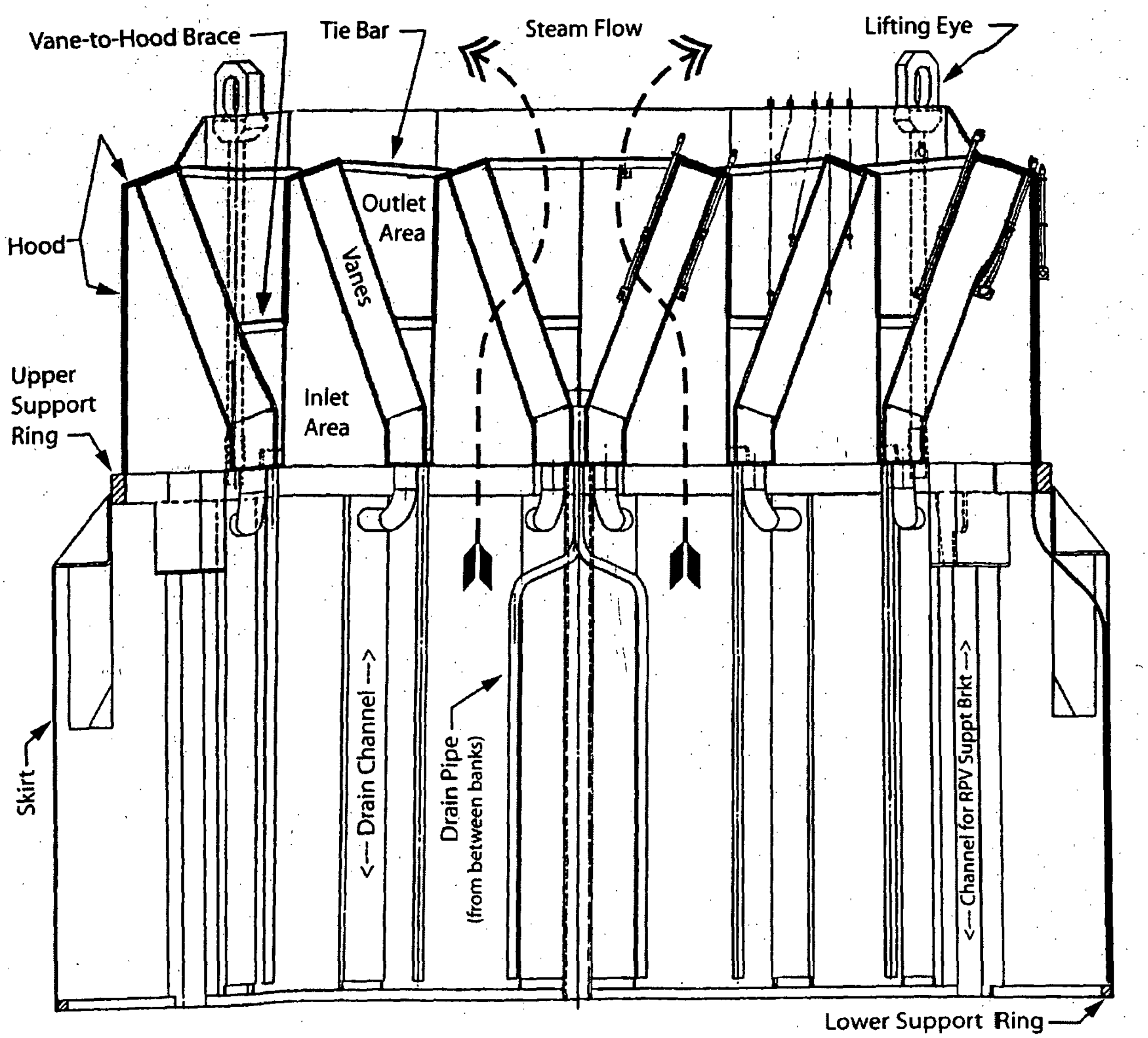


Figure C-2: Cross-Section of BWR/2 Steam Dryer

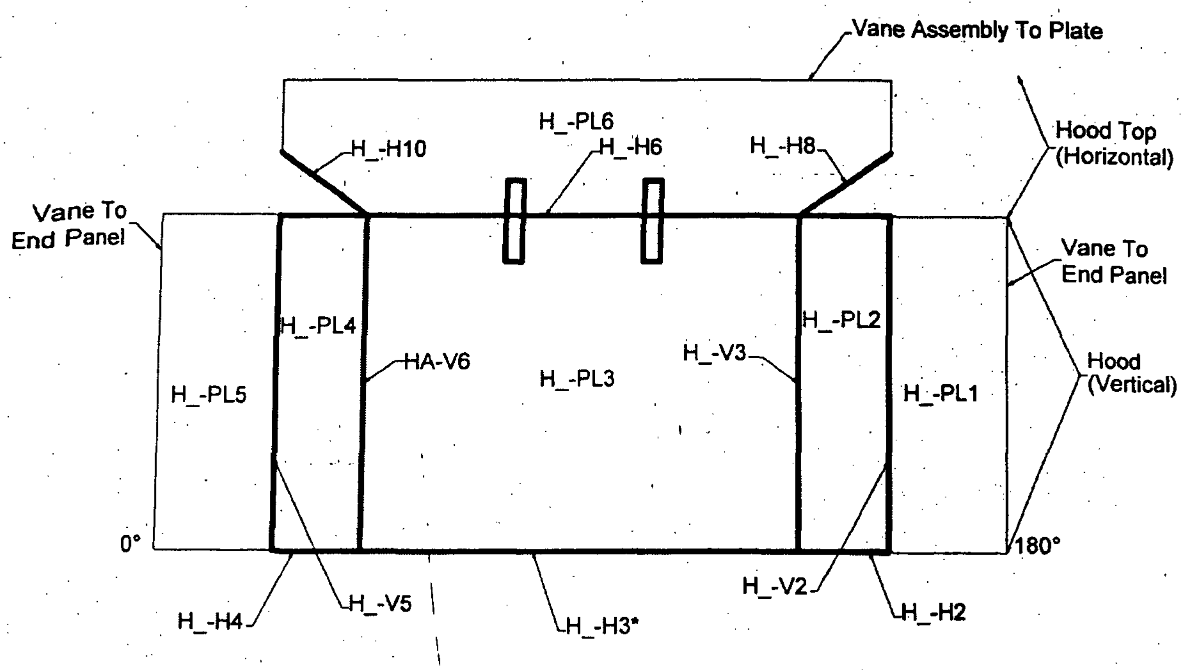
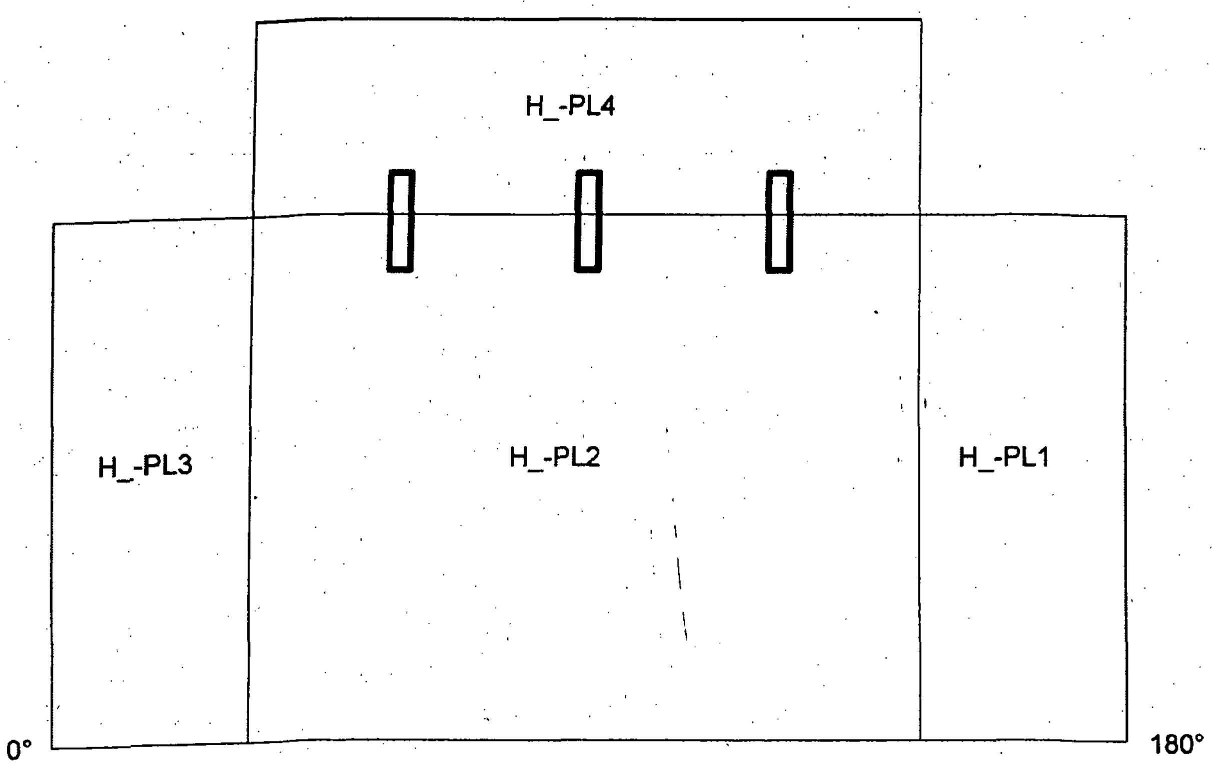


Figure C-3: Weld layout for interior of outer banks (Square Hood Dryer)

The brackets shown only exist in those plants where they were part of the original design and were not removed as part of dryer modifications.



H_-PL# = Plate (Bank B, C, D or E) (Ex. HB-PL1)
Internal View - View Is Looking Away From Vane Assembly

Figure C-4: Weld Rollout – Inner banks with internal brackets (Square Hood Dryer)

The brackets shown only exist in those plants where they were part of the original design and were not removed as part of dryer modifications.

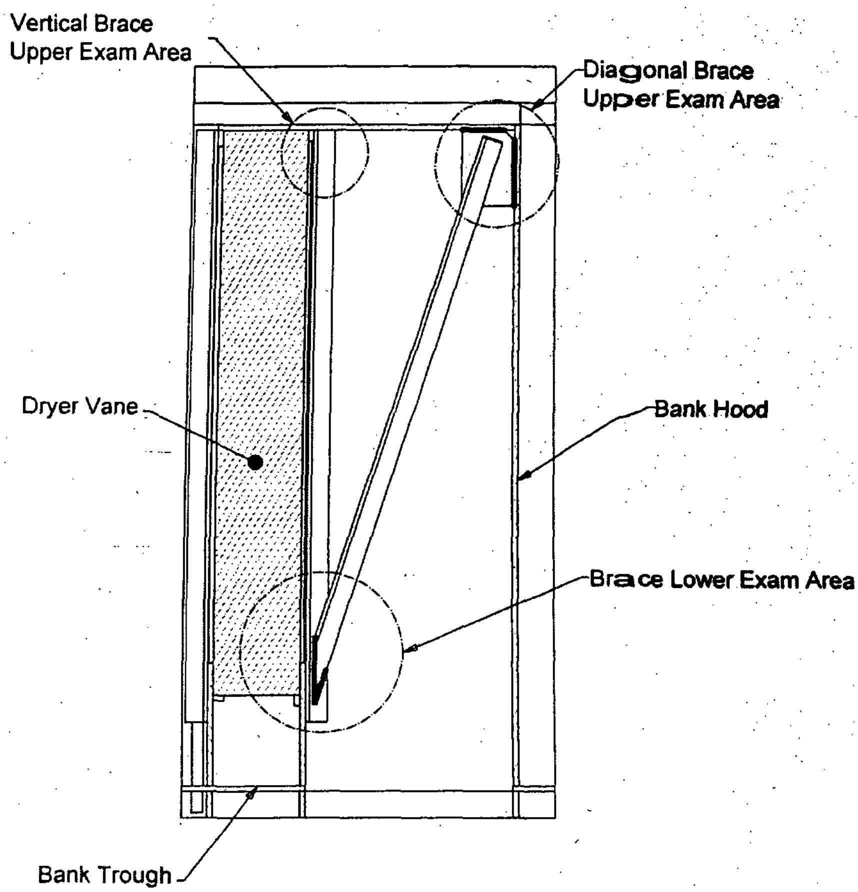


Figure C-5: Dryer Brace Detail (Square Hood Dryer)

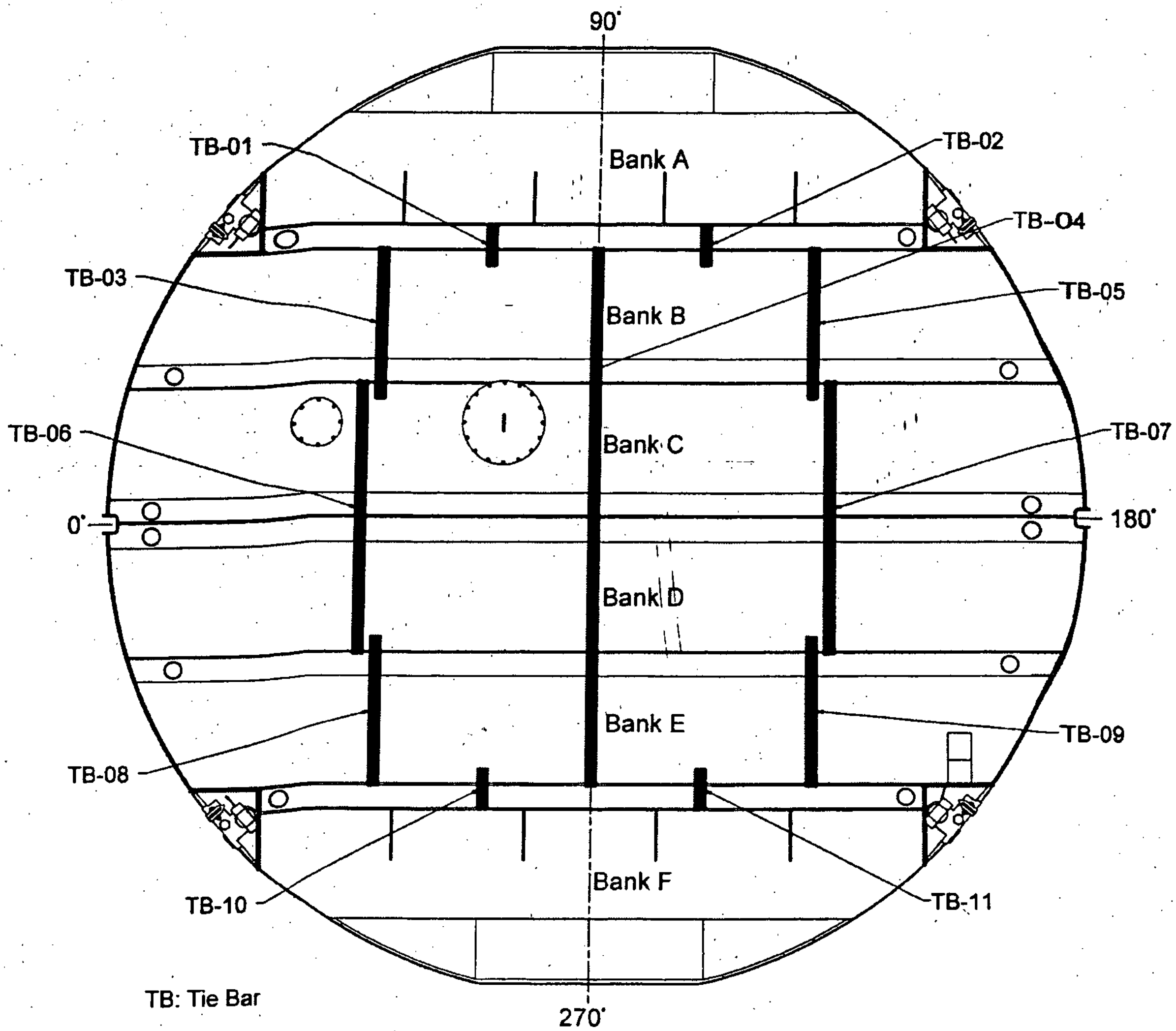


Figure C-6: Inspection Locations: Tie Bars and Steam Dam Inspections (Square Hood Dryer)

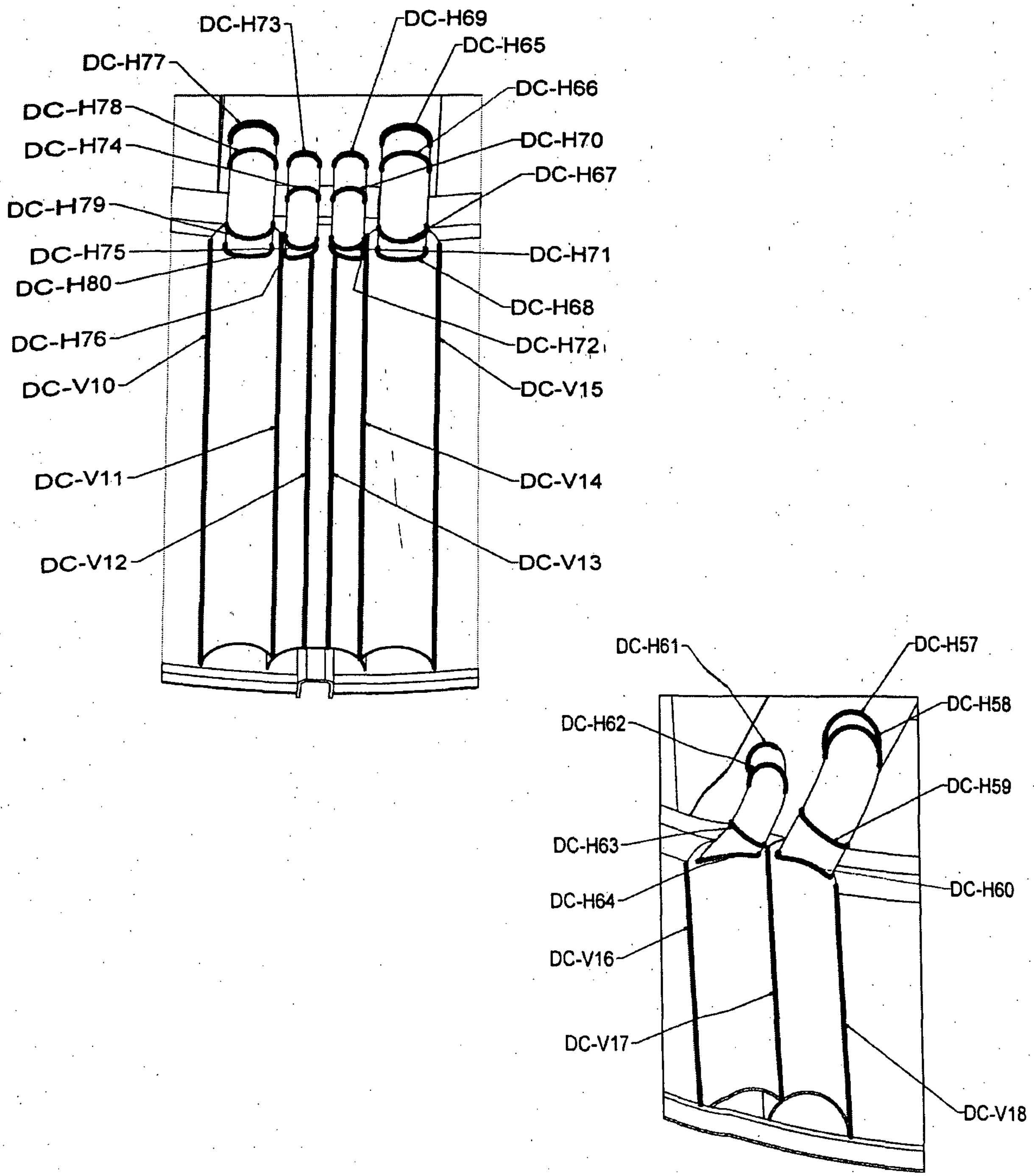


Figure C-7: Drain Channel Locations (Square Hood Dryer)

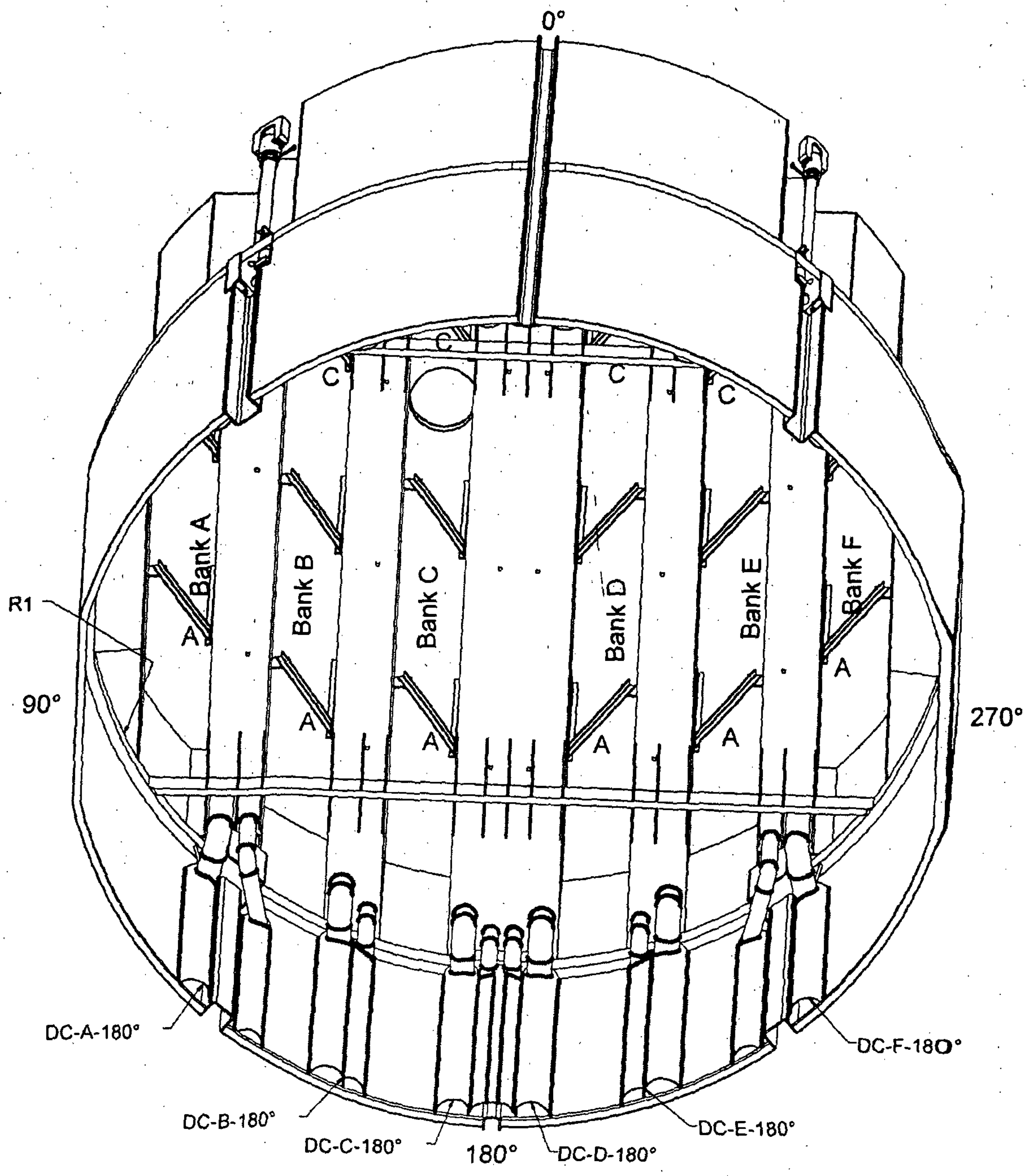


Figure C-8: Dryer Drain Channel, Guide channels and Guide Rod - Bottom View (Square Hood Dryer)

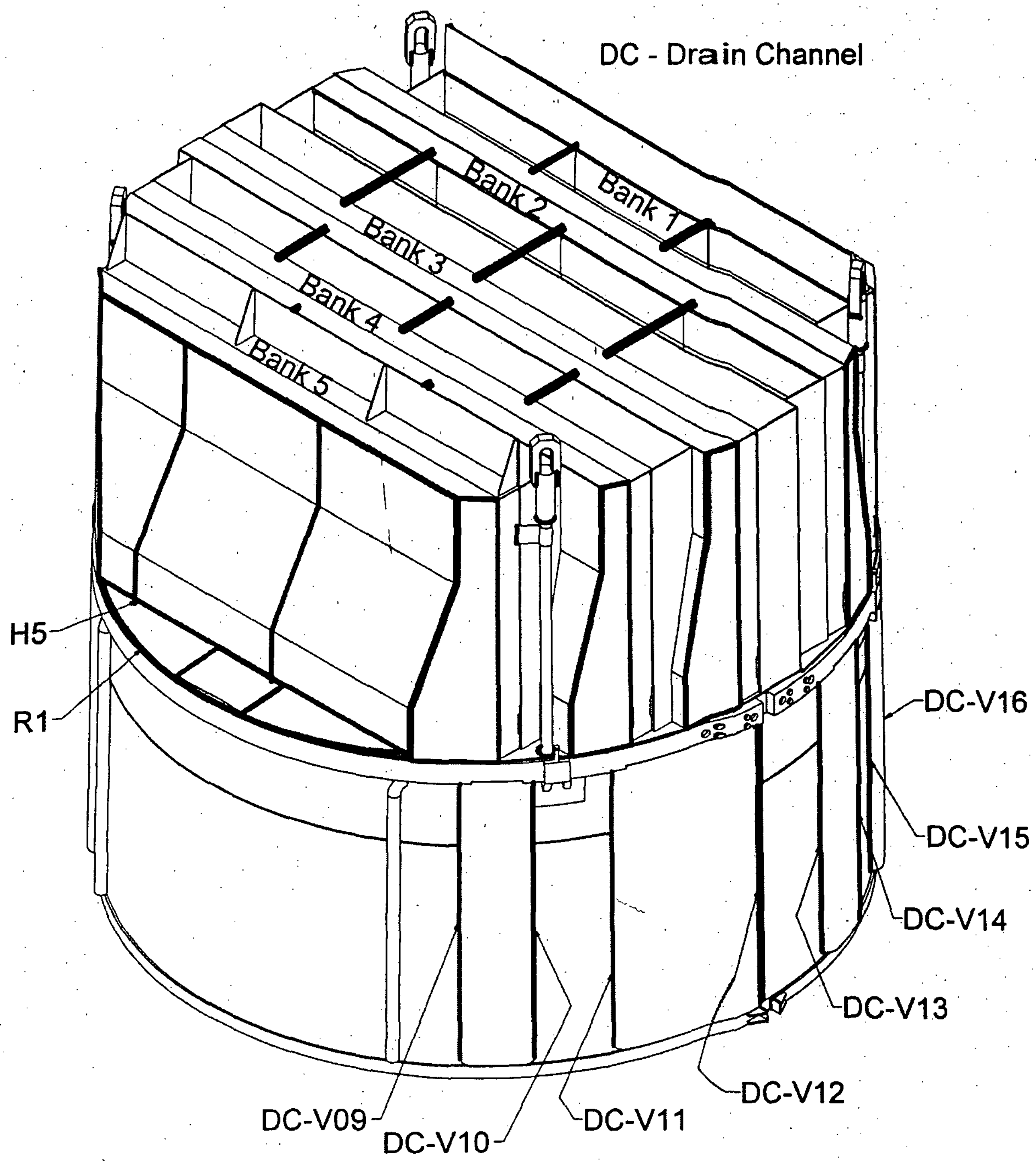


Figure C-9: Inspection Locations (Slanted Hood Dryer)

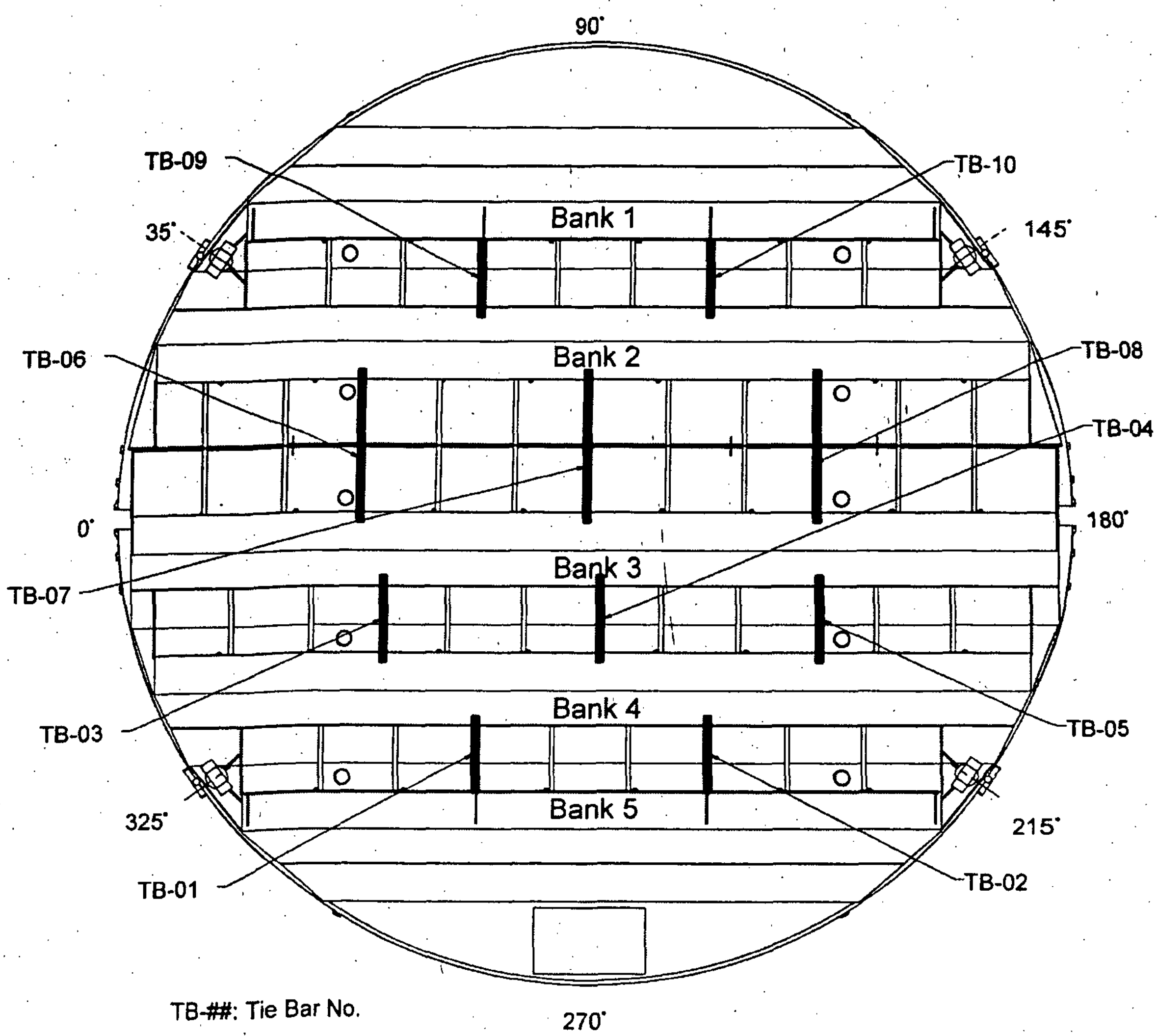


Figure C-10: Tie Bar Locations (Slanted Hood Dryers)

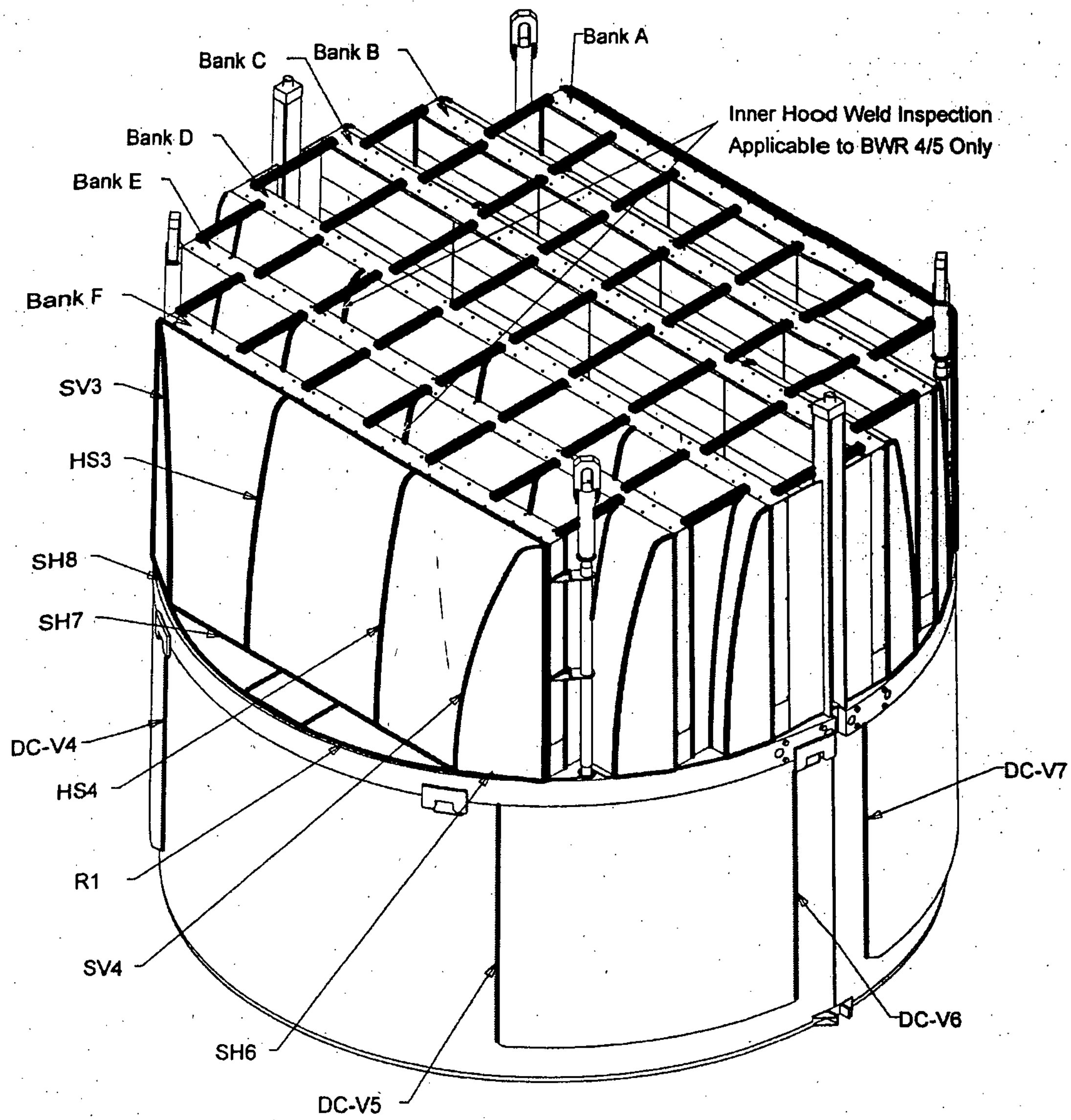


Figure C-11: Inspection Locations (Curved Hood Dryer)

Appendix D
Monitoring Guidelines

Applicability

In general, it is good practice to have access to as much performance data as practicable in order to make informed operational decisions. Therefore, GE recommends that all BWRs implement the moisture carryover and operational response guidance described here. However, plants that have sufficient baseline data and operating experience may elect to consider a less stringent monitoring program.

Background

A moisture carryover greater than 0.1% at the licensed power level is an indication of potential steam dryer damage, unless a higher threshold is established. A higher threshold may be warranted for a BWR with an unmodified square dryer hood (i.e., no addition of perforated plates) and/or operating with MELLLA+ at off-rated core flow.

If plants are reporting measured moisture carryover values of "less than" a value because of inability to measure Na-24 in the condensed steam sample and the "less than" value is greater than 0.025%, then the moisture carryover measurement process should be modified to reduce the minimum detectable threshold (preferably such that "less than" values are never reported). Without quantitative data, the plant staff will be unable to develop operational recommendations based on statistically valid moisture carryover and other plant data.

BWR moisture carryover may be impacted by: (1) reactor power level, (2) core flow and power distributions, (3) core inlet subcooling (which is related to final Feedwater temperature), and (4) reactor water level.

- Moisture carryover is very sensitive to power level. Therefore, data should be collected during steady state operations at the highest possible power levels.
- Moisture carryover has increased in cases where steam flow is increased towards the center of the core.
- Moisture carryover has increased in cases where core inlet sub-cooling is decreased (i.e., final Feedwater temperature is increased).
- Moisture carryover has increased in cases where reactor water level is increased (due to degraded separator performance).

Note that the standard deviation of moisture carryover measurements is not expected to change significantly following power distribution changes. However, if a significant condenser tube leak occurs, then the standard deviation of moisture carryover measurements may change significantly due to the resulting increased Na-24 concentrations.

Plants are recommended to accurately determine the flow distribution between individual steam lines. If significant steam dryer damage occurs, steam line flow distribution changes may result.

It may be helpful to have pressure data at each main steam flow element (venturi) to better understand the pressure drops and possible pressure changes due to moisture content changes in the steam line flow. This pressure data would have been beneficial at Quad Cities to help identify the flow blockage upstream of the flow element following significant steam dryer damage. Note that flow element performance calculations are based on the RPV steam dome pressure.

An increased feed-to-steam mismatch (i.e., total Feedwater flow plus CRD flow minus total steam flow, with reactor water level constant) may validate an increase in moisture carryover. Plant application has confirmed this correlation exists when the initial moisture carryover value is low (~0.01%), however the correlation showed significant scatter at higher initial moisture carryover values (0.04% to 0.10%).

Baseline Data

> NOTE
>
> Data should be collected during steady state operations at the highest possible power levels.

Moisture Carryover

Measure moisture carryover daily to obtain at least five (5) measurements.

Statistically evaluate the moisture carryover data (e.g., determine the mean and standard deviation for the data) to determine if there is a significant increasing trend. Qualitatively review the data to ascertain if there is a significant increasing trend. If there is an increasing trend in moisture carryover, review the changes in plant operational parameters to determine if there is an operational basis for the trend.

If an unexplained increasing trend is evident, then collect additional moisture carryover data with consideration for increasing the measurement frequency (e.g., from "once per day" to "once per 12 hours").

If an unexplained increasing trend is not evident, then begin collecting periodic data for moisture carryover.

Plant Operational Parameters

> NOTE
>
> Most plant operational data is available from the process computer, which can normally be input into an Excel spread sheet for evaluation and storage.

The following parameters should be measured under the same (or similar) plant conditions that existed during collection of moisture carryover baseline data:

Reactor power (MWt)

Core flow (Mlb/hr)

Core inlet sub-cooling (deg F)

Reactor water level, average of at least 1000 data points over a one to three hour time period.

Individual main steam line flows (Mlb/hr), average of at least 1000 data points over a one to three hour time period. Include pressure data at each MSL flow element (venturi), if available.

Total Feedwater flow (Mlb/hr), average of at least 1000 data points over a one to three hour time period.

CRD flow (Mlb/hr)

Periodic Data and Operational Response

> NOTE
>
> Data should be collected during steady state operations at the highest possible power levels.
>
> If a moisture carryover measurement is suspect (e.g., less than "mean minus 2-sigma"), then repeat the moisture carryover measurement to verify sampling and analysis were performed correctly. Consider eliminating data shown to be incorrect/invalid.

Moisture carryover should be monitored weekly.

Statistically evaluate the moisture carryover data and qualitatively determine if there is a significant increasing trend that cannot be explained by changes in plant operational parameters.

If an unexplained increasing trend is evident, then collect additional moisture carryover data with consideration for increasing the measurement frequency (e.g., from "once per week" to "once per day").

If the latest moisture carryover measurement is greater than "mean plus 2-sigma" and this increase cannot be explained by changes in plant operational parameters, then obtain a complete set of data for the plant operational parameters (identified above). Compare the current plant operational data with the baseline data to explain the increased moisture carryover (i.e., is there steam dryer damage or not).

If an increase in moisture carryover occurs immediately following a rod swap, additional moisture carryover data should be obtained to assure that an increasing trend does not exist. Note that occurrence of steam dryer damage immediately following a rod swap would be highly unlikely.

If the increasing trend of moisture carryover cannot be explained by evaluation of the plant operational data, then initiate plant-specific contingency plans for potential steam dryer damage.

If the evaluation of plant data confirms that significant steam dryer damage has most likely occurred, then initiate a plant shutdown.

If there are no statistically significant changes in moisture carryover for an operating cycle, then decreasing the moisture carryover measurement frequency (e.g., from "once per week" to "once per month") may be considered, provided the highest operating power level is not significantly increased.

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SH

STATE OF VERMONT
DEPARTMENT OF PUBLIC SERVICE

July 21, 2006

John Marshall, Esq.
Nancy Malmquist, Esq.
Downs Rachlin Martin PLLC
P.O. Box 99
St. Johnsbury, VT 05819-0099

Re: Docket 7195 – DPS Responses to Discovery - Partial Production

Dear John and Nancy:

I enclose herewith a partial production in response to the discovery requests served by Entergy in this docket on July 14, 2006.

The response to question 8 indicates that a privilege log will be forthcoming. I plan to produce that to you on Monday, July 24. At that time, I will also either provide you with any supplemental responsive materials I have located or I will write to advise that the production is complete.

Should you have any questions, please feel free to contact me upon my return to the office on Monday, July 24, 2006.

Very truly yours,

June E. Tierney, Esq.
Special Counsel

Enclosures

cc: Attached Service List

NRC 50-271-LR
ASLBP 06-849-03-LR
DPS-2

PSB Docket No. 7195 - SERVICE LIST

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STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. 7195

Petition of Vermont Department of Public Service for an investigation into the reliability of the steam dryer and resulting performance of the Vermont Yankee Nuclear Power Station under uprate conditions

DEPARTMENT OF PUBLIC SERVICE'S RESPONSES TO ENTERGY NUCLEAR VERMONT YANKEE, LLC. AND ENTERGY NUCLEAR OPERATIONS, INC.'S FIRST SET OF INFORMATION REQUESTS

July 21, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

1. Please identify and produce all documents reviewed or relied upon for information relating to Quad Cities and Dresden steam dryer problems, repairs, or replacements in connection with Mr. Sherman's Direct Testimony dated June 21, 2006.

ANSWER:

The following attached documents in my possession are responsive to the request:

Attachment 1-1	SECY-06-0136
Attachment 1-2	SECY-05-0098
Attachment 1-3	SECY-04-0104
Attachment 1-4	*Quad Cities' new steam dryers project*, Nuclear News, October 2005
Attachment 1-5	*Snap, Crackel, & Pop: The BWR Power Uprate Experiment*, Union of Concerned Scientists, July 9, 2004
Attachment 1-6	*Extended Power Uprate Licensing Challenges*, slides from Exelon presentation at the Regulatory Information Conference 2004
Attachment 1-7	NRC Preliminary Notification, PNO-III-06-010, *Cracking Identified in Unit 2 Steam Dryer,* April 7, 2006

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

2. Please identify and produce all documents you reviewed relating to fatigue cracking of steam dryers other than those at Quad Cities, Dresden or Vermont Yankee.

ANSWER:

Please see Attachment 1-2, provided in response to Request No. 1 above.

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

3. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 6, line 4. Please identify and produce all documents you reviewed relating to cracks discovered in Vermont Yankee's steam dryer.

ANSWER:

The following attached documents are responsive to the request:

Attachment 3-1	*Vermont Yankee has m ore cracks; probe demanded*, Rutland Herald, November 11, 2005.
Attachment 3-2	*62 cracks found at Vt. Yankee*, Brattleboro Reformer, November 11, 2005.
Attachment 3-3	*More cracks found in Vermont Yankee dryer*, Vermont Guardian, November 10, 2005.
Attachment 3-4	Congressional Letter (Jeffords, Leahy, Sanders, Olver) to NRC, November 10, 2005.

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s First Set of Information Requests

4. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 6, line 16. Please identify and produce all documents relied upon for the assertion that "[t]he Quad Cities and Dresden experience is applicable to Vermont Yankee."

ANSWER:

The following attached documents are responsive to the request:

Attachment 4-1	NRC Summary of July 21 and 22, 2004 Meeting for Vermont Yankee steam dryer, September 2, 2004
Attachment 4-2	NRC Summary of July 25, 2003 meeting with GE regarding steam dryer failures, September 15, 2003

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

**Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests**

5. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, at page 6, footnote 1. Please identify and produce all documents relied upon for the assertion that "[i]t is even possible that Vermont Yankee's smaller size could exacerbate the problem."

ANSWER:

There are no documents responsive to this request.

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

6. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 9, line 5. Please identify and produce all documents relied upon for the assertion that the "only basis for NRC acceptance of the steam dryers in power uprate conditions was the added instrumentation and the power ascension tests."

ANSWER:

In my Direct Testimony dated June 21, 2006, I specifically rely on Exhibits DPS-WKS-2 and -3 for the statement that NRC acceptance of the steam dryers in power uprate conditions was based on the added instrumentation and the power ascension tests. The following additional attached documents are responsive to the request:

Attachment 6-1	NRC letter to Entergy (Dyer to Kansler), *Vermont Yankee Nuclear Power Station - Extended Power Uprate Review Schedule and License Conditions*, October 12, 2005
Attachment 6-2	NRC letter to Entergy (Ennis to Kansler), *Vermont Yankee Nuclear Power Station - Issuance of Amendment Re; Extended Power Uprate*, March 2, 2006

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s First Set of Information Requests

7. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 11, line 6. Please identify and produce all documents relied upon for the assertion that the "NRC was satisfied that catastrophic failure of the steam dryer would not occur."

ANSWER:

The following attached documents are responsive to the request:

Attachment 7-1	*Staff Technical Basis for Continued Power Ascension of Vermont Yankee Nuclear Power Station up to 110% Original Licensed Thermal Power*, April 5, 2006
Attachment 7-2	*Staff Technical Basis for Continued Power Ascension of Vermont Yankee Nuclear Power Station up to 115% Original Licensed Thermal Power*, April 28, 2006
Attachment 7-3	*Staff Technical Basis for Continued Power Ascension of Vermont Yankee Nuclear Power Station to Full Extened Power Uprate Conditoins of 120% Original Licensed Thermal Power*, June 20, 2006
Attachment 7-4	NRC Letter to the Vermont Public Service Board (Diaz to Dworkin), May 4, 2004

In addition, Attachment 8-4, provided in response to Request No. 8, is responsive to this request.

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

8. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 11, line 13. Please identify and produce all notes taken by Mr. Sherman, or reports, memoranda or other documents drafted by Mr. Sherman, relating to Mr. Sherman's review of data Entergy provided to the NRC or relating to his participation in technical conference calls or his site visits during the Vermont Yankee Power Ascension Test.

OBJECTION (BY COUNSEL): The Department objects to this question to the extent that it seeks disclosure and production of privileged information. A privilege log will be provided on or before July 24, 2006.

Subject to this objection the Department responds as follows:

The following are notes taken or reports, memoranda or other documents which I drafted, relating to my review of data Entergy provided to the NRC or relating to my participation in technical conference calls or site visits during the Vermont Yankee Power Ascension Test:

Attachment 8-1	W. Sherman, handwritten notes from site, March 6, 2006 - May 5, 2006.
Attachment 8-2	Email (Sherman to Ennis), *Re: VY Power Ascension*, March 31, 2006.
Attachment 8-3	Email string, *Steam dryer data methodology* (McElwee to Sherman; Nichols to McElwee; McElwee to Nichols; Sherman to McElwee; Sherman to Ennis), May 1, 2006.
Attachment 8-4	Email (Sherman to Ennis), *Steam dryer question,* May 1, 2006

Docket No. 7195

**Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests**

Attachment 8-5	Handwritten notes by W. Sherman, *Steam Dryer Meeting*, 6-15-06
Attachment 8-6	Email (Sherman to McElwee), *questions re: Rbetti presentation*, June 19, 2006

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

9. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 14, line 33. Please identify and produce all documents relied upon for assertion that the "original limit curves presented in the initial power ascension test plan (Exhibit DPS-WKS-4) carried the expectation that steam line/steam dryer phenomena were sufficiently understood analytically and that the limit curves were conservative." By way of clarification, Entergy VY is here requesting documents that demonstrate that the initial power ascension test plan "carried the expectation" indicated.

ANSWER:

Please see Attachments 8-5 and 8-6, which are responsive to the request. In addition, the following document is responsive to the request:

Attachment 9-1	Entergy News Release: *Update: Vermont Yankee Power Increase Program Now at First Plateau*, March 8, 2006

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

10. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 16, line 17. Please identify and produce all documents relied upon for the assertion that "[p]art of NRC's conclusion of reasonable assurance that [the] steam dryer will meet safety requirements is that cracking can be detected by increases in moisture carryover, and the plant power can be reduced to a known, safe power level until the steam dryer can be evaluated and repaired."

ANSWER:

The following document is responsive to the request:

Attachment 10-1 NRC letter to BWR Owners Group (Wang to Putnam), *Boiling Water Reactor Steam Dryer Integrity*, September 26, 2003

In addition, Attachments 6-1 and 6-2 are responsive to this request.

Person Responsible for Response: William K. Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s First Set of Information Requests

11. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 17, line 1. Please identify and produce all documents relied upon for the assertion that "NRC relies upon the possibility of a derate in its safety determination."

ANSWER:

There are no documents responsive to this request.

Person Responsible for Response: William K. Sherman, Department of Public Service
Date: July 20, 2006

Docket No. 7195

**Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests**

12. Reference Mr. Sherman's Direct Testimony dated June 21, 2006, beginning at page 18, line 8, and Exhibit DPS-WKS-7. Please identify and produce the "current power price forecasts" source documents used for calculations in Exhibit DPS-WKS-7.

ANSWER:

The following document is responsive to this request:

Attachment 12-1 NEPOOL Quote Sheet for January 13, 2006

Person Responsible for Response: William Sherman, Department of Public Service

Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s First Set of Information Requests

13. To the extent not already provided in response to the requests above or already provided as Exhibits to Mr. Sherman's Direct Testimony, please identify and produce copies of any and all other documents relied upon by Mr. Sherman in drafting the opinions presented in his Direct Testimony.

ANSWER:

The following documents are responsive to the request:

Attachment 13-1	Entergy letter to NRC, *Information Regarding Steam Dryer Monitoring and FIV Effects*, February 26, 2006
Attachment 13-2	Entergy letter to NRC, *Revision 1 to Steam Dryer Monitoring Plan,* March 26, 2006
Attachment 13-3	Entergy letter to NRC, *Revision 2 to Steam Dryer Monitoring Plan,* April 20, 2006
Attachment 13-4	Entergy letter to NRC, *Revision 3 to Steam Dryer Monitoring Plan,* May 4, 2006
Attachment 13-5	Entergy letter to Department of Public Service (McElwee to Sherman), May 17, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

In addition, I viewed various documents at the Vermont Yankee site related to the results of the power ascension tests. I do not have access to copies of these documents to produce in response to this request as I have not removed these documents for copying from the site in accordance with the *Memorandum of Understanding on Cooperation, Notification and Access Between Entergy Nuclear Vermont Yankee LLC and Vermont Department of Public Service for the Vermont Yankee Nuclear Power Station* (the "Inspection MOU"), dated July 30, 2002.

Person Responsible for Response: William K. Sherman, Department of Public Service
Date: July 20, 2006

Docket No. 7195

Department of Public Service's Responses to
Entergy Nuclear Vermont Yankee, LLC. And Entergy Nuclear Operations, Inc.'s
First Set of Information Requests

VERMONT DEPARTMENT OF PUBLIC SERVICE

By ______________________
William Sherman

Subscribed and sworn before me this 24th day of July, 2006.

____
Notary Public
My commission expires February 10, 2007

As to Objections:

____
June E. Tierney, Esq., Special Counsel

cc: Attached Service List

POLICY ISSUE
INFORMATION

June 9, 2006 SECY-06-0136

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations

SUBJECT: STATUS REPORT ON POWER UPRATES

PURPOSE:

This paper summarizes the power uprate program accomplishments and challenges since the last update in SECY-05-0098, dated June 2, 2005. This paper does not address any new commitments or resources.

BACKGROUND:

The staff provides the Commission an annual update of significant power uprate activities in accordance with a staff requirements memorandum dated February 8, 2002 (SRM-M020129).

DISCUSSION:

Since the last update, the staff has approved 4 plant-specific power uprates. The staff is currently reviewing 9 power uprates. Over the next 5 years, licensees are expected to submit an additional 23 power uprate applications. The enclosed status report provides detailed information on the power uprates approved since June 2, 2005, applications under review, applications expected in the future, accomplishments, operating experience, program performance and interactions with stakeholders.

CONTACT: Thomas W. Alexion
(301) 415-1326

Docket No. 7195
Attachment 1-1
9 Pages

The staff is continuing to develop process improvements based on lessons learned from completed reviews and operating experience reviews. The process improvements include more detailed reviews of certain technical issues and some efficiency improvements. The technical issues include power uprate testing programs, flow-induced vibration issues, and reactor systems calculative techniques and methods. These more detailed reviews have resulted in an increase in the planned resources for an extended power uprate (EPU) review from 3,900 hours to 5,000 hours. These resources are budgeted through Fiscal Year 2008. Regarding efficiency improvements, the staff has implemented more rigorous acceptance reviews for power uprate applications and the staff will, on a pilot basis, conduct more extensive audits to improve the review efficiency. Details of the program accomplishments and improvements are described in the enclosure.

With the exception of the Vermont Yankee review, the 4 plant-specific power uprate reviews were completed within the established resource and timeliness goals. The Vermont Yankee review required additional time and resources to allow a thorough review of key technical issues associated with safe operation at the new power level. The review of the key technical issues discussed above took longer than expected for the staff and licensee to come to resolution on these issues. The review involved several rounds of RAIs and over 40 supplemental submittals by the licensee. Ultimately, license conditions were used to resolve the remaining key issues. To correct this in the future, the staff will utilize more and earlier management involvement in the decision-making process, including consideration of license conditions to resolve key issues earlier in the review process.

The staff formed a Special Inspection Team to evaluate the licensee's response to significant degradation of the electromatic relief valves at the Quad Cities units from EPU operation, and reviewed modifications at Quad Cities Unit 2 in spring 2006 to eliminate the source of flow-induced vibration and acoustic pressure pulses in the main steam lines during EPU operation. Additionally, the staff monitored the power ascension at Vermont Yankee following issuance of the EPU license amendment on March 2, 2006, and met with the vendors of ultrasonic flow meters used for measurement uncertainty recapture power uprates to discuss issues related to small differences in power level indications at some plants. The staff is evaluating the need to modify guidance to address the operating experience.

<u>COORDINATION</u>:

The Office of the General Counsel reviewed this report and has no legal objection.

/RA/

Luis A. Reyes
Executive Director
for Operations

Enclosure: Power Uprate Program Status Report

Power Uprate Program Status Report
June 2006

Power uprates are categorized based on the magnitude of the power increase and the methods used to achieve the increase. Measurement uncertainty recapture (MUR) power uprates result in power level increases that are less than 2 percent and are achieved by implementing enhanced techniques for calculating reactor power. Stretch power uprates (SPUs) typically result in power level increases that are up to 7 percent and generally do not involve major plant modifications. Extended power uprates (EPUs) result in power level increases that are greater than SPUs and usually require significant modifications to major plant equipment. The Nuclear Regulatory Commission has approved EPUs for increases as high as 20 percent.

Power Uprates Approved Since June 2005

Power uprates approved since June 2, 2005, have added an additional 608 megawatts thermal (MWt) or approximately 203 megawatts electric (MWe) to the Nation's electric generating capacity. This brings the total number of power uprates approved since 1977 to 109, resulting in a combined increase of about 13,858 MWt or 4,619 MWe to the Nation's electric generating capacity.

NO.	PLANT	% UPRATE	MWt	APPLICATION DATE	APPROVAL DATE	TYPE
1	Palo Verde 1	2.9	114	07/09/2004	11/16/2005	SPU
2	Palo Verde 3	2.9	114	07/09/2004	11/16/2005	SPU
3	Vermont Yankee	20	319	09/10/2003	03/02/2006	EPU
4	Seabrook	1.7	61	09/22/2005	05/22/2006	MUR

On March 2, 2006, the staff completed its review of the Vermont Yankee EPU application and approved the 20 percent power uprate. The licensee reached 120 percent of original licensed thermal power (the full EPU) on May 5, 2006, and successfully conducted a planned condensate pump trip test on May 8, 2006. Details on program performance versus established goals for these approved power uprates are presented later in this enclosure.

Power Uprate Applications Currently Under Staff Review

Power uprates currently under review could add an additional 2420 MWt or 807 MWe to the Nation's electric generating capacity if approved.

NO.	PLANT	% UPRATE	MWt	SUBMITTAL DATE	PROJECTED COMPLETION DATE	TYPE
1	Browns Ferry 2	15	494	06/25/2004	Spring 2007	EPU
2	Browns Ferry 3	15	494	06/25/2004	Spring 2007	EPU

NO.	PLANT	% UPRATE	MWt	SUBMITTAL DATE	PROJECTED COMPLETION DATE	TYPE
3	Browns Ferry 1	20	659	06/28/2004	Spring 2007	EPU
4	Beaver Valley 1	8	211	10/04/2004	07/18/2006	EPU
5	Beaver Valley 2	8	211	10/04/2004	07/18/2006	EPU
6	Calvert Cliffs 1	1.3	37	01/31/2005	12/31/2006	MUR
7	Calvert Cliffs 2	1.3	37	01/31/2005	12/31/2006	MUR
8	Fort Calhoun	1.5	22	03/31/2005	12/31/2006	MUR
9	Ginna	17	255	07/07/2005	08/23/2006	EPU

Expected Power Uprate Applications

The following table describing intended future license amendment applications is the result of a survey of all licensees conducted in March 2006 and information obtained since the survey.

Fiscal Year	Power Uprates Expected	MUR Power Uprates	SPUs	EPUs	MWt	MWe
2006	4	1	0	3	1470	490
2007	6	5	1	0	431	144
2008	0	0	0	0	0	0
2009	10	2	3	5	1792	597
2010	2	2	0	0	76	25
2011	1	1	0	0	26	9
TOTAL	23	11	4	8	3795	1265

Accomplishments Since June 2, 2005

- Approved four plant-specific power uprates: one MUR power uprate (Seabrook), two SPUs (Palo Verde Units 1 and 3) and an EPU (Vermont Yankee). An adjudicatory proceeding is currently in progress on the Vermont Yankee EPU; hearings are expected to be held in September-October 2006.
- Issued an acceptance review letter for the Ginna power uprate application.
- Monitored the installation of new steam dryers with an improved design at Quad Cities Units 1 and 2 in May 2005 and the return of those units to EPU operation.

- Performed additional reviews of, and conducted public meetings on, the Exelon Generating Company, LLC (Exelon) evaluations of the plant data obtained during EPU operation at Quad Cities to determine the causes of flow-induced vibration (FIV) issues.
- Reviewed Exelon's evaluation of the steam dryer cracking identified at Dresden Units 2 and 3 in November 2005 and subsequent repair of the steam dryers.
- Formed a Special Inspection Team led by Region III with NRR assistance in January 2006 to evaluate Exelon's response to significant degradation of the electromatic relief valves (ERVs) at Quad Cities Units 1 and 2 from EPU operation.
- Reviewed Exelon's response to the significant cracking identified in the steam dryer in Quad Cities Unit 2 during its spring 2006 refueling outage, which the licensee determined was caused by installation difficulties with the new dryer in May 2005.
- Reviewed the modifications performed by Exelon at Quad Cities Unit 2 in spring 2006 to eliminate the source of FIV and acoustic pressure pulses in the main steam lines to reduce vibration of main steam line components and pressure loading on the steam dryer during EPU operation.
- Monitored the power ascension at Vermont Yankee following issuance of the EPU license amendment on March 2, 2006, and reviewed plant data to evaluate pressure loading on the modified steam dryer and vibration of plant components during the power ascension process.
- Continued to hold discussions regarding FIV issues with General Electric Nuclear Energy and the Boiling Water Reactor Owners Group.
- Met with Westinghouse and Caldon, the vendors of ultrasonic flow meters used for MUR power uprates, to discuss issues related to small differences in power level indications at some plants.
- Presented information on the Vermont Yankee, Ginna, and Beaver Valley Units 1 and 2 EPU applications to the Advisory Committee on Reactor Safeguards (ACRS) and the ACRS Subcommittee on Power Uprates.
- Performed acceptance reviews of the EPU applications for Hope Creek and Susquehanna Units 1 and 2 and determined that the information provided was insufficient to demonstrate that the structural integrity of the steam dryers would be maintained during EPU operation.
- Briefed the Mexican regulator, the Japanese regulator, and a group of Young Swedish Nuclear Professionals on the Nuclear Regulator Commission's (NRC's) power uprate program.
- Presented information on NRC's power uprate program at regulatory information exchange meetings in Taiwan and Korea.
- Supported interviews by *World Watch* and the *Chicago Tribune* that included questions on NRC's power uprate program.
- Provided comprehensive power uprate review guidance in all aspects of power uprate reviews to NRC's plant project managers.
- Briefed the ACRS on the staff's proposed final version of Standard Review Plan Section 14.2.1, "Generic Guidelines for Extended Power Uprate Testing Programs."
- Responded to Congressional questions on power uprates.

<u>Operating Experience Related to Power Uprates</u>

There have been several FIV issues warranting staff attention. In May 2005, the licensee installed new steam dryers in Quad Cities Units 1 and 2 with an improved design to increase their structural capability for EPU operation. The steam dryer in Quad Cities Unit 2 was instrumented with pressure, strain, and acceleration sensors to collect data during the power ascension and EPU operation to determine actual steam dryer loading and to validate an acoustic analysis method that uses main steam line strain gage data as input in calculating stress in the steam dryer during plant operation. The staff monitored the return to EPU operation of the Quad Cities units following replacement of the steam dryers. The staff has been reviewing the data collected at the Quad Cities units and the startup test reports prepared by the licensee and has conducted several public meetings with the licensee to discuss the steam dryer loads at EPU conditions. The staff is currently reviewing the licensee's response to several remaining issues regarding the steam dryer stress analysis and its uncertainty assumptions submitted on December 22, 2005. During EPU operation at Quad Cities Units 1 and 2, the licensee discovered significant degradation of the ERVs at those units in late December 2005 and early January 2006. The licensee shut down the Quad Cities units to repair the ERVs and restarted the units with operation up to pre-EPU power levels. In response to the discovery of the ERV degradation, NRC sent a Special Inspection Team to Quad Cities in January 2006 where the staff found several weaknesses in the licensee's actions to ensure the capability of the ERVs for EPU conditions. The licensee's evaluation of the ERV degradation under EPU conditions determined that the degradation was due to the failure to address the source of the vibrations at the Quad Cities units over the last several years.

During the spring 2006 refueling outage at Quad Cities Unit 2, the licensee discovered a significant crack in the skirt region of the steam dryer. The licensee determined that the cracking was the result of fatigue failure during EPU operation due to overstressing of the skirt during installation difficulties in May 2005. The licensee also conducted modifications to the safety and relief valves branch lines from the main steam lines at Quad Cities Unit 2 to reduce the acoustic pressure fluctuations that are causing significant steam dryer loading and main steam line component vibration. Upon restart of Quad Cities Unit 2 in April 2006, the licensee found that the main steam line strain gage instrumentation indicated acoustic pressure fluctuations during a brief test period at EPU conditions to be below the levels measured at EPU conditions. The licensee shut down Quad Cities Unit 1 in May 2006 to install similar modifications in its steam lines and to inspect the steam dryer. The licensee found minimal indications on the Quad Cities Unit 1 steam dryer which confirmed the analysis of the steam dryer cracking found at Quad Cities Unit 2 earlier this year. As a result, the licensee returned Quad Cities Unit 2 to EPU operation. Following the steam line modifications in Quad Cities Unit 1, the licensee restarted that unit and returned it to EPU operation. The NRC staff will evaluate the Quad Cities plant data, analysis, and inspection results to determine whether any safety concerns exist with the long-term EPU operation of those units.

In previous years, the steam dryers at Dresden Units 2 and 3 were modified to increase their structural capability for EPU operation. These plants had operated for several years at the EPU levels with the modified steam dryers without significant damage. However, cracking was found in November 2005 in Unit 2 and later in Unit 3. The licensee repaired the cracks and installed additional modifications to the steam dryers in the Dresden units. The licensee plans to replace the dryers during the fall 2006 (Unit 3) and the fall 2007 (Unit 2).

In preparing a safety evaluation for the EPU license amendment request for Vermont Yankee, the staff reviewed the licensee's modifications and analysis of the Vermont Yankee steam dryer and the plans for monitoring plant instrumentation to assess steam dryer loads and FIV during power ascension and EPU operation. The staff accepted the licensee's analysis of potential adverse flow effects for EPU operation with specific license conditions and a regulatory commitment for monitoring plant instrumentation during power ascension. In March 2006 following issuance of the EPU license amendment, the licensee initiated a slow and deliberate power ascension at Vermont Yankee. The plant reached administrative limits on main steam line strain gage measurements at 105 percent, 112.5 percent, and 117.5 percent of original licensed thermal power (OLTP). The licensee also reached an administrative limit at 117.5 percent of OLTP for moisture carryover efficiency of the steam dryer. The staff reviewed the plant data for each power ascension step and the licensee's analysis of the stress on the steam dryer and specific reassessments of the administrative limits. The staff also reviewed the plant data for vibration and the results from walkdown inspections conducted by the licensee during the power ascension hold points. The staff will continue to monitor steam dryer loads and FIV of plant components at Vermont Yankee.

The staff is applying the lessons learned from the review of the power uprate flow effects at Quad Cities and Dresden to other power uprate applications. For example, the staff determined that the initial EPU applications submitted by the Hope Creek and Susquehanna Units 1 and 2 licensees were insufficient to demonstrate that the steam dryers at those plants were capable of maintaining their structural integrity at the uprated power levels. The Hope Creek and Susquehanna Units 1 and 2 licensees are modifying their applications.

Another operating experience issue relates to abnormalities in ultrasonic flow meter (UFM) instrumentation. The staff is currently following industry evaluations of a problem at plants using a UFM of the type used for MUR power uprates. This problem has led to unexpected but small differences in power level indications at some plants. The staff is currently completing its evaluations of pending applications using the Westinghouse Crossflow system with the benefit of this operating experience.

Program Performance vs. Established Goals

The established performance goals are: 6 months and 960 staff-hours for reviewing MUR power uprate applications, 9 months and 1800 staff-hours for reviewing SPU applications, and 12 months and 3900 staff-hours for reviewing EPU applications.[1]

The staff will continue to ensure that the goal of protection of public health and safety is not compromised in order to meet these timeliness and resource expenditure goals. To that end, the staff believes it now needs to increase the resource goal for EPU applications to 5,000 hours to adequately review EPU applications in several areas, including power uprate testing programs, FIV issues, and reactor systems calculative techniques and methods. These resources are budgeted through Fiscal Year 2008. It should be noted that individual applications may require more or less review time depending on the nature of the technical issues; for example, the staff's review of the Vermont Yankee EPU involved about 11,000 hours of review (about 10 percent of the 11,000 hours was used in the staff's acceptance review), and 900 hours for a pilot engineering inspection that touched on several EPU issues.

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[1] These goals do not include the duration of and staff-hours for the staff's acceptance review, which the staff conducts upon receipt of the initial application.

The timeliness and resource expenditure goals assume that licensees' submittals are consistent with established guidelines, do not include other non-power-uprate related requests, do not involve new or unanticipated significant technical issues, and that licensees respond to requests for additional information (RAIs) within established schedules. When establishing the above goals for the Office of Nuclear Reactor Regulation (NRR) Operating Plan, the staff recognized that in some cases, licensees' plans for implementing power uprates exceed the timeliness goals described above. As a result, for the NRR Operating Plan, the staff can meet its timeliness goals by either completing the reviews according to the numerical goals or by completing the reviews in time to support licensees' proposed implementation schedules (also known as licensees' need dates), whichever is longer. This flexibility allows the staff to utilize its resources to better support other high-priority activities.

The staff met its timeliness and resource goals for its review of the Seabrook MUR power uprate as well as the Palo Verde Units 1 and 3 SPUs. The Seabrook MUR power uprate was approved on May 22, 2006 (which was the licensee's need date), and the staff charged about 900 hours for its review. The Palo Verde Units 1 and 3 SPU was approved on November 16, 2005 (which was prior to the licensee's need date of November 18, 2005), and the staff charged about 1200 hours for its review. For the Vermont Yankee EPU review, the staff took about 25 months and charged about 10,000 hours from the completion of NRC's acceptance review. The timeliness and resource goals were not met. The scheduled review of the Vermont Yankee EPU was extended largely due to incomplete submissions by the licensee, which required greater effort to allow a thorough review of key technical issues associated with safe operation at the new power level.

The review involved several rounds of RAIs and over 40 supplemental submittals by the licensee. Ultimately, license conditions were used to resolve the remaining key issues. To correct this in the future, the staff will utilize more and earlier management involvement in the decision-making process, including consideration of license conditions to resolve key issues earlier in the review process. In addition, the staff will conduct, on a pilot basis, more extensive audits at the plant and/or vendor sites to expedite resolution of RAIs.

For the ongoing EPU reviews of Browns Ferry Unit 1, Browns Ferry Units 2 and 3, and Beaver Valley Units 1 and 2, the staff expects to meet the timeliness goals of 12 months after the staff's acceptance review or the licensee's need date; however, these applications needed substantial supplementation to pass their acceptance reviews, which took over 9 months in each case. To correct this situation, the staff is now conducting more thorough and rigorous acceptance reviews of power uprate applications. Any significant area not addressed with sufficient completeness to allow the staff to proceed with its detailed technical review, may be treated as a basis for not accepting the application. This staff position was illustrated with the Hope Creek and Susquehanna Units 1 and 2 applications that were withdrawn by the licensees on February 10 and May 18, 2006, respectively, after the staff determined that the applications were insufficient to demonstrate that the structural integrity of the steam dryers would be maintained during EPU operation. In addition, the Susquehanna application did not adequately address several plant systems areas.

For the Ft. Calhoun and Calvert Cliffs Units 1 and 2 MUR power uprate reviews, the NRC staff issued acceptance letters on May 12 and March 18, 2005, respectively. However, these reviews did not meet the 6-month timeliness goal because subsequent to the issuance of the acceptance letters, the staff determined that the NRC-approved methodologies for feedwater flow measurement were not being used by the licensees. (The staff based the 6-month timeliness goal for MUR power uprates on the use of NRC-approved methodologies.) The staff may also need to revisit the generic topical report associated with these reviews (i.e., the Westinghouse Crossflow system).

Interactions with Internal and External Stakeholders

The staff briefed the ACRS Subcommittee on Power Uprates and the ACRS Full Committee in November and December of 2005 for the Vermont Yankee EPU, and in March, April and May of 2006 for the Ginna and Beaver Valley Units 1 and 2 EPUs. Regarding the Vermont Yankee EPU, the ACRS had particular interest in the areas of containment overpressure credit, large transient tests, times available to perform critical operator actions, margin added to the safety limit minimum critical power ratio, and the steam dryer monitoring plan during power ascension. By letter dated January 4, 2006, the ACRS recommended approval of the Vermont Yankee EPU.

Regarding the Ginna and Beaver Valley Units 1 and 2 EPUs, the ACRS had particular interest in the areas of non-loss-of-coolant accident (non-LOCA) events, LOCAs, boron precipitation during long-term cooling following a LOCA, flow-induced vibration, flow accelerated corrosion, and probabilistic risk assessment. By letters dated May 22, 2006, the ACRS recommended approval of the Ginna and Beaver Valley Units 1 and 2 EPUs.

For EPU applications, a proposed No Significant Hazards Consideration (NSHC) determination will be issued as soon as the staff is able to make this proposed determination. This determination would most likely be made right after the staff determines that the application passes the acceptance review. The reason for noticing future EPU applications with proposed NSHC determinations is that there has now been enough experience with EPUs (the staff has approved 14 EPUs to date), such that the staff can now issue a proposed NSHC determination when noticing the application.

The staff briefed the Mexican regulator (April 2006), the Japanese regulator (October 2005), and a group of Young Swedish Nuclear Professionals (October 2005) on NRC's power uprate program. This briefing focused on the staff's process for reviewing power uprate applications.

The staff presented information on NRC's power uprate program at regulatory information exchange meetings in Taiwan and Korea in April 2006. These presentations focused on the staff's process for reviewing power uprate applications and some of the current technical issues with power uprates.

POLICY ISSUE
(Information)

June 2, 2005 SECY-05-0098

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations /RA/

SUBJECT: STATUS REPORT ON POWER UPRATES

PURPOSE:

To provide the Commission an update on the status of power uprate activities. This Commission paper summarizes the staff's accomplishments and challenges since the last update in SECY-04-0104, dated June 24, 2004. The staff will continue to keep the Commission informed of the status of power uprate activities by providing annual status reports and by other means as appropriate. Status reports on the power uprate program are generated in response to a staff requirements memorandum dated February 8, 2002.

SUMMARY:

Since the last status update, the staff has made progress in reviewing plant-specific power uprates, stayed abreast of operating experience with potential effects on power uprate reviews, continued to monitor performance related to the effectiveness and efficiency measures established for power uprate reviews, and continued to look for ways to improve the power uprate process. Details of the staff's progress are provided in this Commission paper and the attachments.

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BACKGROUND:

Power uprates are categorized according to power increases and the methods used to achieve the increase. A MUR power uprate results in a power level increase that is less than 2 percent and is achieved by implementing advanced techniques for calculating reactor power. SPUs usually result in power level increases that are up to 7 percent and generally do not involve major plant modifications. EPUs result in larger power level increases than SPUs and usually

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require significant modifications to major plant equipment. The NRC has approved EPUs for increases as high as 20 percent.

This status report is written in response to a staff requirements memorandum dated February 8, 2002. The staff provided its last update in SECY-04-0104, dated June 24, 2004. This update summarizes the staff's accomplishments and challenges since the last update.

To date, the staff has completed the following actions:

- approved five plant-specific power uprates (one extended power uprate (EPU), three stretch power uprates (SPUs), and one measurement uncertainty recapture (MUR) power uprate);
- issued acceptance review letters for the Indian Point Unit 3, Beaver Valley Units 1 and 2, Browns Ferry Units 1, 2, and 3, Calvert Cliffs Units 1 and 2, and Fort Calhoun power uprate applications;
- continued to use Review Standard (RS)-001, "Review Standard for Extended Power Uprates," for EPU reviews;
- conducted additional reviews of Exelon Generating Company, LLC's (Exelon's) evaluations of the causes of flow-induced vibration (FIV) issues at Dresden and Quad Cities;
- continued to hold discussions regarding FIV issues with General Electric Nuclear Energy (GENE) and the Boiling Water Reactor Owners Group (BWROG)
- met with industry on September 17, 2004, to discuss ongoing ultrasonic flow meters (UFMs) issues;
- performed a pilot engineering inspection at Vermont Yankee with focus on the power uprate application;
- discussed the approval of the Indian Point Units 2 and 3, and Seabrook SPUs with external stakeholders, including Congressional delegates and their staff, through public meetings and correspondence;
- presented information on the Waterford EPU application to the Advisory Committee on Reactor Safeguards (ACRS), and the ACRS Subcommittee on Thermal-Hydraulic Phenomena;
- discussed the power uprate program at a panel session during the 2005 NRC Regulatory Information Conference (RIC);
- met with the State of New Jersey to discuss EPU reviews;
- visited Switzerland and Sweden in June 2004 to discuss the NRC's Power Uprate Program and gathered information on lessons learned with international power uprate programs;
- briefed a Japanese delegation on NRC's Power Uprate Program; and
- provided input on power uprates for the 2005 U.S. National Report for the Convention on Nuclear Safety.

The staff will continue to keep the Commission informed of the status of power uprate activities by providing annual status reports and by other means as appropriate.

<u>DISCUSSION</u>:

<u>Power Uprate Applications</u>

Approved Power Uprates

This status update covers power uprates approved since June 24, 2004 (Attachment 1). During this period, the staff approved power uprates for five nuclear power plant units, resulting in a combined increase of 735 megawatts thermal (MWt) or approximately 245 megawatts electric (MWe). This brings the total number of power uprates approved since 1977 to 105, resulting in a combined increase of approximately 13250 MWt or 4417 MWe to the Nation's electric generating capacity.

Ongoing Reviews of Power Uprates

The staff is currently reviewing power uprates for 11 nuclear power plant units (three MUR power uprates, two SPUs, and six EPUs (Attachment 2)). If approved, these power uprates will result in 2714 MWt or 905 MWe added to the Nation's electric generating capacity. The staff has given the review of power uprates a high priority, as previously directed by the Commission.

Expected Power Uprates

In January 2005, the staff surveyed all licensees to obtain information on whether they planned to submit power uprate applications over the next 5 years (Attachment 3). Based on this survey and information obtained since the survey, licensees plan to request power uprates for 28 nuclear power plant units over the next 5 years. If approved, these power uprates will result in an increase of about 4139 MWt or approximately 1379 MWe. Based on the results of the January 2005 survey and the staff's models for reviewing power uprates, approximately 24 full-time equivalent staff will be used to review power uprate applications expected over the next 5 years. These resources are budgeted and the staff does not anticipate needing additional resources for power uprate reviews.

Vermont Yankee EPU Review

On September 10, 2003, Entergy Nuclear Northeast (Entergy) submitted an EPU application for Vermont Yankee. Entergy requested a 20-percent (310 MWt) EPU. Some of the technical issues associated with the power uprate include: (1) steam dryer cracking, (2) FIV issues, (3) flow-accelerated corrosion, and (4) use of containment overpressure for calculating net positive suction head for emergency core cooling system pumps.

The NRC has received numerous stakeholder comments, questions, and concerns regarding this proposed EPU (from members of the public, intervener groups, the State and Congress).

Based on the public's interest and the amount of correspondence associated with the Vermont Yankee EPU review, the staff established a communications team and developed a communication plan for Vermont Yankee.

On August 30, 2004, the Vermont Department of Public Service (DPS) and the New England Coalition (NEC) filed requests for hearings in connection with the proposed EPU. The NRC established an Atomic Safety Licensing Board (ASLB) panel of three NRC administrative judges to review the requests. The ASLB found that each of the petitioners has standing to intervene. Currently, the only contentions that have been admitted by the ASLB and that will be argued during the hearing are two contentions from DPS related to the use of containment overpressure and two contentions from NEC related to large transient testing and the structural integrity of the cooling towers. The ASLB has not yet set a date for the hearing. The date will be set after the NRC staff provides a revised EPU schedule to the ASLB.

As discussed in the NRC's letter to Entergy dated October 15, 2004, the Vermont Yankee EPU review schedule is being impacted primarily due to concerns about the steam dryer analysis. On April 5, 2005, Entergy submitted a supplement to the EPU application. This submittal is the last in a series of supplements to address the concerns in the October 15, 2004, letter. The NRC staff is currently reviewing these submittals and is reassessing the review schedule. Once the reassessment is complete, the information will be provided to the ACRS so that the subcommittee and full committee meeting can be scheduled. The schedule information will also be provided to the ASLB so that a date for the hearing on the proposed EPU can be set as noted above. The staff will not approve the EPU license amendment until all outstanding technical issues have been resolved to the staff's satisfaction, to ensure that after approval and implementation of the EPU an adequate safety margin is maintained. The staff's timeliness goal of completing the review within one year or by the licensee's need date of the fall of 2005 likely will not be met. The staff is making every effort to meet the goal, however the staff will not sacrifice safety to meet the goal.

Operating Experience Related to Power Uprates

Attachment 7 to this memorandum provides details about power uprate operating experience issues over the last year.

Staff Performance vs. Established Goals

Established Goals

Maintaining safety remains the staff's highest priority in reviewing power uprate applications and the staff intends to ensure that safety is maintained. The staff has established performance goals of 6 months and 960 staff-hours for reviewing MUR power uprate applications, 9 months and 1800 staff-hours for reviewing SPU applications, and 12 months and 3900 staff-hours for reviewing EPU applications. The staff will continue to ensure that the goal of maintaining safety is not compromised in order to meet these timeliness and resource expenditure goals.

The timeliness and resource expenditure goals assume that licensees' submittals are consistent with established guidelines; that licensees' submittals do not include other non-power uprate related requests; that licensees' submittals do not result in substantive requests for additional information (RAIs); and that licensees respond to RAIs within established schedules. In establishing the above goals, the staff recognized that in some cases, licensees' plans for implementing power uprates are more flexible than the timeliness goals described above. As a result, the staff can meet its timeliness goals by either completing the reviews according to the numerical goals or by completing the reviews in time to support licensees' proposed implementation schedules, whichever is longer. This flexibility allows the staff to utilize its resources to better support other high-priority activities.

Staff Performance

Since the staff, at the direction of the Commission, established timeliness and resource expenditure goals for power uprate reviews, the staff has met the timeliness goals for all power uprate reviews. Specifically, for the five power uprate applications approved since June 2004, the Indian Point Units 2 and 3 SPUs were issued within the 9 months goal. The Waterford EPU, Seabrook SPU and Palisades MUR power uprate were all approved before the licensees' need dates.

However, the staff only met the hourly goal for completing power uprate reviews for 2 of the 5 power uprate applications approved since June 2004. The goal hours were met for the power uprate reviews of the Palisades MUR (948 hours) and Indian Point Unit 3 SPU (1660 hours). For the Seabrook (2883 hours) and Indian Point Unit 2 (2800 hours) SPU reviews, and the Vermont Yankee (5995 hours) currently under review, and Waterford (7344 hours) EPU reviews, the staff has exceeded the hourly goals for the reviews. Attachments 4, 5, and 6 summarize the hours charged by the staff for the power uprate reviews recently completed, and for the power uprate applications currently under review.

The key reason the staff exceeded the hourly goals is the quality of the power uprate applications. The applications lacked sufficient technical information to allow the staff to decide that safe plant operation will continue after the proposed power uprate. The staff had to request additional information from the licensees resulting in several supplements to the original applications. The original Waterford EPU application lacked so much technical information that 32 supplements were needed to provide the information required by the staff.

To address the hourly-goal issue, the staff is using the Office of Nuclear Reactor Regulation (NRR) Work Planning Center (WPC) to control and monitor all power uprate applications. The WPC monitors the timeliness and hourly goals for power uprates. The staff is also developing additional guidance for power uprate reviews. The guidance is intended to provide project managers with a comprehensive set of directions on how to process a power uprate license amendment. The guidance will emphasize a pre-application review of each power uprate starting approximately 1 year before the power uprate application is submitted. This will initiate a dialogue between the staff and the licensee to ensure that sufficient technical information is included in each application. The guidance will also focus on a timely and thorough acceptance review of each power uprate application. The guidance is scheduled to be issued by the end of 2005.

The staff will continue to closely monitor power uprate reviews and keep the Commission informed when the performance goals are not met.

Review Standard for EPUs

RS-001 was issued in December 2003. RS-001 is a first-of-a-kind document that provides a comprehensive process and technical guidance for NRC EPU reviews. The document also provides useful information to licensees for EPU applications. The development of RS-001 was a significant process improvement effort and involved all divisions within NRR. The final RS fully addressed the public comments received on the draft RS and was endorsed by the ACRS as an "excellent review standard." In previous memoranda to the Commission, the staff stated that it would ask the Committee To Review Generic Requirements (CRGR) to endorse the final version of RS-001. After discussing the matter with the staff, the CRGR chairman determined that a CRGR formal review was not required.

The staff is currently using RS-001 for reviewing EPUs. The staff used RS-001 for the first time to review the Waterford EPU application, which was approved on April 15, 2005. RS-001 was developed to improve the effectiveness and efficiency of EPU reviews. The staff exceeded the review hours goals in the Waterford and Vermont Yankee reviews. The staff is performing lessons learned reviews to determine why the hourly goals were exceeded. The staff is also reviewing operating experience at plants which have implemented EPUs. The staff will make changes to RS-001 based on these reviews and operating experience insights.

Interactions With Internal and External Stakeholders

ACRS Briefings on the Waterford EPU

The staff briefed the ACRS Subcommittee on Thermal-Hydraulic Phenomena on January 26, 2005, and the ACRS Full Committee on February 10-11, 2005, on the Waterford 8-percent EPU. The ACRS questioned the staff about boron precipitation during long-term cooling after a loss-of-coolant accident, large transient testing, and the effects of FIV on components as a result of the EPU.

The ACRS complimented the staff on the review of the Waterford EPU as being comprehensive. In addition, the ACRS indicated that the rationale for the staff's decisions in the safety evaluation was clear. The ACRS attributed the high quality of the staff's review to RS-001.

Power Uprate Presentation at the 2005 NRC Regulatory Information Conference

The NRC chaired a power uprate panel at the 2005 RIC. The panel included several distinguished industry representatives and external and internal stakeholders. The discussion focused on the challenges and operating experience of plants with approved power uprates. The session was a great success and was well attended by over 250 people. There was a frank and open exchange of information between the panel and audience.

States Activities

In February 2005, NRR management met with representatives of the State of New Jersey, and made a presentation on the NRC's Power Uprate Program. The presentation focused on how the staff reviews and approves an EPU. The presentation included details on RS-001 and the interface between States and the NRC during an EPU review.

International Activities

The staff is continuing its dialogue with international regulatory counterparts on power uprates and technical challenges. The staff visited Switzerland and Sweden in June 2004 to discuss the NRC's Power Uprate Program and gathered information on lessons learned from international power uprate programs. The staff provided input on power uprates for the 2005 U.S. National Report for the Convention on Nuclear Safety. The input included a description of the NRC's Power Uprate Program and details of staff activities related to operating experience issues in plants that have implemented power uprates.

In September 2005, NRR management briefed a Japanese delegation on the status of the NRC's Power Uprate Program, and the operating experience of plants which have implemented power uprates.

Challenges

The staff continues to be challenged by various FIV issues at Quad Cities and Dresden, and by issues associated with EPUs currently under review. Based on these challenges, the staff is evaluating the need to modify guidance for future power uprate reviews, and the need to revisit previous reviews of power uprates. The staff is monitoring operating experience issues related to power uprates to ensure that review guidance is updated and is focused on reactor safety. The staff also continues to monitor its performance related to power uprate reviews, especially the hourly goals for completing power uprate reviews.

Due to extensive public interest and correspondence from stakeholders, the staff continues to be challenged with activities related to the Vermont Yankee EPU review. The staff has dedicated resources to deal with these issues.

COMMITMENTS:

Listed below are the actions or activities committed to by the staff in the paper:

1. Perform lessons learned reviews concerning the use of RS-001;
2. Update power uprate guidance documents as necessary;
3. Continue to monitor operating experience at plants that are operating at uprate power levels;
4. Continue to interface with owners groups;
5. Continue international exchange of information and operating experiencescontinue to monitor effectiveness and efficiency goals; and

6. Review the inspection activities related to the power uprate program and incorporate the Vermont Yankee inspection lessons learned as appropriate. This issue will be reported to the Commission in a separate Commission paper as required in staff requirements memorandum dated December 23, 2004.

/RA/

Luis A. Reyes
Executive Director
for Operations

Attachments:
1. Table 1 - Power Uprates Approved Since June 2004
2. Table 2 - Power Uprate Applications Currently Under Staff Review
3. Table 3 - Expected Power Uprate Applications
4. MUR Hourly Charges Through April 2005
5. SPU Hourly Charges Through April 2005
6. EPU Hourly Charges Through April 2005
7. Operating Experience Related to Power Uprates

TABLE 1 - Power Uprates Approved Since June 2004

NO.	PLANT	% UPRATE	MEGAWATTS THERMAL	APPLICATION DATE	APPROVAL DATE	TYPE
1	Palisades	1.4	34	06/18/2003	06/23/2004	MUR
2	Indian Point 2	3.26	101.6	01/29/2004	10/27/2004	SPU
3	Seabrook	5.2	176	03/17/2004	02/28/2005	SPU
4	Indian Point 3	4.85	148.6	06/03/2004	03/24/2005	SPU
5	Waterford	8	275	11/13/2003	04/15/2005	EPU
	TOTAL		735.2			

Power uprates approved since June 2004 have added an additional 735.2 MWt or approximately 245 MWe to the Nation's electric generating capacity.

TABLE 2 - Power Uprate Applications Currently Under Staff Review

Boiling Water Reactor (BWR)
Pressurized Water Reactor (PWR)

NO	PLANT	RX TYPE	% UPRATE	MWt	SUBMITTAL DATE	PROJECTED COMPLETION DATE	TYPE
	POWER UPRATES UNDER REVIEW						
1	Vermont Yankee	BWR	20	319	09/10/2003	TBD*	EPU
2	Browns Ferry 2	BWR	15	494	06/25/2004	TBD*	EPU
3	Browns Ferry 3	BWR	15	494	06/25/2004	TBD*	EPU
4	Browns Ferry 1	BWR	20	659	06/28/2004	TBD*	EPU
5	Palo Verde 1	PWR	2.9	114	07/09/2004	06/30/2005	SPU
6	Palo Verde 3	PWR	2.9	114	07/09/2004	06/30/2005	SPU
7	Beaver Valley 1	PWR	8	211	10/04/2004	TBD*	EPU
8	Beaver Valley 2	PWR	8	211	10/04/2004	TBD*	EPU
9	Calvert Cliffs 1	PWR	1.3	37	01/31/2005	08/01/2005	MUR
10	Calvert Cliffs 2	PWR	1.3	37	01/31/2005	08/01/2005	MUR
11	Fort Calhoun	PWR	1.6	24	03/31/2005	10/01/2005	MUR
	TOTAL			2714			

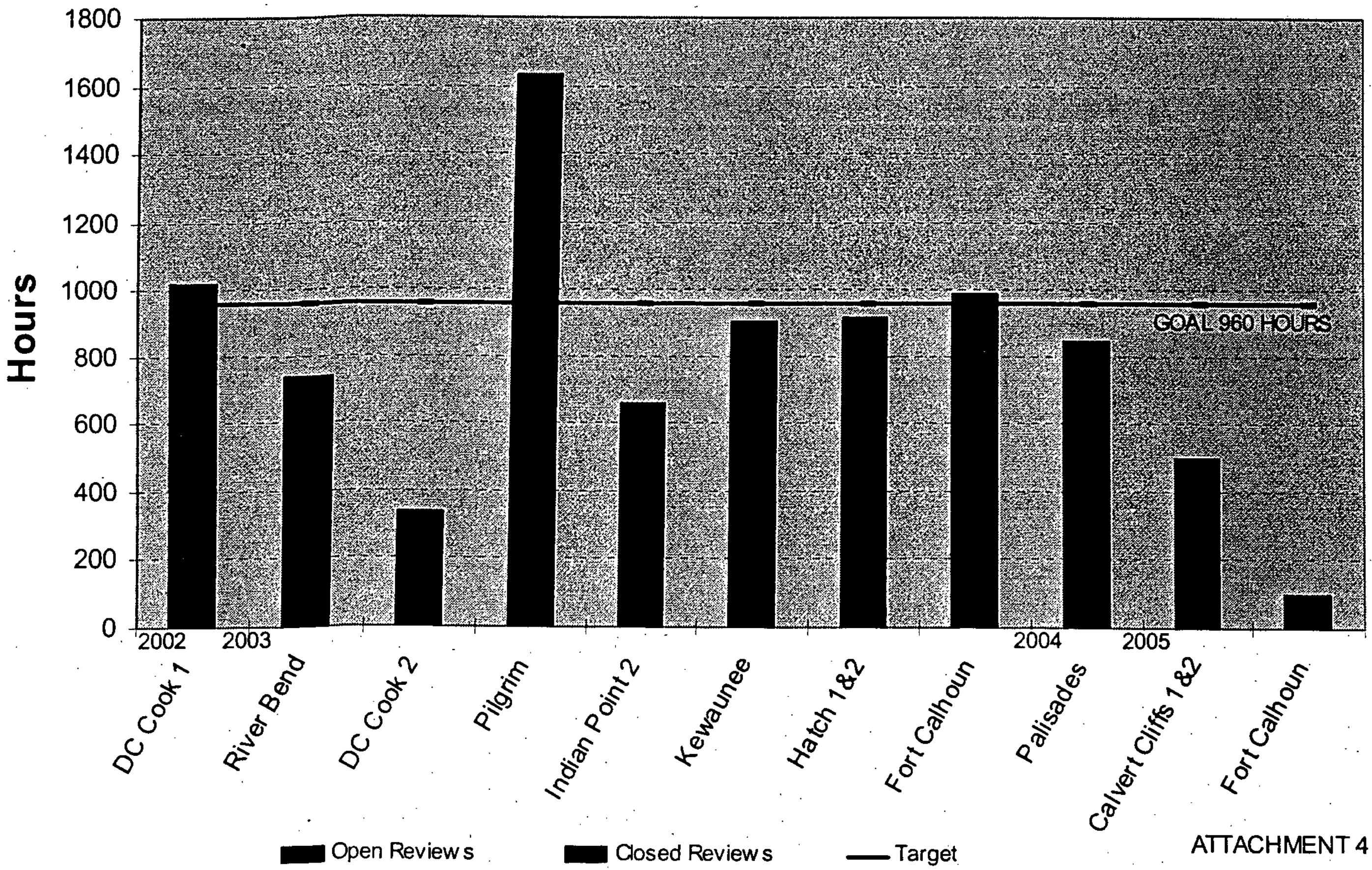
Power uprates currently under review could add an additional 2714 MWt or approximately 905 MWe to the Nation's electric generating capacity if approved.

* The projected completion date is uncertain.

TABLE 3 - Expected Power Uprate Applications

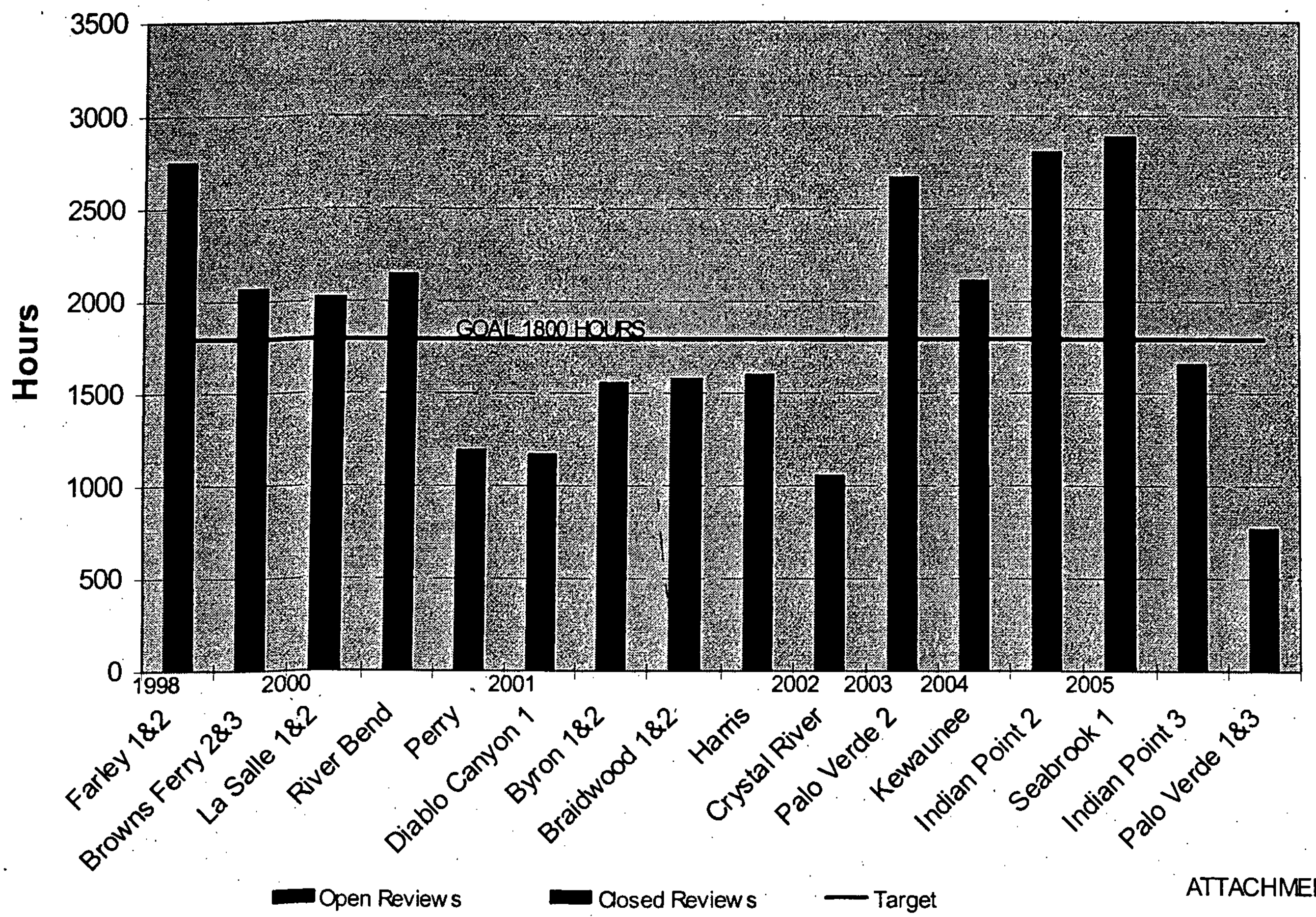
Fiscal Year	Power Uprates Expected	MUR Power Uprates	SPUs	EPUs	MWt	MWe
2005	7	5	0	2	959	320
2006	9	7	0	2	1177	392
2007	3	0	1	2	386	129
2008	5	0	0	5	1309	436
2009	2	0	2	0	232	77
2010	2	2	0	0	76	25
TOTAL	28	14	3	11	4139	1379

Measurement Uncertainty Power Uprate Hourly Charges Through April 2005

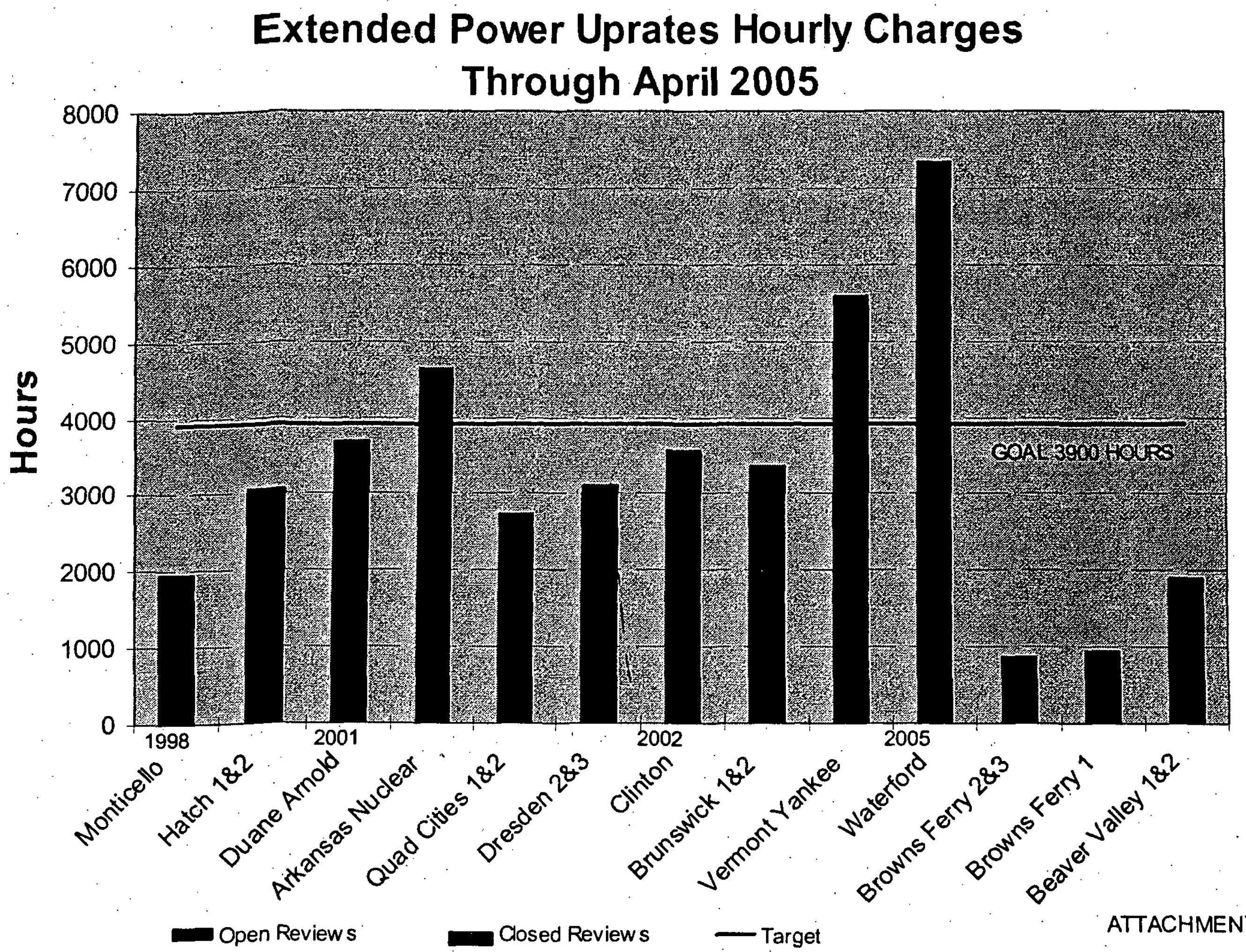


ATTACHMENT 4

Stretch Power Uprate Hourly Charges Through April 2005



ATTACHMENT 5



ATTACHMENT 6

OPERATING EXPERIENCE RELATED TO POWER UPRATES

Flow-Induced Vibration Issues

The commercial nuclear industry has experienced several incidents of steam dryer cracking and FIV issues at nuclear power plants operating at EPU conditions. The NRC staff continues to closely monitor plant-specific actions and the industry's generic response to this issue. Based on its review, the staff will consider the need for additional regulatory actions.

In June 2002 and again in June 2003, Quad Cities Unit 2 experienced failures of its

ATTACHMENT 7

steam dryer during 17 percent EPU operation. Similarly, the steam dryer in Quad Cities Unit 1 failed during 17 percent EPU operation in November 2003. During a March 2004 refueling outage, Exelon discovered additional cracks in the steam dryer in Quad Cities Unit 2. Exelon identified less significant cracks in the steam dryers in Dresden Units 2 and 3 during their outage inspections. Exelon repaired the damaged steam dryers at Quad Cities and Dresden to improve their structural capability following each instance of steam dryer degradation. In addition to steam dryer cracking, FIV contributed to failures of feedwater sampling probes at Dresden Units 2 and 3, the inoperability of an electromatic relief valve, and degradation of other main steam components and pipe supports at Quad Cities Unit 1.

In response to the adverse flow effects at Quad Cities Units 1 and 2 and subsequent analyses, Exelon committed to maintain those units at pre-EPU power levels, except for limited EPU testing, until the NRC staff is satisfied that the FIV issue is resolved. During the Quad Cities Unit 1 refueling outage in March 2005, Exelon identified cracks in its steam dryer similar to those found in other BWRs operating at uprated power conditions (as well as non-uprated power conditions). The licensee evaluated the structural capability of the modified steam dryers in Dresden Units 2 and 3, and has returned those units to EPU operation. The staff does not consider the FIV issue to pose safety concerns. However, steam dryers and other internal main steam and feedwater components must maintain structural integrity to avoid generating loose parts.

Exelon is planning to install new steam dryers with an improved design in Quad Cities Units 1 and 2 in 2005. The enhanced features of the new steam dryers include thicker outer hoods and cover plates, curved edges to reduce FIV, and slanted outer hood plates. In addition, the new steam dryer in Quad Cities Unit 2 will be instrumented to obtain direct data about the FIV loads acting on the dryer during EPU operation. Over the past 6 months, the staff has conducted numerous public meetings with Exelon to discuss the licensee's FIV analyses for the Dresden and Quad Cities steam dryers and other components, and its extent of condition review of EPU FIV issues. The staff also observed the fabrication of the Quad Cities replacement steam dryers, and installation of the instrumentation on the Quad Cities Unit 2 replacement steam dryer. The staff is currently reviewing the licensee's design and analysis of the replacement steam dryers for Quad Cities Units 1 and 2 to demonstrate its structural capability for EPU conditions, and the startup test procedure for Quad Cities Unit 2 following the steam dryer replacement. The staff expects Exelon to request NRC approval to return Quad Cities Units 1 and 2 to EPU power following replacement of their steam dryers.
Entergy has modified the steam dryer at Vermont Yankee to increase its structural capability in support of its request to operate the plant at EPU conditions. The licensee recently submitted an analysis of the structural capability of the modified steam dryer at Vermont Yankee. The staff is currently reviewing the licensee's analysis.

The staff monitors the inspection results of steam dryers in BWR plants during refueling outages for potential adverse flow effects. For example, licensee inspections of the slanted hood steam dryer at LaSalle Unit 2 in the spring of 2005 found only indications on the lug support bracket only after several years of operation at 5 percent power uprate conditions. Further, licensee inspections of the slanted hood steam dryer at Brunswick Units 1 and 2 in the spring of 2005 following several years of EPU operation found several fatigue and stress corrosion cracks that the licensee has resolved by repair or analysis.

The BWROG is leading the industry's efforts in assessing the generic implications of potential adverse flow effects of power uprate operation, and has several initiatives underway to address this issue. The BWROG issued a lessons learned report in November 2004 to help licensees avoid adverse flow effects of EPU operation. General Electric also revised its steam dryer inspection guidelines in November 2004 in response to industry experience with adverse flow effects under EPU conditions. The staff has provided comments to the BWROG on its EPU lessons learned report and the revised General Electric steam dryer inspection guidelines. The staff will continue to hold public meetings with the BWROG to discuss industry activities to resolve this issue.

The Office of Nuclear Reactor Regulation (NRR) is working with the Office of Nuclear Regulatory Research (RES) on the long-term resolution of potential adverse flow effects of power uprate operation. RES has assisted NRR during reviews of steam dryer analyses presented by licensees at public meetings. NRR is assisting RES in compiling an operating experience report on adverse flow effects of EPU operation at BWR plants. The BWROG has several initiatives to assess industry-wide operating experience with post-EPU FIV issues. NRR is also working with RES in assessing the industry's resolution of the issues.

Abnormalities in Ultrasonic Flow Meter Instrumentation

The staff is following the industry's evaluations of a problem at plants that use an ultrasonic flow meter of the type used for MUR power uprates. This problem has led to unexpected but small differences in power level indications at some plants. The staff is closely monitoring this issue to identify information relevant to the use of feedwater measurement techniques in power uprate applications. The staff is also clarifying the safety evaluation basis for feedwater measurement techniques in power uprate applications, based on the operating experience. After completing the evaluation of pending MUR power uprate applications, the staff will determine whether a generic communication or updating staff review guidance is needed.

POLICY ISSUE
(Information)

June 24, 2004 SECY-04-0104

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations /RA/

SUBJECT: STATUS REPORT ON POWER UPRATES

PURPOSE:

To provide the Commission an update on the status of power uprate activities. This memorandum summarizes the staff's accomplishments and challenges since the last update in SECY-03-0190, dated November 3, 2003. The staff will continue to keep the Commission informed of the status of power uprate activities by providing annual status reports and by other means as appropriate. This status report is generated in response to a staff requirements memorandum dated February 8, 2002.

SUMMARY:

Since the last status update, the staff has made progress in reviews of plant-specific power uprates, stayed abreast of operating experience with potential effects on power uprate reviews, continued to monitor performance related to the effectiveness and efficiency measures established for power uprate reviews, and continued to look for ways to improve the power uprate process. Details of the staff's progress are provided in this Commission paper and the attachments. In summary, the staff has:

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Docket No. 7195
Attachment 1-3
15 Pages

- approved two plant-specific power uprates[1]
- issued final Review Standard (RS)-001, "Review Standard for Extended Power Uprates" on December 24, 2003
- conducted additional inspections of Exelon Generating Company, LLC's (Exelon's), evaluations of the causes and subsequent repairs of the steam dryer damage at Quad Cities Unit 2
- issued a commitment acknowledgment letter on April 20, 2004, regarding Exelon's commitments for long-term extended power uprate (EPU) operation at the Dresden and Quad Cities units
- continued to engage General Electric Nuclear Energy (GENE) and the Boiling Water Reactor Owners Group regarding steam dryer damage and flow-induced vibration issues
- issued Supplement 2 to Information Notice 2002-026, "Additional Flow-Induced Vibration Failures after a Recent Power Uprate"
- met with Westinghouse on April 22, 2004, to discuss ongoing issues related to the Advanced Measurement and Analysis Group (AMAG) ultrasonic flow meters
- issued an acceptance review letter for the Vermont Yankee Nuclear Power Station (Vermont Yankee) EPU application on February 20, 2004
- issued a letter to the Vermont Public Service Board on May 4, 2004, noting that the Nuclear Regulatory Commission (NRC) would perform a pilot engineering assessment inspection at Vermont Yankee
- engaged external stakeholders, including Congressional delegates and their staff, through public meetings and correspondence regarding the Vermont Yankee EPU application and the need for an independent safety assessment (ISA) at Vermont Yankee
- presented information to the full committee of the Advisory Committee on Reactor Safeguards (ACRS) on unanticipated effects of power uprates, and the ACRS Subcommittee on Thermal-Hydraulic Phenomena on potential adverse flow effects from power uprates
- presented power uprate reports at the 2004 NRC Regulatory Information Conference, the International Conference of Nuclear Engineering (ICONE), and at an American Nuclear Society (ANS) meeting

BACKGROUND:

Power uprates are categorized based on the magnitude of the power increase and the methods used to achieve the increase. Measurement uncertainty recapture (MUR) power uprates result in power level increases that are less than 2 percent and are achieved by implementing enhanced techniques for calculating reactor power. Stretch power uprates typically result in power level increases that are up to 7 percent and generally do not involve major plant modifications. EPUs result in power level increases that are greater than stretch power uprates

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[1] Subsequent to the staff's approval of one of the power uprates which was an MUR power uprate for Fort Calhoun, the staff approved an exigent license amendment request to return Fort Calhoun's maximum licensed operating power level back to the pre-MUR power level.

and usually require significant modifications to major plant equipment. The NRC has approved EPUs for increases as high as 20 percent.

The staff provided its last update in SECY-03-0190, dated November 3, 2003. This memorandum summarizes the staff's accomplishments and challenges since the last update. The staff will continue to keep the Commission informed of the status of power uprate activities by providing annual status reports and by other means as appropriate. This status report is generated in response to a staff requirements memorandum dated February 8, 2002.

DISCUSSION:

Power Uprate Applications

Approved Power Uprates

This status update covers power uprates approved since November 3, 2003 (Attachment 1). During this period, the staff approved power uprates for two nuclear power plant units, resulting in a combined increase of 99 megawatts thermal (MWt) or about 35 megawatts electric (MWe). This brings the total number of power uprates approved since 1977 to 101, resulting in a combined increase of approximately 12513 MWt or 4173 MWe to the Nation's electric generating capacity. The staff approved an MUR power uprate for Fort Calhoun on January 16, 2004, which authorized an increase in the licensed thermal power limit to 1524 MWt. The Omaha Public Power District was subsequently informed by Westinghouse that potential instrument inaccuracies in the AMAG ultrasonic flow meter would not allow implementation of the MUR power uprate at Fort Calhoun. As a result, on May 7, 2004, prior to implementation of the MUR power uprate, the Omaha Public Power District submitted an exigent license amendment request to return Fort Calhoun's licensed thermal power limit to 1500 MWt, the pre-MUR level. On May 14, 2004, the staff approved this license amendment request, returning the licensed maximum power level at Fort Calhoun to 1500 MWt.

Ongoing Reviews of Power Uprates

The staff is currently reviewing power uprates for five nuclear power plant units. These include one MUR power uprate, two stretch power uprates, and two EPUs (Attachment 2). If approved, these power uprates would result in a combined increase of an additional 907 MWt or 325 MWe to the Nation's electric generating capacity. As in the past, the staff has given the review of these power uprates a high priority.

Expected Power Uprates

In January 2004, the staff conducted a survey of all licensees to obtain information regarding their plans for submitting power uprates over the next 5 years (Attachment 3). Based on this survey and information obtained since the survey, licensees plan to request power uprates for

24 nuclear power plant units over the next 5 years. If approved, these power uprates would result in an increase of about 5018 MWt or about 1692 MWe. Based on the results of the January 2004 survey and the models the staff developed for reviewing power uprates, approximately 29 full-time equivalent staff will be used for reviewing the power uprates expected over the next 5 years. These resources are budgeted and the staff does not anticipate any need for additional resources for power uprate reviews.

Vermont Yankee Extended Power Uprate Review

In a letter dated December 15, 2003, the NRC notified Entergy Nuclear Operations, Inc. (Entergy), that its EPU application for Vermont Yankee lacked sufficient information in several areas needed to allow the NRC staff to complete a detailed review of the application. These areas included: (1) applicability of analyses in GENE's Constant Pressure Power Uprate (CPPU) Licensing Topical Report to Vermont Yankee, (2) insufficient information for the NRC staff to arrive at an adequate safety conclusion based on the template safety evaluation in RS-001, and (3) steam dryer integrity analysis. Entergy submitted additional information to the NRC on January 31, 2004. The staff evaluated the additional information and responded to Entergy on February 20, 2004, noting that Entergy had provided the necessary information to allow the staff to proceed with the detailed technical review. The staff's review of this amendment request is expected to be completed by January 31, 2005.

Operating Experience Related to Power Uprates

Attachment 4 to this memorandum provides details regarding power uprate operating experience issues.

Review Standard for EPUs

Issuance of RS-001

RS-001 was issued in December 2003. RS-001 is a first-of-a-kind document that provides a comprehensive process and technical guidance for EPU reviews by the NRC staff and provides useful information to licensees for EPU applications. The development of RS-001 was a significant process improvement effort and involved all divisions within the Office of Nuclear Reactor Regulation (NRR). The final RS fully addressed the public comments received on the draft RS and was endorsed by the ACRS as an "excellent review standard." In previous memoranda to the Commission, the staff stated that it would seek endorsement from the Committee to Review Generic Requirements (CRGR) of the final version of RS-001. Following dialogue with the staff, the CRGR Chairman determined that formal review by the CRGR was not required.

The staff is currently using RS-001 for the review of the proposed 20-percent EPU for Vermont Yankee and the proposed 8-percent EPU for the Waterford Steam Electric Station.

The staff will closely monitor these ongoing EPU reviews to identify any issues with the use of RS-001.

Assessment of Past Requests for Additional Information

During the development of draft RS-001, the staff reviewed requests for additional information (RAIs) issued during the reviews of recently approved EPUs to ensure that RS-001 addressed the issues identified as a result of the staff's reviews of those EPUs. The staff is preparing a summary of this review and plans to make it available to internal and external stakeholders. The staff believes that making the results of this summary available to licensees could aid them in preparing high quality applications. In SECY-03-0190, the staff committed to complete the assessment of past RAIs by the end of 2003. Due to ongoing activities related to the Vermont Yankee EPU and steam dryer cracking and flow-induced vibration issues, this assessment has not been completed. The staff plans to complete this task by the end of 2004.

Staff Performance vs. Established Goals

Established Goals

Maintaining safety remains the staff's highest priority when conducting power uprate reviews and the staff intends to take the time necessary to ensure that safety is maintained. The staff has established performance goals of 6 months and 960 staff hours for completing the review of a MUR power uprate application, 9 months and 1800 staff hours for completing the review of a stretch power uprate application, and 12 months and 3900 staff hours for completing the review of an EPU application. The staff will ensure that the goal to maintain safety is not compromised in order to meet these timeliness and resource expenditure goals.

The timeliness and resource expenditure goals are predicated on licensees' submittals being consistent with established guidelines; licensees not including other non-power uprate related requests in their submittals; licensees' submittals not resulting in substantive RAIs; and licensees responding to RAIs within established schedules. In establishing the above goals, the staff recognized that in some cases, licensees' plans for implementing power uprates are more flexible than the numerical timeliness goals described above. As a result, the staff may meet its timeliness goals by either completing the reviews according to the numerical goals or by completing the reviews in time to support licensees' implementation schedules, whichever is longer. This flexibility allows the staff to better utilize its resources in a way to support other high priority activities.

Staff Performance

One of the two power uprates the staff approved during the period covered by this status report was for a MUR power uprate. It was completed within the staff's established timeliness goal of 6 months and the established goal of 960 staff review hours. The staff also approved a

6-percent power uprate for Kewaunee during this period. The review was completed within the staff's established timeliness goal of 9 months. However, the review required over 2600 staff review hours to complete due to the following reasons: (1) some necessary technical analyses were not provided in the original application, (2) some technical information lacked sufficient detail to support the requested changes and resulted in the staff issuing multiple RAIs, and (3) late in the review of this application, the staff identified areas where additional information was needed resulting in further delays and a reduction in efficiency.

The staff will continue to closely monitor power uprate reviews and keep the Commission informed of instances where the performance goals are not met.

Interaction With Internal and External Stakeholders

ACRS Briefings on Potential Adverse Flow Effects from Power Uprates

NRR management briefed the full committee of the ACRS on March 5, 2004, regarding unanticipated effects of power uprates. The staff briefed the ACRS Subcommittee on Thermal-Hydraulic Phenomena on May 7, 2004, on potential adverse flow effects from power uprates and the Office of Nuclear Regulatory Research's (RES's) plan to assess potential adverse flow effects during boiling-water reactor power uprates. RES is developing computational fluid dynamics and finite element analysis models to perform thermal hydraulic and structural analyses of the steam dryer cracking issue. The ACRS challenged the staff regarding the staff's understanding of the causes and the adequacy of repairs of steam dryer cracking at plants that have implemented EPUs. The ACRS also expressed concern about the lack of risk analyses regarding the dryer cracking at these plants. The staff is evaluating the ACRS comments.

Vermont Yankee Power Uprate Stakeholder Issues

Based on the substantial amount of public interest and correspondence associated with the Vermont Yankee EPU review from various public officials, public interest groups, and other stakeholders, the staff established a communications team and developed a communication plan for Vermont Yankee. Additionally, NRR has temporarily established a new project section that is developing and coordinating communications for all of the various Vermont Yankee issues.

On January 15, 2004, the NRC staff held a conference call with senior staff members for Vermont Senators Jeffords and Leahy in response to their constituents' requests for an ISA inspection of Vermont Yankee (similar to the Maine Yankee inspection). The NRC staff also discussed the EPU review process and the status of the NRC's review of the Vermont Yankee EPU application. Following this call, the NRC received a letter from Senator Leahy's office requesting an overview of the NRC's review process for the Vermont Yankee EPU application.

The staff sent a response describing its EPU review process in a letter dated February 20, 2004.

The Vermont State Senate passed a resolution in March 2004 requesting that the NRC perform an independent engineering assessment at Vermont Yankee. The NRC also received a letter from the Vermont Public Service Board on March 15, 2004, requesting that the NRC perform an independent engineering inspection at Vermont Yankee to support the ongoing NRC review of the Vermont Yankee EPU application. The NRC issued its response on May 4, 2004, noting that the NRC would perform a pilot engineering inspection at the site and was willing to meet with the Vermont Public Service Board. On March 29, 2004, in response to a February 27, 2004, letter from Senators Jeffords and Leahy, the NRC stated that it will hold a public meeting in Vernon, Vermont, near Vermont Yankee, to discuss the status of the agency's review of Entergy's EPU request for Vermont Yankee.

Additionally, certain stakeholders have raised a concern regarding the adequacy of Entergy's analyses supporting its EPU amendment request. The staff is preparing responses to stakeholder letters and evaluating the concern during the EPU review.

Vermont Yankee Power Uprate Public Meeting

On March 31, 2004, the NRC held a public meeting in Vernon, Vermont, near Vermont Yankee, to discuss the status of the agency's review of Entergy's EPU request for Vermont Yankee. More than 500 people attended this meeting, including several State and local public officials from Vermont, Massachusetts, and New Hampshire, as well as representatives of Senators Leahy and Jeffords. Many people at this meeting voiced concerns about the power uprate process and expressed their desire for an independent engineering inspection at Vermont Yankee to support the proposed EPU.

Power Uprate Presentation at the 2004 NRC Regulatory Information Conference

NRC management presented a report on power uprates and other licensing actions during a panel session of the 2004 Regulatory Information Conference. The presentation included details about RS-001 and information on several technical challenges that the staff has been addressing related to power uprates. These challenges include steam dryer cracking and flow-induced vibration issues at plants that have implemented EPUs, interpretations of GENE EPU topical reports, and issues with the AMAG ultrasonic feedwater flow meter measurement systems.

International Activities

The staff is continuing dialogue with international regulatory counterparts related to power uprates and technical challenges. The staff is scheduled to visit Switzerland and Sweden in June 2004 to discuss the NRC's Power Uprate Program and gather information regarding developments and lessons learned with international power uprate programs. The staff provided input on power uprates for the 2004 U.S. National Report for the Convention on Nuclear Safety. This input included a description of the NRC's Power Uprate Program and details of staff activities related to operating experience issues from plants that have implemented power uprates.

Power Uprate Presentation at the American Nuclear Society International Winter Meeting

The staff made a presentation on the NRC's Power Uprate Program during a 2-day workshop at the 2003 ANS International Winter Meeting in November 2003. The workshop covered several power uprate topics, including an NRC staff presentation on the regulatory aspects of power uprates. The audience at the workshop included domestic and foreign representatives of utilities interested in power uprates.

Presentation at the 12th International Conference on Nuclear Engineering

On April 28, 2004, the staff presented a report on power uprates during a panel session at the 12th ICONE. The staff's presentation included information regarding final RS-001, methods that licensees can follow for improving NRC reviews of power uprates, and technical challenges resulting from power uprates..

Challenges

The staff continues to face challenges with technical issues including the Quad Cities steam dryer failures, various flow-induced vibration issues at Quad Cities and Dresden, and ultrasonic flow meter reading abnormalities at Byron, Braidwood, and Fort Calhoun. Based on these challenges, the staff is evaluating the need for modifying its guidance for future reviews of power uprates, and the potential need to revisit prior reviews of power uprates. The staff is monitoring operating experience related to power uprates to ensure that review guidance is updated and focused on reactor safety. The staff also continues to monitor its performance related to power uprate reviews to identify areas for further improvement.

Due to extensive public interest and correspondence from various public officials, public interest groups, and other stakeholders, the staff continues to be challenged with activities related to the Vermont Yankee EPU review. As noted above, to meet these challenges, the staff has dedicated resources for these issues.

/RA Martin Virgilio Acting For/

Luis A. Reyes
Executive Director
for Operations

Attachments:
1. Table 1 - Power Uprates Approved Since November 3, 2003
2. Table 2 - Power Uprate Applications Currently Under Staff Review
3. Table 3 - Expected Power Uprate Applications
4. Operating Experience Related to Power Uprates

TABLE 1 - Power Uprates Approved Since November 3, 2003

NO.	PLANT	% UPRATE	MEGAWATTS THERMAL	APPLICATION DATE	APPROVAL DATE	TYPE[1]
1	Fort Calhoun*	1.6	24	7/18/2003	1/16/2004	MUR
2	Kewaunee	6.0	99	5/22/2003	2/27/2004	S

Power uprates approved since November 3, 2003, have added an additional 99 megawatts thermal or approximately 35 megawatts electric to the Nation's electric generating capacity.

*Due to an exigent license amendment approved by the staff on May 14, 2004, Fort Calhoun's authorized licensed power level was returned to the pre-MUR level.

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[1] TYPE -- S = Stretch; MUR = Measurement Uncertainty Recapture

TABLE 2 - Power Uprate Applications Currently Under Staff Review

NO.	PLANT	% UPRATE	MEGAWATTS THERMAL	SUBMITTAL DATE	PROJECTED COMPLETION DATE	TYPE[1]
1	Palisades	1.4	35	6/3/2003	June 2004	MUR
2	Vermont Yankee	20	319	9/10/2003	January 2005	EPU
3	Waterford 3	8	275	11/13/2003	January 2005	EPU
4	Indian Point 2	3.3	102	1/29/2004	October 2004	S
5	Seabrook	5.2	176	3/17/2004	TBD*	S

Power uprates currently under review could add an additional 907 megawatts thermal or 325 megawatts electric to the Nation's electric generating capacity if approved.

*Seabrook's projected completion date is still being determined.

[1] TYPE -- EPU = Extended Power Uprate; S = Stretch; MUR = Measurement Uncertainty Recapture

TABLE 3 - Expected Power Uprate Applications

Fiscal Year	Total Power Uprates Expected	MUR Power Uprates	Stretch Power Uprates	EPUs	Megawatts Thermal	Megawatts Electric
2004	12	2	3	7	3538	1196
2005	4	3	0	1	362	121
2006	5	3	0	2	426	142
2007	2	0	1	1	333	111
2008	1	0	0	1	365	122
TOTAL	24	8	4	12	5018	1692

MUR = Measurement Uncertainty Recapture; EPU = Extended Power Uprate

OPERATING EXPERIENCE RELATED TO POWER UPRATES

Damage of Steam Dryers and Other Plant Components at Quad Cities and Dresden

Exelon Generating Company, LLC (Exelon), has discovered cracks in the steam dryer on three separate occasions at Quad Cities Unit 2 since the unit has operated at EPU power levels. Exelon also found cracks in the steam dryers at Dresden Units 2 and 3 and Quad Cities Unit 1. Flow-induced vibration contributed to failures of feedwater sampling probes at Dresden Units 2 and 3 and inoperability of an electromatic relief valve at Quad Cities Unit 1. Loose parts in the reactor coolant system have been generated from pieces of cracked steam dryers and flow-induced vibration damaged feedwater probes. The staff has determined that these issues do not pose an immediate safety concern given the current operating conditions at Quad Cities and Dresden. However, steam dryers and other internal main steam and feedwater components must maintain structural integrity to avoid generating loose parts that could impact safety system or reactor plant operation.

Since 2002, steam dryer cracking and flow-induced vibration damage on components and supports for the main steam and feedwater lines have been observed at Dresden and Quad Cities following implementation of extended power uprates (EPUs). In June 2002, approximately 3 months following implementation of a 17.8-percent EPU, Quad Cities Unit 2 experienced an increase in the moisture content of the steam flowing to the turbine. In July 2002, the licensee shut down Quad Cities, Unit 2, for inspection and identified cracks in the steam dryer. The licensee repaired the steam dryer, and returned the unit to power operation at the EPU power level. The steam dryer is not a safety-related component, but is required to maintain its structural integrity. Approximately 10 months following restart of Quad Cities, Unit 2 from the outage to repair the steam dryer, the plant experienced a similar increase in the moisture content of the steam. The licensee shut down the plant for inspection of the steam dryer and identified cracks in several locations of the steam dryer.

On November 12, 2003, Quad Cities Unit 1 was shut down to perform inspections and repairs of the steam dryer. The unit had been operating at a reduced power level since November 3, 2003, due to indications of higher-than-normal moisture carryover in the reactor steam. On November 13, 2003, the steam dryer was found damaged during inspections following reactor disassembly. The damage occurred in the ½ inch-thick upper dryer hood cover plate. The cover plate had cracks approximately 51 inches in total length and a 6 inch by 9 inch portion of the plate broke off from the steam dryer. Exelon conducted extensive inspections in an effort to locate the lost steam dryer piece(s). The piece(s) were not recovered; however, Exelon has found indications on a recirculation pump impeller. Based on these indications, the material is most likely in the bottom of the reactor vessel. The licensee conducted a loose part analysis to determine potential effects on plant systems and concluded that it was safe to operate the plant with the loose part in the vessel. The staff reviewed the licensee's loose part analysis and agreed with the licensee. Repairs and modifications, similar to those completed on the Quad Cities Unit 2 steam dryer earlier in 2003, were also completed on Unit 1.

Also during the November 2003 Quad Cities Unit 1 outage, Exelon discovered that the pilot vent line on a main steam line electromatic relief valve was sheared off from the pilot assembly and the solenoid actuator for the valve was significantly damaged. Flow-induced vibration on the main steam line during EPU operating conditions contributed to this damage. Exelon replaced the damaged solenoid actuator and rewelded the pilot vent line to the pilot assembly on the relief valve prior to restarting the unit.

During the fall 2003 refueling outage at Dresden Unit 2, Exelon found cracking on the steam dryer, but it was not through-wall. There were no indications of higher-than-expected moisture carryover in the reactor steam at Dresden Unit 2 during the previous operating cycle. Repairs and modifications, similar to those performed on the dryers at Quad Cities Units 1 and 2, were completed on the steam dryer at Dresden Unit 2 during this recent refueling outage. Additionally, Exelon found three holes in a feedwater sparger and an isokinetic feedwater sampling probe in the sparger at Dresden Unit 2. Exelon believed that the probe apparently caused the damage to the sparger. Exelon determined that the probe failed due to mechanical, high-cycle fatigue induced by flow vibrations during the previous operating cycle. A feedwater sampling probe also failed at Dresden Unit 3 following EPU operation. This probe was never found. The staff issued Information Notice (IN) 2004-06, "Loss of Feedwater Isokinetic Sampling Probes at Dresden Units 2 and 3, on March 26, 2004, to inform licensees about this issue.

On February 24, 2004, Quad Cities Unit 2 was shut down for a scheduled refueling outage and for inspections of the steam dryer. After approximately 6 months of operation at EPU conditions, Exelon identified several new cracks on the steam dryer at Quad Cities Unit 2, including cracking on areas of the steam dryer that were modified to address previous problems identified with the steam dryer. Exelon repaired the steam dryer and developed a plan to attempt to identify the mechanism that has been causing unacceptable steam dryer loads and steam dryer cracking. On March 28, 2004, Exelon returned Quad Cities Unit 2 to operation at the pre-EPU power level and will hold the unit at this power level except to conduct testing at EPU conditions, for brief periods of time, to establish the steam dryer loads with respect to flow rates and to identify any operating limitations. Exelon has held Quad Cities 1 to pre-EPU power levels since returning the unit to operation following the November 2003 outage and plans to continue to operate the unit at pre-EPU levels until the results of the tests at Quad Cities 2 are evaluated. Based on longer EPU operation and less observed steam dryer damage at the Dresden units, in comparison to the Quad Cities units, Exelon believes that sufficient basis exists to continue to operate Dresden Units 2 and 3 at EPU power levels. Exelon plans to inspect the steam dryers at the Quad Cities and Dresden units at the next applicable refueling outages.

On April 2, 2004, Exelon committed to the Nuclear Regulatory Commission (NRC) to maintain both Quad Cities units at pre-EPU power levels, except for testing of the flow effects on the Quad Cities units. The NRC sent Exelon a commitment acknowledgment letter on April 20, 2004, documenting Exelon's commitments and the NRC's assessment of those commitments. In the April 20, 2004, letter, the NRC staff noted concerns with Exelon's plans to justify long-term EPU operation of the Quad Cities units and Exelon's summary basis for continued long-term EPU operation of the Dresden units. On May 12, 2004, Exelon provided an update to its commitments regarding EPU operation of the Quad Cities and Dresden units. In particular, Exelon will not exceed pre-EPU levels at the Quad Cities units until demonstrating to the NRC staff that EPU operation is justified. Exelon also provided additional information for support of the continued EPU operation of the Dresden units.

The staff is closely monitoring industry's generic response to the failures. General Electric Nuclear Energy (GENE) issued Services Information Letter (SIL) No. 644, "BWR/3 Steam Dryer Failure," on August 21, 2002, to inform its customers of the first steam dryer failure and SIL No. 644, Supplement 1, "BWR Steam Dryer Integrity," on September 5, 2003, to inform its customers of the second steam dryer failure. Both of these documents provided recommendations for monitoring steam dryer performance to ensure that steam dryer degradation is promptly identified. The staff issued IN 2002-026, "Failure of Steam Dryer Cover Plate after a Recent Power Uprate," on September 11, 2002, to inform licensees of the first failure and Supplement 1 to IN 2002-026, "Additional Failure of Steam Dryer after a Recent Power Uprate," on July 21, 2003, to inform licensees of the second failure. On January 9, 2004, the staff issued Supplement 2 to IN 2002-026, "Additional Flow-Induced Vibration Failures after a Recent Power Uprate," to inform licensees of the failure of the steam dryer and other plant components at Quad Cities, Unit 1. In addition, the staff has provided comments to the Boiling Water Reactor Owners Group (BWROG) on the technical evaluation and recommendations contained in SIL No. 644.

The staff held meetings with the BWROG and GENE on February 3 and March 4, 2004, to discuss industry's actions related to resolution of BWR steam dryer integrity and other EPU concerns. On May 7, 2004, the BWROG provided the results from its EPU survey and the Institute of Nuclear Power Operations database review. The staff is considering its regulatory options based on the industry's response, including the ongoing activities noted above.

Abnormalities in Ultrasonic Flow Meter Instrumentation Readings

On August 28, 2003, Exelon informed the staff that it was reducing the operating power of Byron Units 1 and 2 by 32 megawatts thermal (MWe) and 22 MWe, respectively. The decision was made following analysis of feedwater flow data derived from the Westinghouse/AMAG "CROSSFLOW" ultrasonic flow meters (AMAG UFMs) used at Byron and Braidwood. The AMAG UFMs were used to adjust the feedwater flow rate indications from the venturi meters to compensate for possible venturi fouling during an operating cycle. Exelon reported that there were unexpected, small differences in power level indications while using the AMAG UFMs. On September 1, 2003, the power at Braidwood Unit 2 was reduced due to problems with the AMAG UFM.

Westinghouse issued Technical Bulletin (TB) 03-6 on September 5, 2003, to inform its customers of the abnormalities experienced at the Byron and Braidwood plants. TB 03-6 also provided recommendations for plants to monitor their instrumentation to promptly identify any such abnormalities at their plants. Westinghouse issued a Nuclear Safety Advisory Letter (NSAL)-03-12 on December 5, 2003, describing this issue and providing recommendations to licensees using the AMAG system.

On February 6, 2004, a tracer test of the feedwater flow rates was conducted at Byron to obtain an accurate measure of the feedwater flow and compare this measurement with the AMAG UFM. The test results indicated that there were differences in flow measurements between the AMAG UFM reading and the tracer test results. On February 12, 2004, Westinghouse issued TB-04-4, which provided information regarding recent AMAG UFM system performance issues including the results of the tracer test. Braidwood and Byron are no longer using the AMAG UFM system to measure feedwater flow.

The NRC staff met with Westinghouse on April 22, 2004, to discuss ongoing activities related to the AMAG UFMs. Westinghouse has implemented an action plan to perform scale model testing and obtain industry performance data. Additionally, the Westinghouse Owners Group (WOG) has notified the NRC that it is adopting the AMAG issue as an industry initiative. The WOG is soliciting industry support and will take over the Westinghouse action plan.

The staff continues to follow this issue for any implications for plants that have implemented MUR power uprates. There are 12 nuclear reactor units in the United States that have received staff approval for MUR power uprates based on the use of the AMAG UFM system.

An MUR power uprate for Fort Calhoun was authorized on January 16, 2004, which allowed an increase in the licensed thermal power limit to 1524 MWt. The licensee was subsequently informed by Westinghouse that potential instrument inaccuracies in the AMAG UFM would not allow implementation of the MUR power uprate at Fort Calhoun. As a result, on May 7, 2004, prior to implementation of the MUR power uprate, the licensee submitted an exigent license amendment request to return Fort Calhoun's licensed thermal power limit to 1500 MWt, the pre-MUR level. On May 14, 2004, the staff approved this license amendment request, returning the licensed maximum power level at Fort Calhoun to 1500 MWt.

Currently, the issues identified with the AMAG UFMs at Byron, Braidwood, and Fort Calhoun have not been shown to be a problem at nuclear units that have implemented MUR power uprates using the AMAG UFM system.

Docket No. 7195
Attachment 1-4
5 Pages

Quad Cities' new steam dryers project

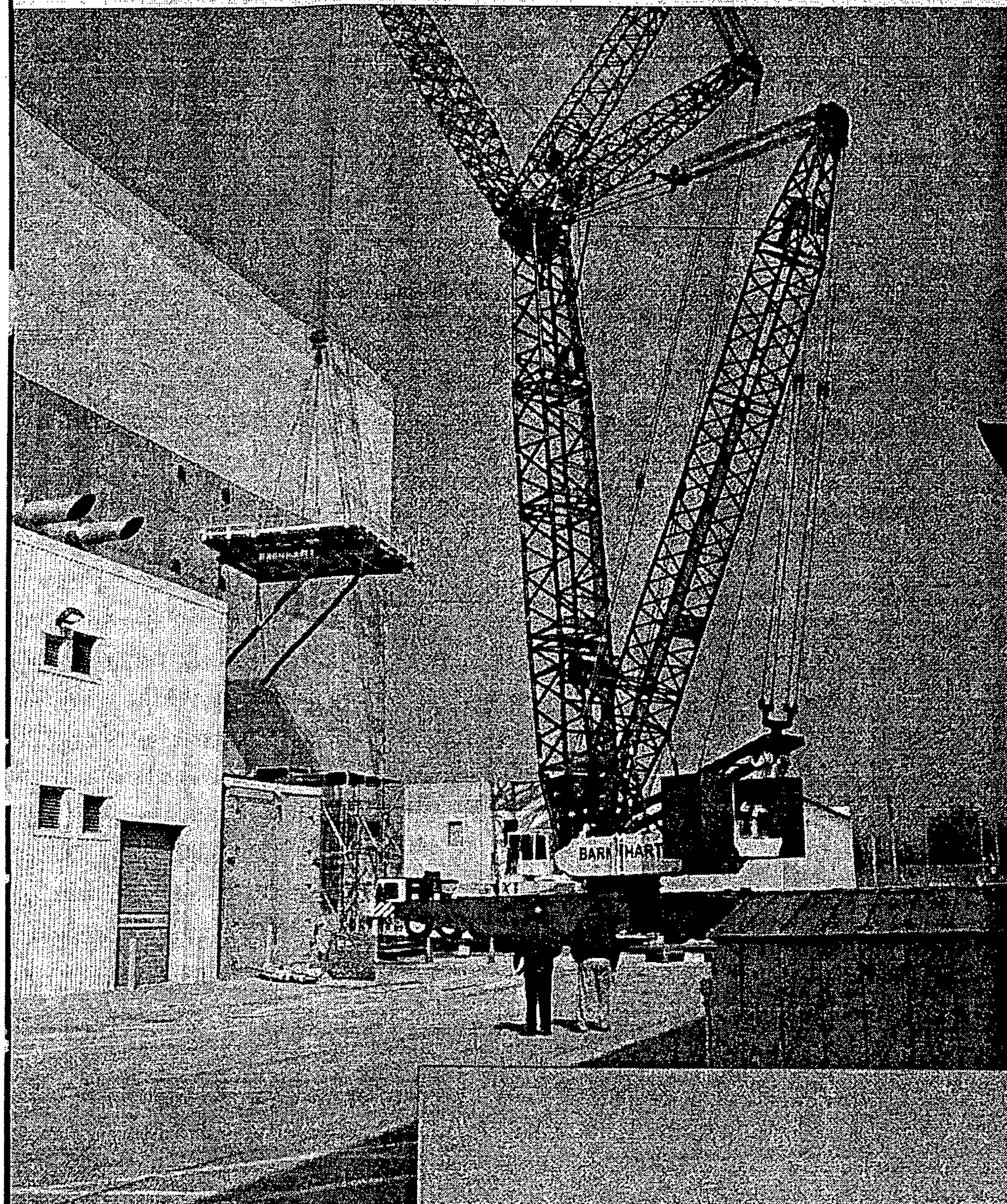
For the first time ever, Exelon performed the replacement of a pair of steam dryers.

EXELON GENERATION'S QUAD Cities nuclear power plant installed new steam dryers in the site's boiling water reactors earlier this year. Quad Cities, in Cordova, Ill., has two General Electric BWRs, each rated at 867-MWe (net design electric rating). Unit 1 started commercial operation in February 1973 and Unit 2 in March 1973.

The installation project, which took place during outages at Unit 1 in April and Unit 2 in May, was a first for Exelon and its contractor, Barnhart Crane and Rigging. The utility–contractor team worked together on the off-site assembly of the steam dryers, transporting them to the site, removing and replacing siding from the reactor building, and designing, fabricating, and building a temporary platform and slide rail system that were used to get the dryers inside the reactor building. Once inside, the dryers were moved from a temporary containment airlock to the refueling floor for their eventual installation in the reactors.

The steam dryers, manufactured in Pennsylvania by GE, weigh 55 tons each. The width of each dryer is 20 ft 7 in., and the height is 17 ft 10 in. After manufacture, the dryers were transported in March in pieces to an assembly plant in Illinois. Once assembled, the dryers traveled 15 miles down the road aboard a hydraulic platform trailer to the Quad Cities plant.

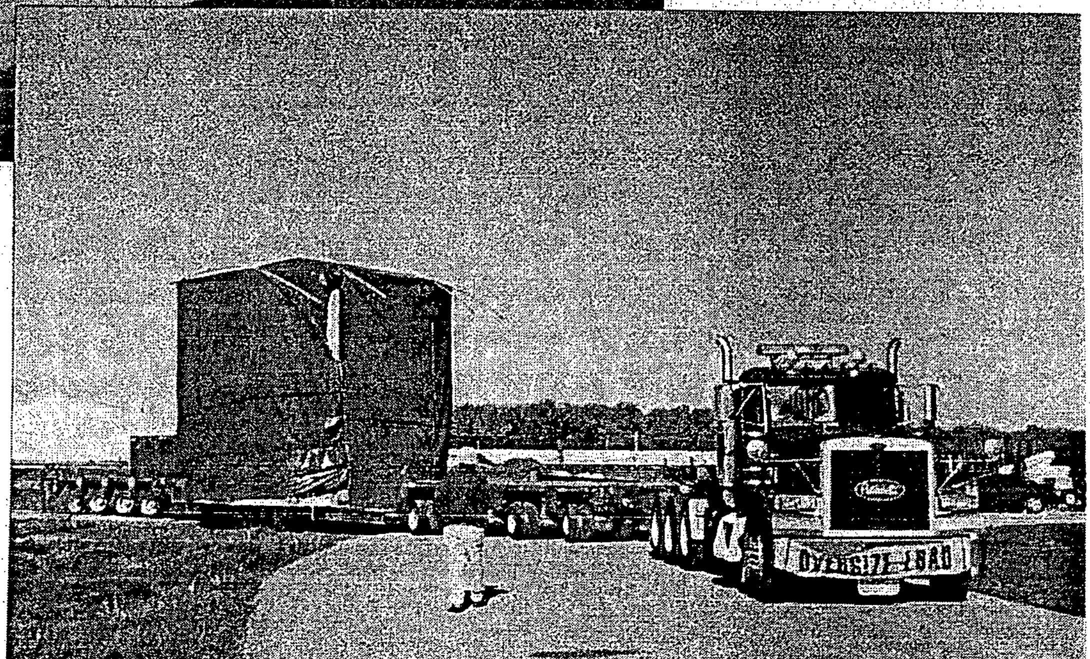
The utility–contractor team focused on minimizing the project's impact on plant activities. Seismic and tornado loads were important considerations for the team in the design and fabrication of the temporary platform, which had to be capable of supporting more than 110 000 pounds. Once on the platform, the dryers were seated on a slide rail system that used hydraulics to transport each one into the airlock through a series of small moves, 30 inches at a time. The distance covered along the slide rail system was about 30 feet, almost an hour's worth of work. Clearances were as tight as a couple of inches for moving the dryers through the airlock doors. Tolerances were less than that for other parts of the job.



Left: A temporary platform was assembled on the exterior of the Quad Cities reactor building in anticipation of accepting a pair of new steam dryers that ultimately would be installed in the plant's boiling water reactors. After the platform was assembled, a hole was cut and a doorway placed in the building's side. (Photos, pp. 41–44: Barnhart Crane and Rigging)

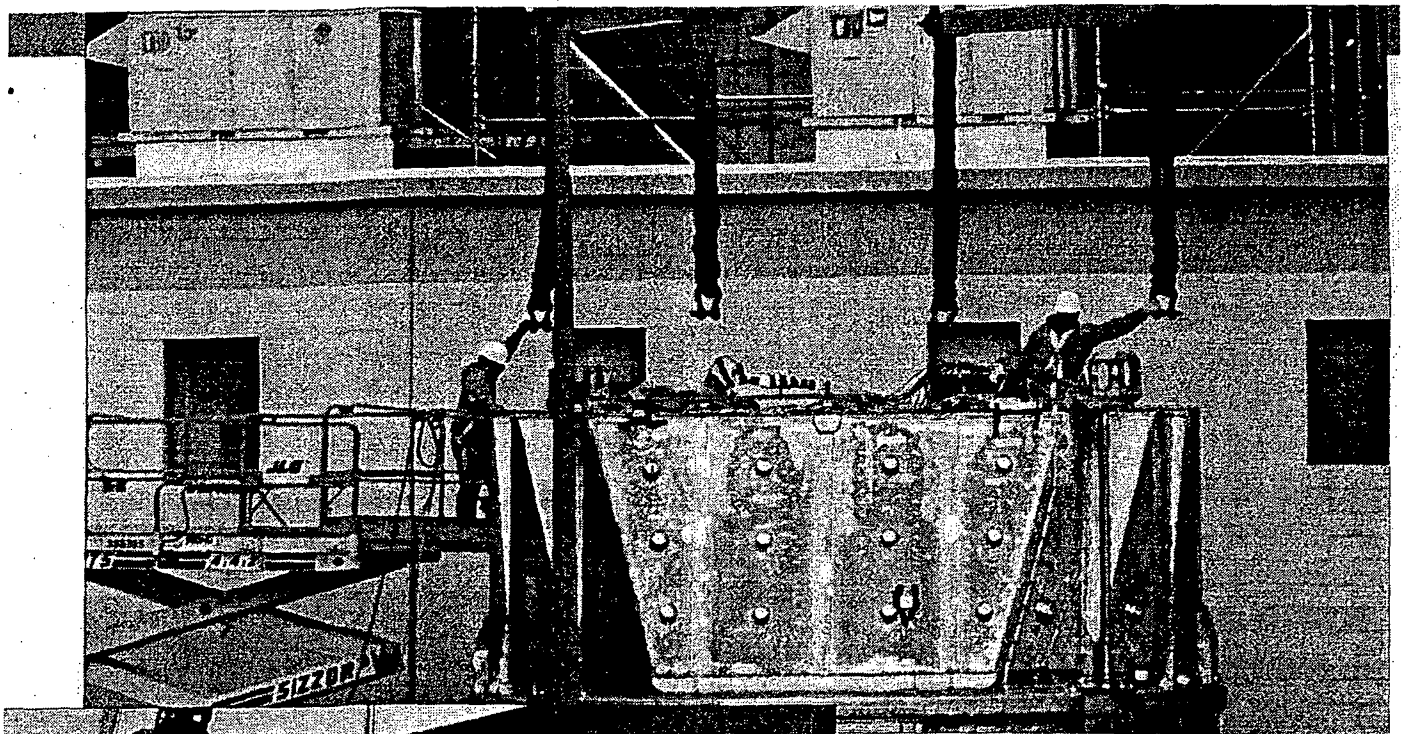
Below: Following the assembly of the steam dryers at a local fabrication plant, they were transported 15 miles aboard a hydraulic platform trailer to the Quad Cities plant. One dryer arrived in April and the other in May.

Photos continue through page 44

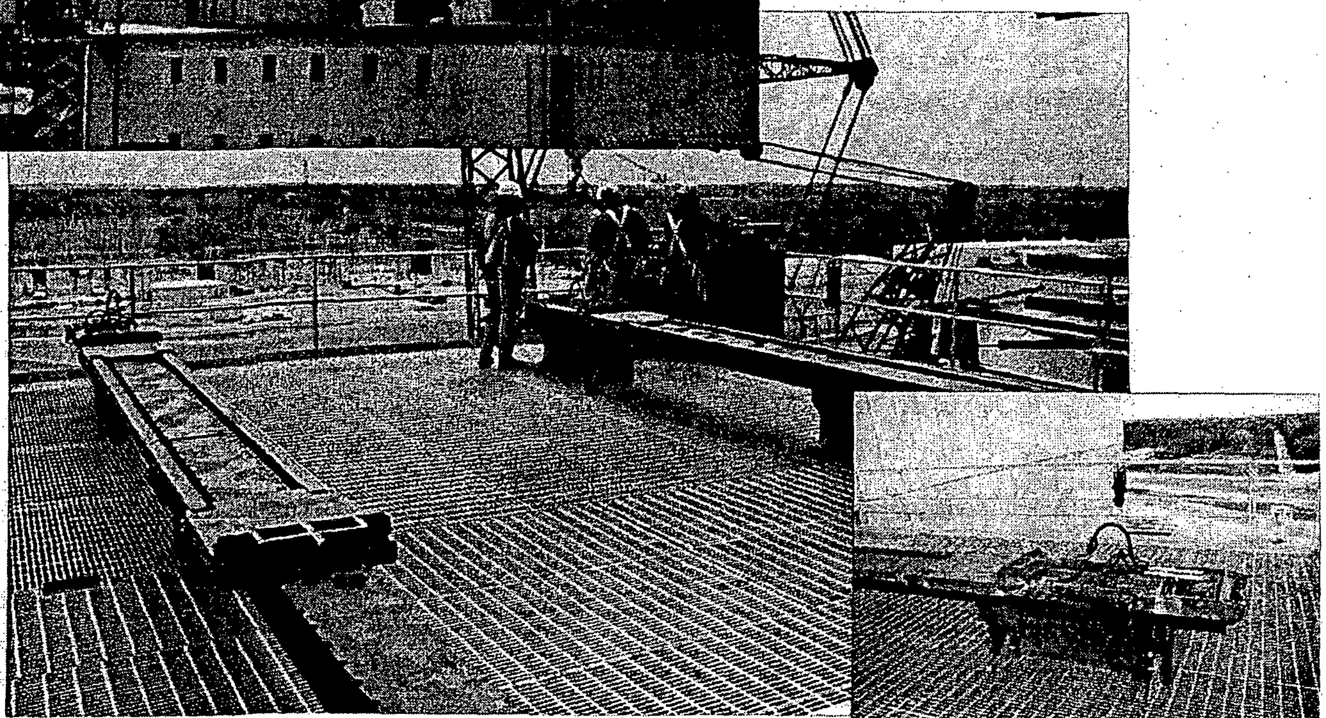


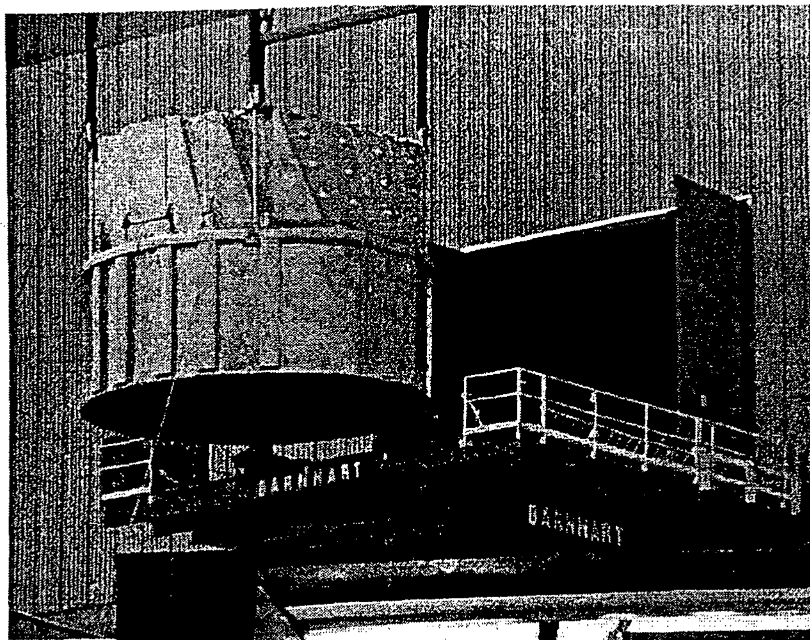
Steam dryers are used only in BWRs—not in pressurized water reactors. When wet steam is formed in a BWR, it leaves the core and goes through a steam separator, just like in a PWR. But unlike a PWR, the steam in a BWR also goes through a steam dryer, where additional moisture is removed. The steam then proceeds to the turbine.

This was the first time Exelon had ever replaced steam dryers in any of its BWRs, and it was one of the first replacement jobs of its kind in the industry, according to a project manager.

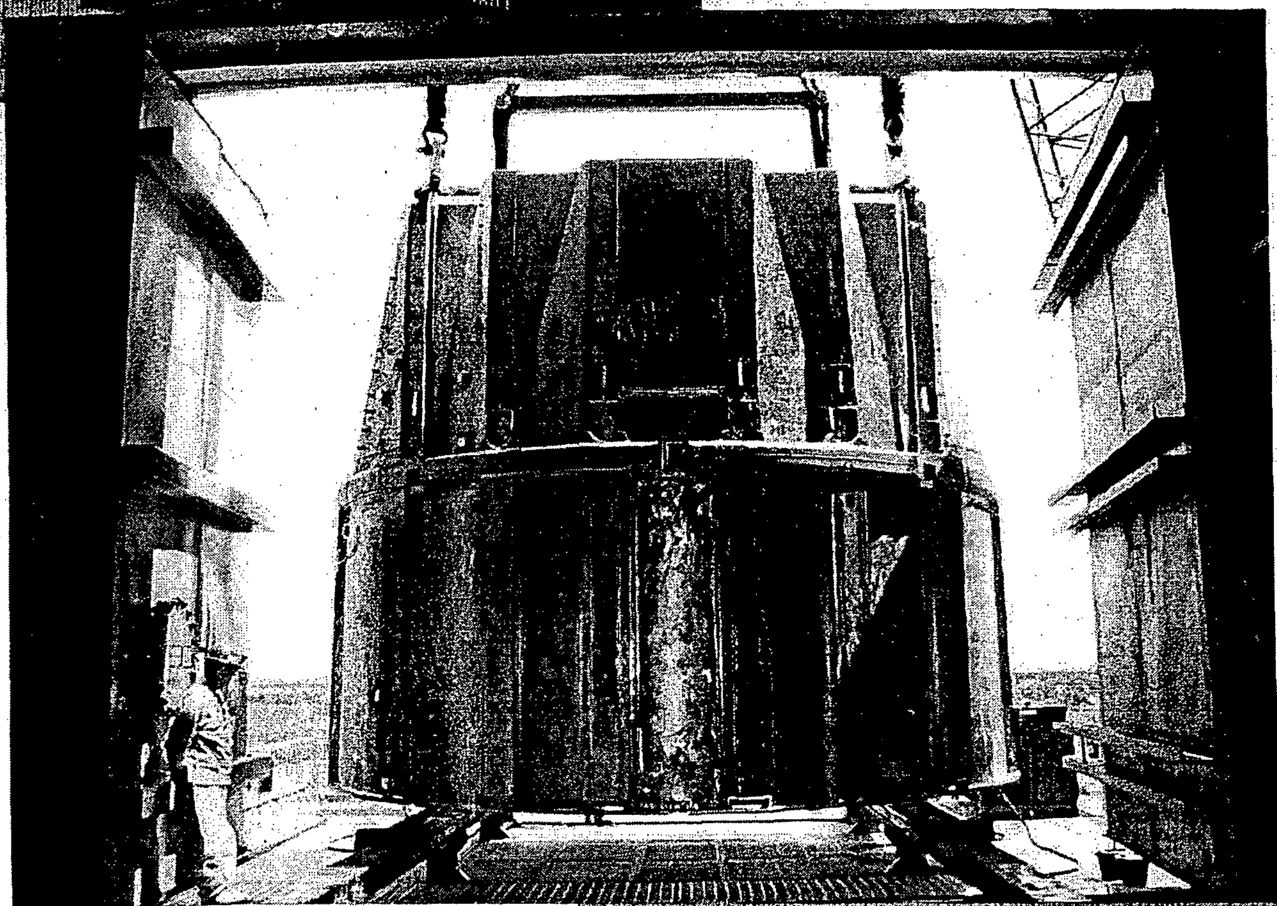


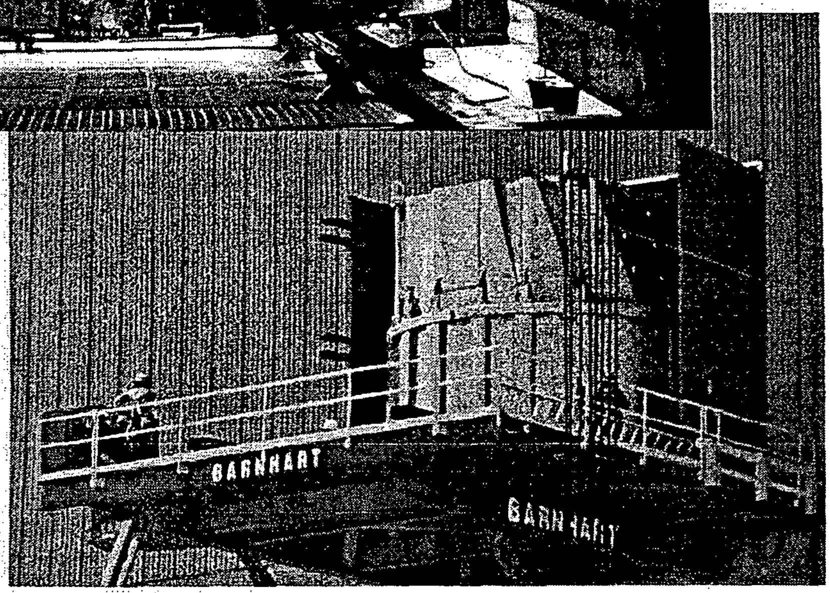
Above: On the same day that each dryer arrived at Quad Cities, it was connected to a crane lift to be hoisted to the temporary platform.
Left: The project's contractor, Barnhart Crane and Riggin used a lattice boom crane to lift each of the dryers. Each dryer weighs 55 tons and has a width of 20 ft 7 in. and a height of 17 ft 10 in.
Below: Workers stand ready to accept the dryer onto th reactor building's temporary platform. A slide rail system used four shoes and hydraulic pump assemblies to inch eac dryer into the airlock. ***Inset:*** One of the four shoes upon which the dryer was placed. In photo, the shoe is the flat red piece on the slide rail, located in front of the two hydraulic pumps used to push the shoe—as the other sho and pumps work in unison.

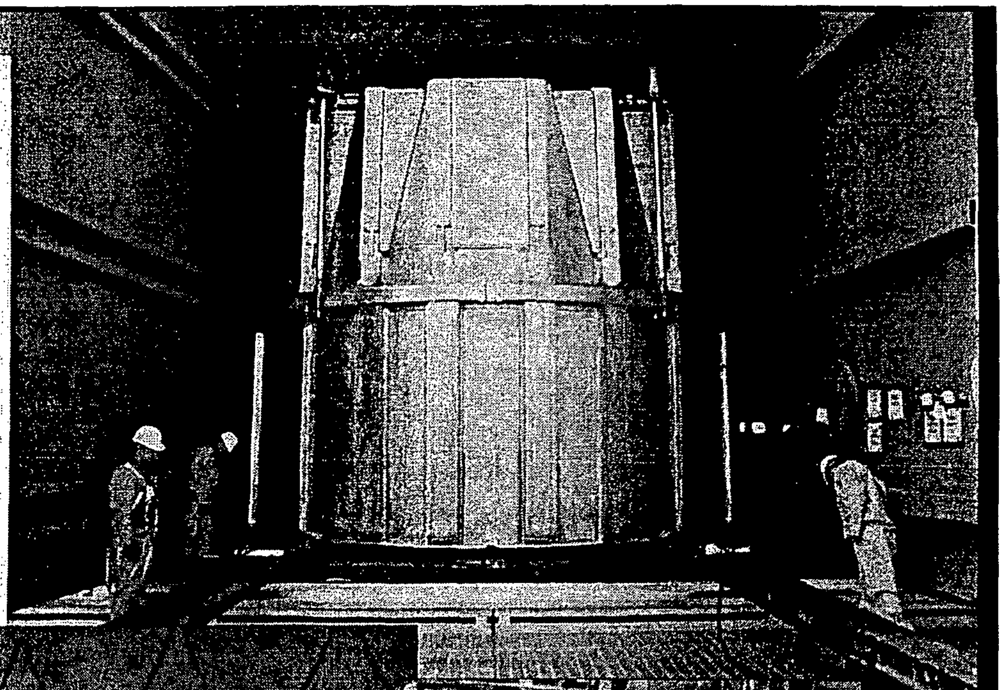




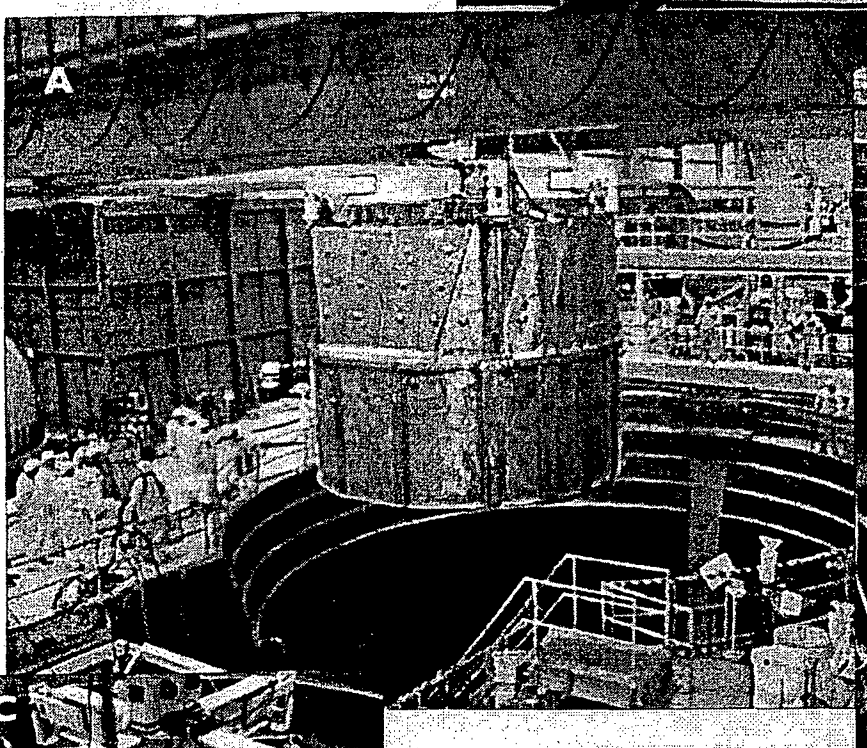
Top: The dryer edges closer to the temporary platform.
Middle: Nearing setdown, the dryer hovers over the slide rail system used to move it inside the airlock.
Bottom: The dryer is transported through a series of small moves, 30 inches at a time, into the airlock, with clearances through the doorway as tight as a couple of inches.

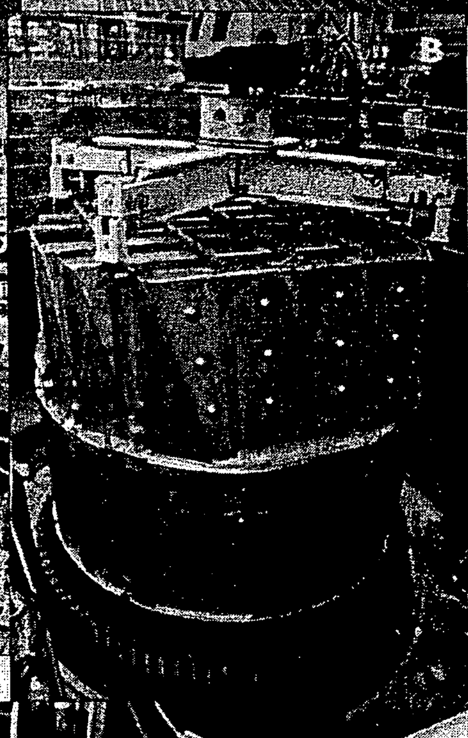


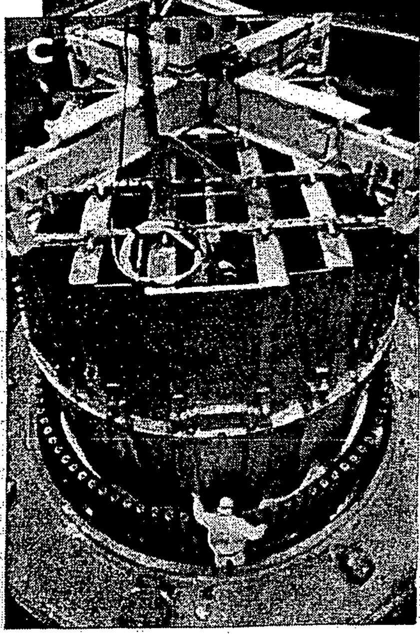


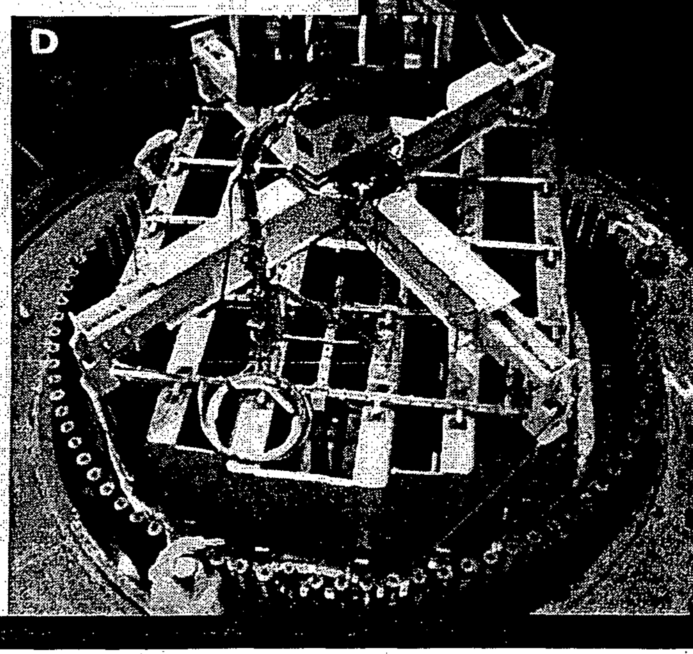


Top: The dryer nears the end of its journey, from its start at Quad Cities outside the reactor building, to inside the temporary airlock. Once the doors were sealed, the top of the airlock was removed and the plant's overhead crane hoisted the dryer out, moving it to the refueling floor, where it awaited installation into a reactor. **A-D, Below:** (A) The overhead crane moves the dryer to a location above a reactor cavity. (B-D) Inside the reactor, the dryer is installed. (Photos A-D: Exelon Generation)









Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions

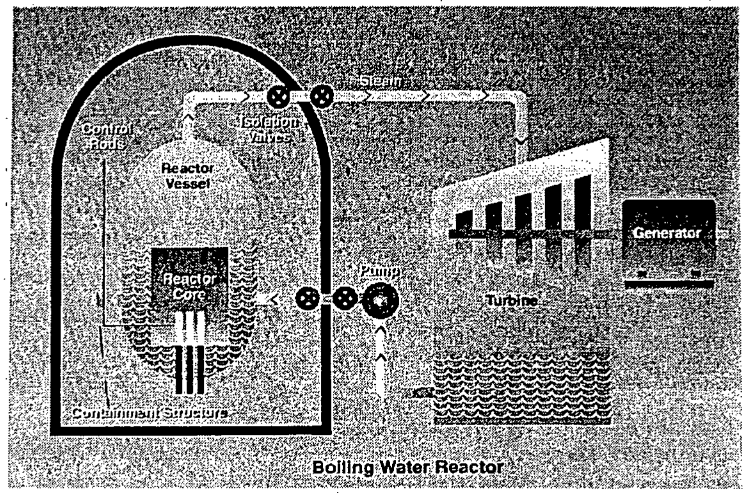
issue brief

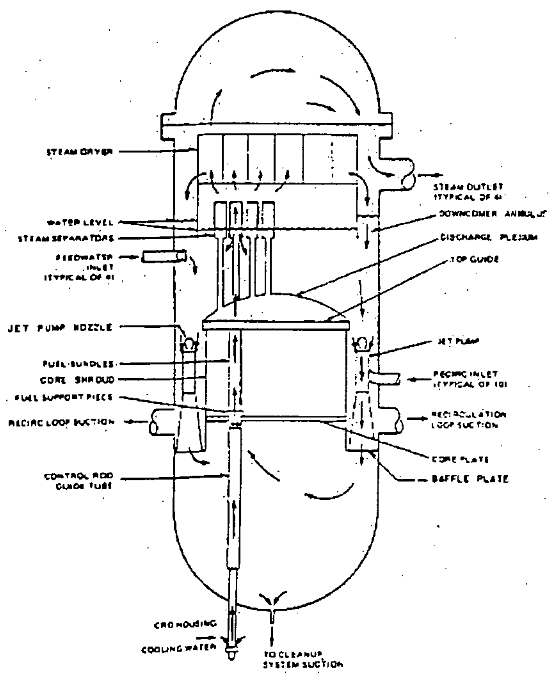
SNAP, CRACKLE, & POP:
THE BWR POWER UPRATE EXPERIMENT

EPU. The Nuclear Regulatory Commission believes it stands for Extended Power Uprate where the agency relicenses a nuclear power reactor to operate at a significantly higher power level.[1] But trials and tribulations at nuclear power reactors over the past two years strongly suggest that EPU really stands for Experimental Power Uprate. The Experiment underway in Illinois may soon move to Vermont.

The Quad Cities Nuclear Power Station is located on the Mississippi River about 20 miles northeast of Moline, IL. The NRC licensed its two boiling water reactors (BWRs) on December 14, 1972.[2] Twenty-nine years later – almost to the day – the NRC amended the licenses to permit the reactors to operate at nearly 20 percent higher output.

As illustrated in the color schematic, energy released from the reactor core of a BWR boils water. The steam spins a turbine connected to a generator to make electricity.





The outline drawing shows the components inside the reactor vessel above the reactor core that process the steam before it flows to the turbine. The steam leaving the reactor core carries little droplets of water. The steam passes through vertical tubes called 'steam separators' that remove many of the droplets. The drier steam then weaves its way back and forth through a metal maze called the 'steam dryer.' When all is working right, water droplets form less than one-tenth of one percent of the steam leaving the reactor vessel.[3]

On March 5, 2002, the Experimental Power Uprate began at Quad Cities when workers reconnected Unit 2 to the electrical grid following a refueling outage. After operating nearly 30 years up to the original licensed power level, the plant literally began shaking itself apart at the higher power level. Workers manually shut down Unit 2 on March 29th after high vibrations caused leaks in the control system for the main turbine.[4]

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Docket No. 7195
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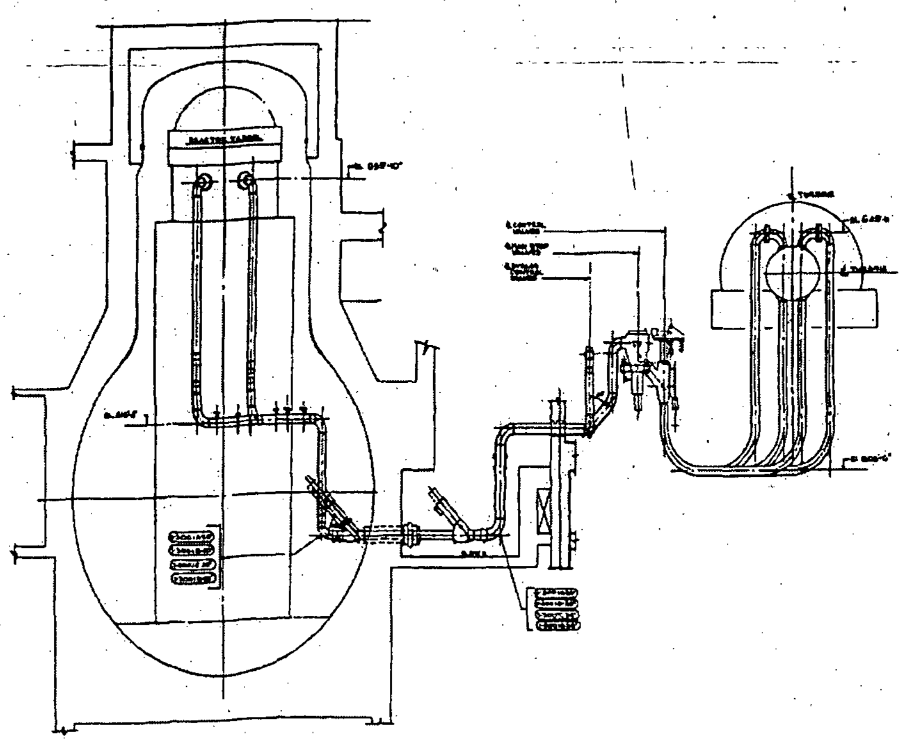
6 Pages

During the subsequent restart of Unit 2 on April 2, 2002, vibrations broke a drain line on one of the four main steam pipes. Workers knew the main steam pipes were vibrating abnormally at the Experimental Power Uprate conditions because insulation and – of all things – vibration monitors had shaken loose and fallen from the pipes.[5] Workers fixed the broken line – not its cause – and restarted Unit 2 to resume the Experiment.

The main steam pipes signaled trouble again on June 7, 2002. With Unit 2 steadily operating at Experimental Power Uprate conditions, the indicated flow in main steam line 'A' suddenly increased from 2.95 to 3.05 million pounds per hour while the indicated flows in the remaining three lines decreased. The plant's owner, the reactor's manufacturer, and the site's regulator huddled about the problem.[6]

The head-scratching intensified on June 18, 2002, when the measured amount of water droplets being carried away by the steam was about four or five times the values recorded over the past three decades. When the high amount doubled over the next two days, operators suspended the Experimental Power Uprate by reducing Unit 2's output below the original licensed level. But the damage had already been done. Operators shut down Unit 2 on July 11, 2002, for repairs.[7]



Workers soon spotted a gaping hole in the steam dryer. Metal fragments from the hole were later found in a flow instrument for one of the main steam lines and on the inlet screen for a main turbine stop valve. Thus, at least one fragment from the cracked, broken steam dryer sitting above the reactor core was carried by steam out of the reactor vessel, past both of the main steam isolation valves, out of the primary containment, out of the secondary containment, to the stop valve in the turbine building.

According to Exelon, the owner of the Quad Cities reactors:

> *The root cause of the steam dryer failure was determined to be a lack of industry experience and knowledge of flow-induced vibration dryer failures. The dryer failed as a result of fatigue caused by flow-induced vibrations created by higher steam flows due to Extended Power Update conditions.*[8]

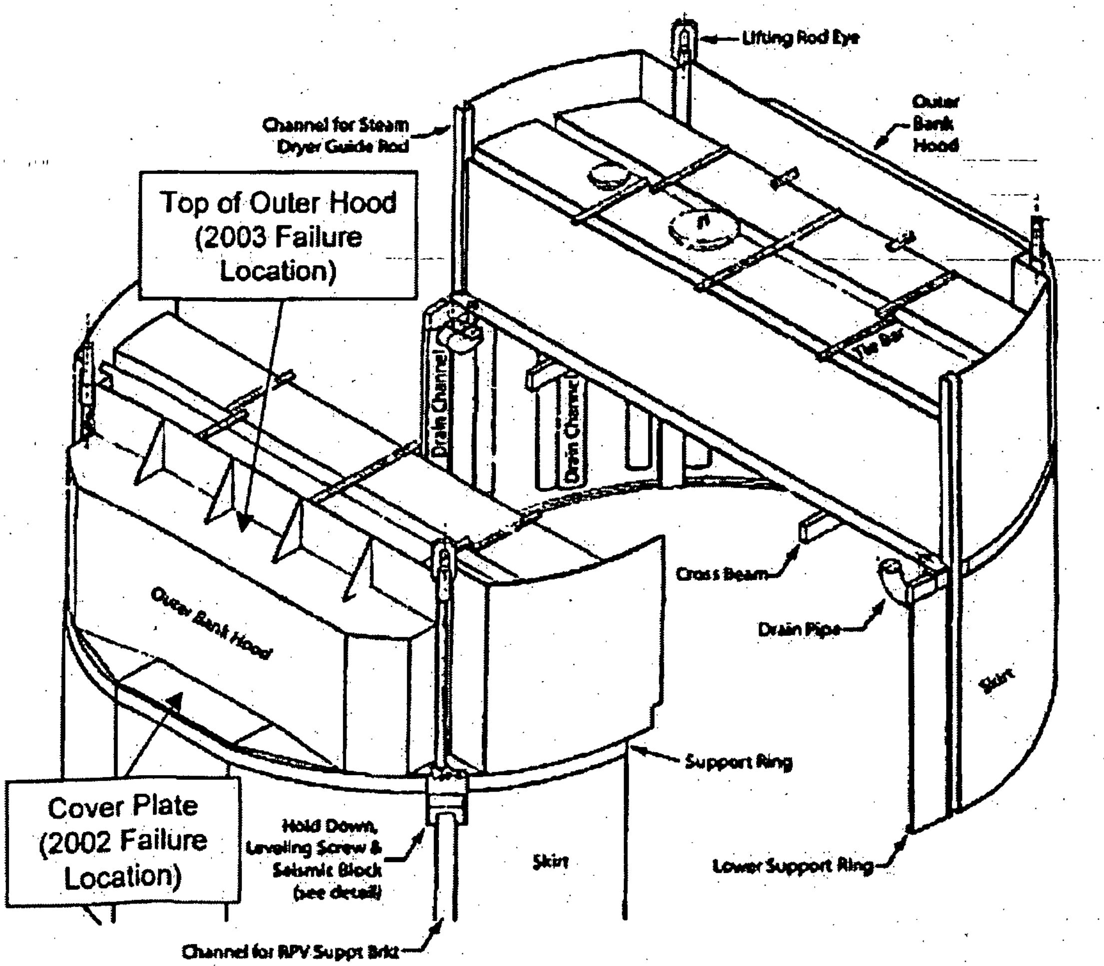
Hence, the Experiment fills in gaps in the nuclear industry's knowledge. The nuclear industry did not know what to expect or what might happen, so Exelon cranked up Quad Cities Unit 2 to find out. But the resulting steam dryer snap, crackle, and pop in 2002 only schooled the industry on how to band-aid that problem, not how to prevent it.

SNAP, CRACKLE, & POP:
THE BWR POWER UPRATE EXPERIMENT

After repairing the steam dryer by replacing the damaged plate and adding braces, workers restarted Unit 2 on July 21, 2002, and resumed the Experiment.

The next phase of the Experiment began on May 6, 2003, when the measured amount of water droplets in the steam again significantly exceeded the normal value. On May 28, 2003, operators suspended the Experiment by reducing Unit 2's power output below the original licensed level. Two weeks later, Unit 2 was shut down for another round of steam dryer repairs.[9]

It was again child's play to spot the damage – a crack in the steam dryer ¾ inch wide and merely 9 feet long.



The damage was not in the exact same location as in 2002, but Exelon recycled the same excuse nonetheless:

> *The root cause of the steam dryer failure was determined to be a lack of industry experience and knowledge of flow-induced vibration dryer failures. The dryer failed as a result of fatigue caused by flow-induced vibrations created by higher steam flows due to EPU conditions.*[10]

In other words, not enough knowledge was gained from the steam dryer shaking itself apart in 2000 to prevent it from happening again in 2003. Not enough data? No problem, there are more BWRs to include in the Experiment. Enter Quad Cities Unit 1.

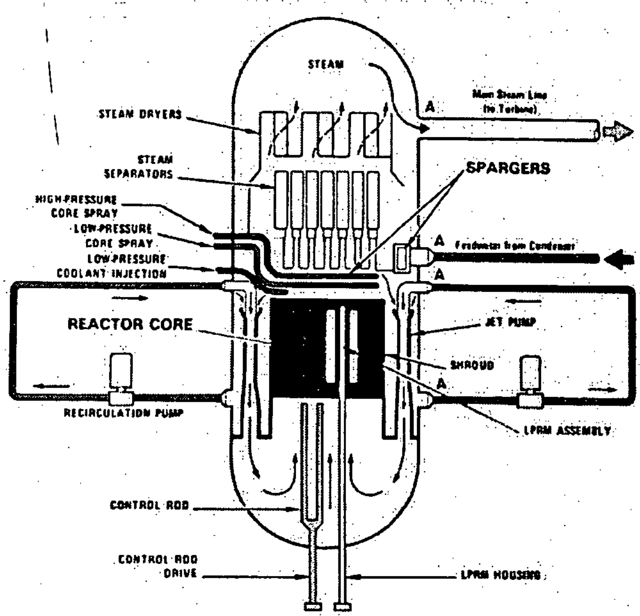
On October 26, 2003, the indicated flow in main steam line 'D' suddenly increased by 0.5 million pounds per hour while the indicated flows in the remaining three lines decreased.* Within days, the amount of water droplets in the steam was measured at significantly higher than the usual value. Operators suspended the Experiment on November 3, 2003, by reducing Unit 1's power output below the original licensed level. Unit 1 was shut down on November 12, 2003, for repairs to the steam dryer. That same month, workers discovered cracks in the Dresden Unit 2 (another Exelon BWR) steam dryer following a single operating cycle at the Experimental Power Update conditions.[11]

When workers entered the Quad Cities Unit 1 containment for the now well-rehearsed repairs to the steam dryer, they found a new problem. The vent line broke off the pilot valve for one of the electromatic relief valves. Technicians later concluded that vibrations broke the vent line, which prevented the relief valve from opening as required in event of an accident. Although its operating license only allowed Unit 1 to operate for 14 days with a broken relief valve, the reactor had operated for nearly 110 days in that degraded condition.[12]

The Unit 1 steam dryer had a half-inch thick piece of the outer hood bank measuring about 6 ½ inches by 9 inches missing. Workers could not locate the missing piece(s), but they did find evidence of its journey. One of the two large pumps that recirculates cooling water through the reactor core had scratch marks on its impeller. The pump's impeller had been replaced in 2002 so the damage was recent.

Workers restarted Unit 1 after repairing the steam dryer and abandoning the search for its missing pieces. Exelon guessed the steam dryer piece, or a fragment thereof, passed through the recirculation pump and now resides inside the lower curved dome of the reactor vessel.

General Electric Reactor Pressure Vessel



On March 18, 2004, the NRC teleconferenced with Exelon about recent inspections of the steam dryer during the spring refueling outage on Unit 2. The Experiment continues to add to the nuclear industry's knowledge of how steam dryers break while remaining coy about how to stop the damage:

- Cracks formed in some of the plates added during the 2003 repairs
- Cracks formed in a weld where a stiffener plate was added
- A one-inch crack formed in a steam dryer seam

* This steam flow redistribution occurs because the hole(s) in the broken steam dryer allows a "short cut" for steam to the nearest steam pipe.

Exelon may have tired of the Experiment. They plan to replace the steam dryers at Quad Cities as soon as practical. For Unit 1, that means the refueling outage scheduled for March 2005. For Unit 2, that means the refueling outage scheduled for spring 2006.[13]

In Exelon's own words:

> ***The dryer is a non-safety related component whose only safety function is to remain intact such that no loose part will prevent a safety related component from performing its function.***[14]

The steam dryer has no moving parts. It is a bunch of metal plates, some with holes drilled through them, welded together. The only thing one has to do is keep it intact. The Experimental Power Uprate failed three times against this fairly simple success criterion at Quad Cities in less than two years.

The NRC informed Exelon that:

> *the NRC staff noted that the licensee's resolution of the potential adverse flow effects from EPU operation at Quad Cities and Dresden continues to rely primarily on questionable analyses.*[15]

Lack of knowledge caused the problems. Questionable analyses hinder their resolution. Yet the NRC allows BWRs in Illinois, Iowa, and North Carolina to operate at Experimental Power Uprate conditions justified by the ill-informed, questionable analyses. The NRC's mission is to protect public health and safety. The BWR Power Uprate Experiment conflicts with that mission.

For the NRC to allow BWRs to continue operating at Experimental Power Update conditions is to naively assume that the only adverse consequences from the incomplete knowledge and questionable analyses have – very politely – revealed themselves in the form of Swiss-cheese steam dryers and vibration monitors lying on the floor. What about emergency systems also incapacitated at the Experimental Power Uprate conditions but still undetected? We won't know until someday when these standby emergency systems are called upon during an accident and fail to respond. That lesson will come with a very high, and totally unnecessary, price tag.

Repeatedly told that the nuclear industry doesn't have enough knowledge about Experimental Power Update conditions, the NRC is shirking its responsibility to protect the public by allowing clueless plant owners to crank up BWRs to see what happens.

Prepared by: David Lochbaum, Nuclear Safety Engineer

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Extended Power Uprate Licensing Challenges

Exelon Nuclear

Keith Jury, Director – Licensing and Regulatory Affairs

Regulatory Information Conference 2004

Session W6

March 11, 2004

Background

Exelon.
Nuclear

- NRC approved 17% extended power uprate (EPU) for Dresden and Quad Cities in 2001, and modifications were implemented in 2001-2002
- Two major categories of EPU issues since implementation
  - Vibration effects
    - Steam dryer failures
    - Main steam relief valve degradation
    - One example of small bore piping failure
    - Feedwater sample probe failures
  - Reduced operating or safety margin

Licensing Process Issues

Exelon
Nuclear

- Approved EPU topical reports do not provide sufficient guidance on the depth or focus of analyses required, especially concerning vibration
- Effects of core design and fuel transitions, combined with EPU, may result in unanticipated cycle-specific analysis results
  - Example is requirement for additional safety valve at Dresden
- Review of previous generic communications and operating experience (OE) information for EPU needs to be more thorough
  - EPU exacerbated condition reported in GE Service Information Letter (SIL) on main steam line low pressure isolation setpoint margin
  - SIL regarding sample probe failures was thought to be unaffected by EPU
- BWRVIP documents regarding steam dryers and effects of loose parts require re-evaluation/revision

3

Regulatory Implications

Exelon
Nuclear

- NRC confidence in the EPU licensing process has eroded
  - Extensive high level interactions with NRC management
  - Additional NRC information and review requests
  - Letters of expectation and commitment confirmation
  - Recognized need to revise safety evaluation for previous EPU amendment
- NRC has shown increased sensitivity toward potential EPU impact on licensing actions and plant issues
- Licensing process is still robust
  - Safety analysis acceptance criteria are verified to be met
  - Issues to date have not been safety significant
- Issues show there is some uncertainty when moving into previously uncharted territory
  - Uncertainty is mitigated through sharing of OE, similar to experience gained during early stages of nuclear industry
- Emphasizes need for continued focus on effective use of industry OE

4

Exelon and Industry Response

Exelon Nuclear

- Exelon and industry EPU evaluation
  - Exelon has undertaken several in-depth reviews to prevent additional unexpected outcomes
  - BWR Owners' Group committee on EPU effects
  - BWR Owners' Group subcommittee and BWRVIP working group on steam dryers

5

Conclusion

Exelon Nuclear

- EPUs have produced significant benefit to the industry by increasing generation at acceptable costs
- Unexpected issues clearly demonstrate the need to make adjustments in the analyses and reviews
- NRC sensitivity toward potential EPU impacts has increased significantly
- Implications are manageable through a combination of more detailed up-front analyses and continued effective use of OE

6

April 7, 2006

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE -- PNO-III-06-010

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region III staff on this date.

Facility	Licensee Emergency Classification
Exelon Generation Co.	___ Notification of Unusual Event
Quad Cities 2	___ Alert
Cordova, IL	___ Site Area Emergency
Docket: 50-265	___ General Emergency
License: DPR-30	X Not Applicable

SUBJECT: CRACKING IDENTIFIED IN UNIT 2 STEAM DRYER

DESCRIPTION:

The licensee has identified cracking in the Unit 2 steam dryer during the unit's ongoing refueling outage. The steam dryer is an internal reactor structure designed to remove moisture from steam before it enters the main steam lines to the turbine. The steam dryer was installed in May 2005 as the first steam dryer replacement in a U. S. reactor.

The steam dryers for both Quad Cities units were replaced because of cracking concerns caused by acoustic loading and vibration from operation at Extended Power Uprate power levels. The replacement dryers were designed and constructed to be more robust and resistant to cracking than the previous steam dryers. The Unit 2 steam dryer was also instrumented with several strain gauges, pressure transducers, and accelerometers.

The initial inspection by the licensee revealed one large crack, approximately 5 feet in length, with multiple branches, in the skirt region of the dryer. This crack is currently believed to have been caused by binding difficulties experienced during the initial installation last year, but the root cause evaluation is still in process. The Unit 2 dryer installation lessons learned were incorporated into the Unit 1 steam dryer installation, and no difficulties were experienced with its installation.

The licensee has also identified several smaller cracks of lesser significance on various internal bracing within the dryer. The steam dryer inspection is expected to be completed on April 9.

Evaluations of all of the cracks and indications also are continuing, and the licensee is developing plans to repair the steam dryer. Region III (Chicago) and the NRC Resident Inspectors are monitoring the licensee's activities.

The State of Illinois will be notified. The information in this preliminary notification has been discussed with licensee management.

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Attachment 1-7
2 Pages

Region III received initial notification of the steam dryer inspection findings on March 29, 2006, and additional information was provided as the inspection has continued. This information is current as of 1:45 p.m. CDT on April 7, 2006.

CONTACTS: Allan Barker 630/829-9679 | Mark Ring 630/829-9703

Docket No. 7195
Attachment 3-1
3 Pages

Sherman, William

From: Raymond Shadis [shadis@prexar.com]
Sent: Friday, November 11, 2005 7:54 AM
To: c-10@c-10.org; can@nukebusters.org; Nuclear Policy Research Institute; NECNP; nuclearfreevermont@yahoogroups.com; NucNews; vce@vermontel.net
Subject: Vermont Yankee has more cracks; probe demanded
Importance: Low

http://www.rutlandherald.com/apps/pbcs.dll/arti AID=/20051111/NEWS/511110380/1003/NEWS02

Article published Nov 11, 2005

Vermont Yankee has more cracks; probe demanded

BRATTLEBORO A key component at Vermont Yankee nuclear power plant has developed dozens of additional cracks, the plant's owner announced late Thursday.

Entergy Nuclear said that sophisticated technology discovered a total of 62 cracks in the steam dryer during a special inspection during the power plant's ongoing shutdown and refueling. The company had reported last year that there were 16 cracks in the 17-foot-wide steel steam dryer.

The Nuclear Regulatory Commission said that despite the cracks, the reactor was safe to resume operation, but it said the new cracks raised unanswered questions about the plant's ability to withstand the additional pressures that would come with its plans to generate more power.

The large number of cracks quickly caught the attention of the state's congressional delegation. Led by Sen. James Jeffords, I-Vt., the ranking member of the Senate committee that oversees nuclear power plants, the delegation called for federal regulators to do their own investigation into the cause of the cracks in the steam dryer.

"We request that the condition of the steam dryer be fully evaluated, using the techniques of the most recent inspection and any other appropriate means, as the NRC considers Entergy Nuclear's request to produce an additional 100 megawatts of power from Vermont Yankee," said the statement from Jeffords, Sen. Patrick Leahy, D-Vt., and Rep. Bernard Sanders, I-Vt., to NRC Chairman Nils Diaz.

"We believe it is essential that our constituents receive needed information about whether the plant's steam dryer will be able to withstand boosted power conditions and operate safely and reliably," the letter added.

Cracking in steam dryers has been a critical issue in Entergy's ambition to boost power production by 20 percent, or 110 megawatts, because other General Electric-designed reactors have developed cracks in their steam dryers, resulting in failure. Entergy's long-stalled application for a power boost has been largely delayed over the NRC's concerns about the steam dryer.

According to NRC information, only six reactors out of the 100 commercial reactors in the country have developed such cracks.

The steam dryers are not a safety component by themselves, but their failure, which could result in pieces of steel falling back into large steam valves, which lead back to the reactor, could create serious safety problems.

NRC spokesman Neil Sheehan said Thursday the NRC was sure that the plant was safe to continue to operate and the plant had clearance to resume operation. The plant has been shut down for its regular refueling and maintenance outage since Oct. 24.

But Sheehan said the NRC had asked Entergy for additional information about the cracking issue, a report that is expected by the end of the month.

Sheehan said 16 cracks had been discovered in April 2004, the last time the plant was shut down for its regular refueling and maintenance. He said a testing with increased magnification revealed the additional cracks.

"Our evaluation is these cracks don't pose any sort of a problem," Sheehan said.

He said the NRC and Entergy had concluded that the cracks had been there "a long time," probably "early in the power history of Vermont Yankee." The reactor started operation in November 1972.

Sheehan said he didn't know how big the cracks were, but said they were "very minor."

"We don't believe these pose any problem for restarting," he said.

The uprate or power boost is another matter, he said.

Robert Williams, spokesman for Entergy, said the cracks were "insignificant and didn't pose a safety hazard."

Last year, the plant originally announced finding only four cracks, with one as long as 14 inches and another 3 inches long. They were cleaned and welded. Months later, the company later increased the number to 16.

Williams said a "high-resolution inspection" had revealed 62 "shallow hairline surface cracks that Entergy, General Electric and the Nuclear Regulatory Commission staff have determined are acceptable because they are not structurally significant."

Williams said the cracks are "similar to those found at other boiling-water reactors." He said the cracks occurred in metal less than a quarter-inch thick, while the "hairline" ones were 1 to 5 inches long.

Unlike the cracks discovered last year, these cracks didn't have to be welded or reinforced, Williams said.

Raymond Shadis, senior technical advisor for the anti-nuclear group New England Coalition, said it was "insulting to the public" that the information was released so late in the day, on the eve of a federal three-day weekend holiday, and leading up to important NRC hearings in Brattleboro on the technical problems of the so-called uprate.

"These (surface) failures are indicators of future structural failures," Shadis said, saying that anyone with commonsense experience in welding, metal fabrication or metalurgy knew that cracking was a precursor to failure.

He said Entergy, having now identified defects which probably existed since plant construction, "should have undertaken an analysis to determine whether or not they would have an effect on future safety."

Contact Susan Smallheer at susan.smallheer@rutlandherald.com.

Sherman, William

From: Raymond Shadis [shadis@prexar.com]
Sent: Friday, November 11, 2005 8:07 AM
To: c-10@c-10.org; can@nukebusters.org; Nuclear Policy Research Institute; NECNP; nuclearfreevermont@yahoogroups.com; NucNews; vce@vermontel.net
Subject: 62 cracks found at Vt. Yankee

http://www.reformer.com/Stories/0,1413,102~8860~3126276,00.html

62 cracks found at Vt. Yankee

By KRISTI CECCAROSSI
Reformer Staff

BRATTLEBORO -- There are 62 cracks in an important piece of equipment at Vermont Yankee, but plant officials and federal regulators say that's not a problem.

The hairline, surface cracks in the plant's steam dryer were found this month during a routine shutdown. Entergy Nuclear, owners of the plant, and the Nuclear Regulatory Commission said the cracks pose no safety threat.

The cracks are not structurally significant and they are probably from the plant's early years of operation, according to Neil Sheehan, spokesman for the NRC. They "appear to be old," he said.

However, nuclear watchdogs say the cracks are one more reason why the NRC should put the brakes on Entergy's plans to boost power at the plant to 120 percent. A so-called "uprate" at Vermont Yankee is pending final review by the NRC.

In other nuclear plants that have been uprated, cracks in the steam dryer have been a persistent concern.

Vermont's congressional delegation has identified the cracks as a problem, too. The state's senators and sole representative wrote to the NRC on Thursday, urging the agency to evaluate the steam dryer issue before approving the uprate.

The Vernon reactor has been off line for re-fueling since Oct. 22. During the outage, plant engineers looked at the reactor and the steam dryer, located at the top of the reactor. They found 42 cracks, ranging from 1 inch to 5 inches in length, said Rob Williams, spokesman for the plant.

The other 16 cracks were discovered in March 2004, during the last refueling outage.

The cracks could have been on the steam dryer more than 20 years, but they've only been discovered now because engineers are using cameras with higher resolutions than ever before.

The images show the cracks have been reviewed by Entergy officials, as well as the NRC and General Electric.

Vermont Yankee is a boiling water reactor that started running in 1972.

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3 Pages

When the reactor heats up, it produces steam which, eventually, produces power. Before the steam hits the plant's turbines, it passes through the steam dryer, where any traces of water are removed.

The Quad Cities Generating Station in Illinois, also a boiling water reactor that went on line in 1972, was granted a 17.5 percent uprate by the NRC in 2002.

Since then, the steam dryer has failed twice because of cracking. In one instance, a piece of the dryer broke off and damaged other components of the reactor. The plant has been shut down a number of times to try to fix the problem.

The NRC is scrutinizing the steam dryer issue at Vermont Yankee as a result. This fall, it told plant officials that in order to have their uprate approved, they'd have to adhere to more stringent maintenance of the steam dryer. Entergy agreed to the condition.

Ray Shadis, technical advisor for the nuclear watchdog New England Coalition, said the added oversight amounts to "an experiment on the banks of the Connecticut River."

"They are now making the assertion that because these are surface cracks, they will go no further."

And particularly in light of a 20 percent boost in power output at the plant, Shadis said, "that's preposterous."

Entergy officials have until the end of the month to prove that the cracks won't be exacerbated by an uprate, said Sheehan, of the NRC.

Plant engineers will evaluate the steam dryer and submit a report to the NRC for review. The NRC will not investigate the issue itself.

However, in a letter to the NRC chairman, Sens. Patrick Leahy, D-Vt., and Jim Jeffords, I-Vt., and Rep. Bernard Sanders, I-Vt., indicated that's what they'd like the agency to do.

"We request that the condition of the steam dryer be fully evaluated, using the techniques of the most recent inspection and any other appropriate means," the letter states. "... it is essential that our constituents receive needed information about whether the plant's steam dryer will be able to withstand boosted power conditions and operate safely and reliably."

While Vermont Yankee was shut down, plant officials refueled the reactor with a fuel specifically designed for the plant's "uprated" production, according to Williams, plant spokesman. During last year's outage, plant officials installed the same fuel.

Entergy has reportedly done other work at the plant in preparation for the power boost, but Williams could not say how much officials have spent in anticipation of an uprate.

The uprate has been approved by the state's Public Service Board, a quasi-judicial panel that handles all matters related to utilities. The board's approval is not final, however; members are still deliberating whether they want an independent safety assessment of the plant done first.

The NRC is the last, major agency that must endorse the uprate. This month, it all but granted tentative approval. It's "draft" evaluation will bear public review on Nov. 15 and 16, when an agency panel hosts hearings at the Quality Inn in Brattleboro.

NRC officials have said they will issue a final evaluation of the uprate early next year.

Kristi Ceccarossi can be reached at kceccarossi@reformer.com.

Sherman, William

From: Raymond Shadis [shadis@prexar.com]
Sent: Friday, November 11, 2005 7:45 AM
To: c-10@c-10.org; can@nukebusters.org; Nuclear Policy Research Institute; NECNP; nuclearfreevermont@yahoogroups.com; NucNews; vce@vermontel.net
Subject: More cracks found in Vermont Yankee dryer

http://www.vermontguardian.com/local/112005/V More cracks found in Vermont Yankee dryer

By Kathryn Casa | Vermont Guardian

Posted Nov. 10, 2005

BRATTLEBORO Inspectors at the Vermont Yankee Nuclear Power plant discovered another 46 hairline cracks in the reactor's problematic steam dryer during a regular refueling outage, prompting a call by Vermont's congressional delegation for closer review of the component.

The fissures were found with specialized remote-controlled underwater cameras that were being used to check the welds on some 40 steam dryer cracks discovered in 2004, according to a press release from VY spokesman Rob Williams. They are in addition to 16 cracks found during the last refueling outage, according to federal regulators.

"The high resolution inspection of the steam dryer in this outage and the previous outage have identified a total of 62 shallow hairline surface cracks that Entergy, General Electric and the Nuclear Regulatory Commission staff have determined are acceptable because they are not structurally significant and are likely to have occurred in the early years of plant operation," according to Williams. He said further operation of the reactor "will not affect their condition."

Entergy is the Mississippi-based corporation that owns Vermont Yankee, and is seeking to increase power there by 20 percent. General Electric is the company that built the 33-year-old boiling water reactor.

The development prompted Vermont's three-member congressional delegation to call for more testing of the steam dryer. "We believe it is essential that our constituents receive needed information about whether the plant's steam dryer will be able to withstand boosted power conditions and operate safely and reliably," wrote Sens. James Jeffords, I-VT, and Patrick Leahy, D-VT, and Rep. Bernie Sanders, I-VT, in a letter Thursday to NRC Chairman Nils Diaz.

"We request that the condition of the steam dryer be fully evaluated, using the techniques of the most recent inspection and any other appropriate means, as the NRC considers Entergy Nuclear's request to produce an additional 100 megawatts of power from Vermont Yankee," they wrote.

Jeffords is ranking member of the Senate Environment and Public Works Committee.

Williams said operators were preparing Thursday to restart the reactor, which has been shut down in

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2 Pages

refueling mode since Oct. 22.

"The outage … was based on 18 months of planning and involved more than 5,000 separate tasks including refueling the reactor, as well as testing and inspection of virtually every component and system in the plant," Williams said in a press release. "In addition, several equipment upgrades were completed to support a proposed increase in power output."

It is unclear what effect the increased vibrations of a power uprate would have on the steam dryer. Although it is not considered a safety component, breakage could lead to complications within the plant's safety systems.

NRC Region I spokesman Neil Sheehan said a special inspector was sent to Vernon to review Vermont Yankee's steam dryer work during the outage. "We have not identified any problems with the company's evaluation and determination that the steam dryer will be safe to operate following the outage, at current power conditions," Sheehan said in an e-mail Thursday.

However, Entergy will be required to "conduct an evaluation of the new cracks for uprate conditions by the end of this month," Sheehan said.

The VY uprate application is believed to be in its final stages. In a draft safety report issued late last month, NRC staff said the plant could be uprated safely. A two-day meeting and public hearings on the uprate are set for Nov. 15-16 in Brattleboro.

Nuclear watchdog Ray Shadis, technical advisor to the New England Coalition, a citizens' group fighting the uprate, said the cracking is far more serious than either the NRC or Entergy have indicated.

"Anybody who understands how metal is stressed understands that surface indications are very, very serious because they reflect what is beneath the metal," Shadis said. "Therefore, the uprate should not proceed until a thorough analysis is done."

Shadis rejected the contention by Entergy and the NRC that the cracks were not recent. "Why didn't they find them sooner?" he asked. "The more they look, the more they find."

The NRC last month informed Entergy that it would require a broad set of conditions before an uprate would be permitted, including hourly monitoring of plant conditions as power is increased and an ongoing assessment of the steam dryer.

David Lochbaum, a nuclear engineer with the Union of Concerned Scientists in Washington, said such conditions indicate that neither Entergy nor the NRC are confident the plant can withstand an uprate.

Lochbaum pointed to serious steam dryer breakage at two sister boiling water reactors in Illinois, which vibrated apart when those plants implemented a power uprate. Both of those reactors were also made by General Electric, and both had to temporarily shut down due to serious steam dryer breakage.

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Congress of the United States

Washington, DC 20515

November 10, 2005

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Chairman:

We write in response to the announcement today of the discovery, during a recent scheduled outage, of more than 40 additional cracks in the steam dryer at Vermont Yankee. We understand that a Region 1 Nuclear Regulatory Commission (NRC) inspector was dispatched to assist the resident inspector in the determining whether these cracks pose safety and operational concerns for the plant's current power production. We request that the condition of the steam dryer be fully evaluated, using the techniques of the most recent inspection and any other appropriate means, as the NRC considers Entergy Nuclear's request to produce an additional 100 megawatts of power from Vermont Yankee.

We understand that these cracks were discovered through the use of enhanced visual inspection techniques. As you know, these cracks are in addition to some 18 cracks, both hairline and larger, that were discovered through visual inspections of the plant's steam dryer in April and May of 2004. Steam dryer cracking is of concern at many boiling water reactor facilities. We know that cracking problems have persisted at the Quad Cities facilities' steam dryers, despite repeated fixes, and that uprated power conditions at those facilities place additional stresses on dryer performance. While the steam dryer itself is not a safety-related piece of equipment, its proper functioning is important to the plant's safe and reliable operation. Steam dryer cracking could result in pieces breaking off, and falling back into the steam lines that lead out of the reactor. In the case of the Quad Cities reactors, these plants have been forced to shut down because of cracking, making their operation less reliable.

As the NRC reviews the Vermont Yankee power uprate request, we believe it is essential that our constituents receive needed information about whether the plant's steam dryer will be able to withstand boosted power conditions and operate safely and reliably. The functioning of this piece of equipment should receive the Commission's full and thorough attention during the review of the uprate application.

We look forward to a prompt reply.

Sincerely,

Jim Jeffords

Patrick Leahy

Docket No. 7195
Attachment 3-4
2 Pages

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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.

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45 Pages

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. Energy 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.

Richard B. Ennis, Senior Project Manager, VY Section
Project Directorate I
Division of Licensing Project Management
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

cc w/atts: See next page

cc:

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Chairman, Board of Selectmen
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MEETING ATTENDANCE LIST

Licensee: Entergy

Plant: Vermont Yankee Nuclear Power Station

Subject: General Electric Steam Dryer Analysis Methodology

Date: July 21, 2004 Time: 8:00 a.m.

Location: NRC Headquarters, TWFN Room 8A1

Name	Title	Organization
Rick Ennis	Senior Project Manager	NRC/NRR/DLPM
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PEDRO B. PÉREZ	SR. ENGINEER	VERMONT YANKEE
RAJU ANANTH	PROJECT ENGINEER	STRUCTURAL INTEGRITY
Jim DeVincentis	LICENSING MANAGER	Entergy Vermont Yankee
George Stramback	Regulatory Services	~~NRC~~ GENE
DAN PAPPONE	ENGINEER	GENE
Alex Pinsker	ENGINEER	GENE
Cayetano Santos	Sr Staff Engineer	NRC/ACRS
RALPH CARUSO	Sr Staff Engineer	NRC/ACRS
SHAH MALIK	SR. Materials Engineer	NRC/RES
MIKE SCHRAG	MANAGER	GE-NE
Richard Wu	Engineer	GENE
Henry Hwang	Engineer	GENE
JIM KLAPPROTH	MGR, ENGR & TECH	GENE
Leslie Wellstein	Engineer	GENE
Guy DeBoo	Sr. Staff Engineer	EXELON
Carl Hinds	Sr. Engineer	GE
RICK CUTSINGER	Civil Manager - ~~[illegible]~~	TVA

ATTACHMENT 1

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Jorge Hernandez	Reactor Engineer	RI/DRP
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Larry Yemma	Lead Engineer	Progress Energy
Ed Hartwig	Project Manager	TVA/Browns Ferry
Glen Ohlemacher	Project Manager	Detroit Edison / BWROG
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Louis Quintana	Mgr., GENE Licensing	GENE
HAR MEHTA	Engineering Fellow	GENE
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JOHN WU	NRC/NRR/DE/EMEB	MECHANICAL ENGINEER
Tom Mulcahy	ANL - NRC subcontractor	Senior Mechanical Engr.

Name	Title	Organization
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Larry Rossbach	PM	NRC/NRR/DLPM
Steve Dembek	Section Chief	NRC/NRR/DLPM
Mel Fields	Project Manager	"
Bill Sherman	VT Nuclear Engr	VT-Dept of Pub Serv.
Scott Goodwin	Supervisor	Vermont Yankee

MEETING ATTENDANCE LIST

Licensee: Entergy

Plant: Vermont Yankee Nuclear Power Station

Subject: Steam Dryer Analysis Associated with Extended Power Uprate Request

Date: July 22, 2004 Time: 8:00 a.m.

Location: NRC Headquarters, OWFN Room 1G16

Name	Title	Organization
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MIKE SCHRAG	MANAGER	GENE
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PEDRO B. PEREZ	ENGINEER	ENTERGY VY
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GEORGE NELSON	BFN EPU PROJECT	BECHTEL/TVA
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BILL SHERMAN	VT Nuclear Eng'r	VT-Dept of Pub Serv
Jenny Weil	Managing Editor	McGraw-Hill
David Terao	Section Chief	NRC / NRR / EMEB
Allen Howe	Section Chief	NRC/NRR/DLPM
CRAIG NICHOLS	ENTERGY EPU PROJECT MGR	ENTERGY
George Stramback	GENE-Regulatory Services Mgr	
John McCann	Director - Licensing	Entergy
John Dreyfuss	DIRECTOR - ENG'G	ENTERGY - VY
L.B. (Tad) Marsh	Director, DLPM/NRC	NRC
Gene Imbro	Chf, Mech & Civil Eng	NRC
KAMAL MANOLY	Chief, Civil & Eng Mech. Section	NRC
Tom Mulcahy	~~Argonne National~~ Senior ME	ANL
Vik Shah	Mech. Engineer	ANL
John Wu	Mech. Engineer	NRC

Name	Title	Organization
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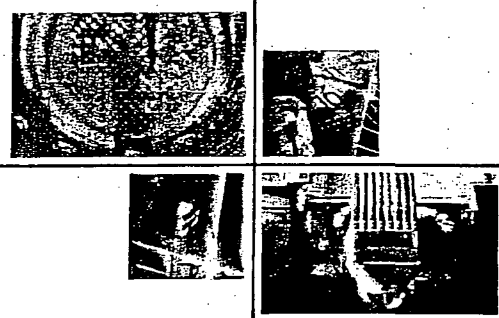
Louis Quintana	Mgr., GENE Licensing	GE NE
DAN PAPPONE	ENGINEER	GENE
Thomas Scarbrough	Senior Mech. Engineer	NRC/NRR/DE/EMEB
Jeff Jacobson	Program Manager	NRR/IIPB
BARRY ELLIOT	NRC/NRR/DE	SR. MATL. ENG.



BWR Steam Dryer
Structural Analysis Methodology

July 21, 2004

Agenda

- Meeting Goals
- Meeting Structure
- EPU Operating Experience
- Fluctuating Load Definition
- Structural Analysis Techniques
- Finite Element Model
- Fatigue Structural Analysis
- Load Combinations
- Transient and Accident Load Definitions
- Primary Stress Structural Analysis

ATTACHMENT 3

Meeting Goals

- Update NRC technical staff on BWR steam dryer structural analysis methodology
  - Load definition
  - Structural analysis
- Provide generic basis and background information supporting EPU dryer analyses
- Provide information supporting VY dryer analysis review

Significant improvements in methodology have been made over the last year

Meeting Structure

- Informal question/answer format
  - Similar to technical audit
  - Not a structured presentation
- Review
  - Detailed analysis results
  - Design record files
  - Spreadsheets, etc
- Review of generic methodology
  - Vermont Yankee EPU analysis used as example
- Copies of materials requested by the staff will be formally provided after the review

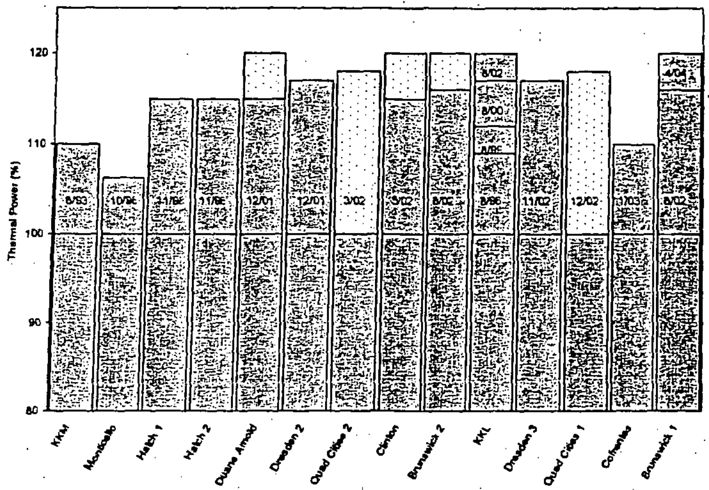
GENE Technical Discussion Leaders

Fluctuating Load Definition	Dan Pappone
Structural Analysis Techniques	Richard Wu
Finite Element Model	Alex Pinsker
Fatigue Structural Analysis	Henry Hwang
Load Combinations	Henry Hwang
Transient and Accident Load Definitions	Dan Pappone
Primary Stress Structural Analysis	Henry Hwang

Steam Dryer Design Basis

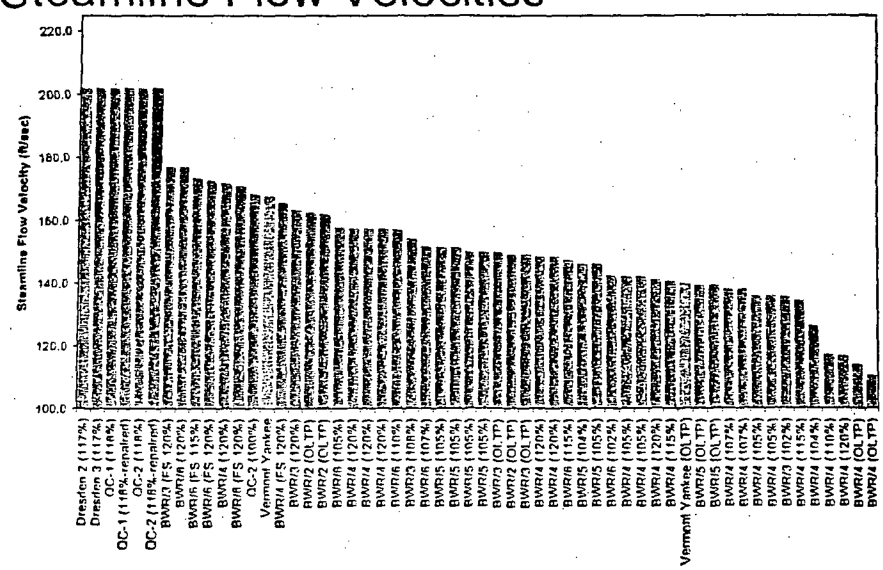
- Original Design Requirements
  - Not ASME-coded component
  - Fatigue from flow-induced vibration not explicitly considered
  - Maintain structural integrity for outside steamline break accident
    - No loose parts
    - Deformation acceptable
- Current Dryer Analyses
  - Finite Element Model of dryer
  - Fluctuating pressure loads defined
  - Fatigue from flow-induced vibration analyzed
  - Normal, upset, faulted conditions analyzed
  - ASME code criteria used as guidance for modifications

EPU Operating Experience

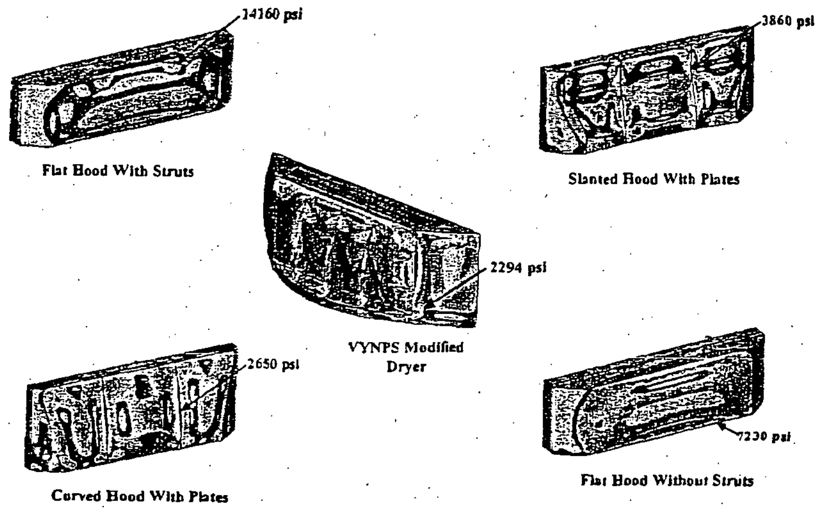


Nearly 50 Reactor Operating Years of EPU Experience

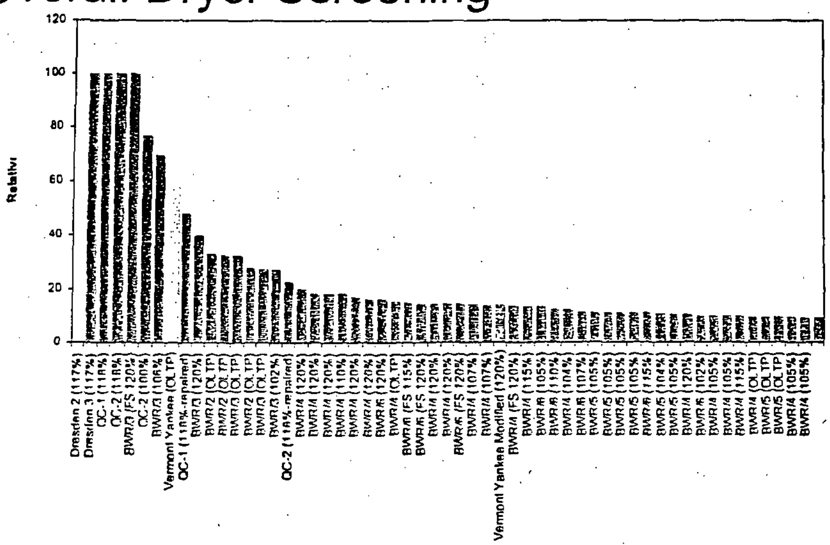
Steamline Flow Velocities



Relative Hood Stresses



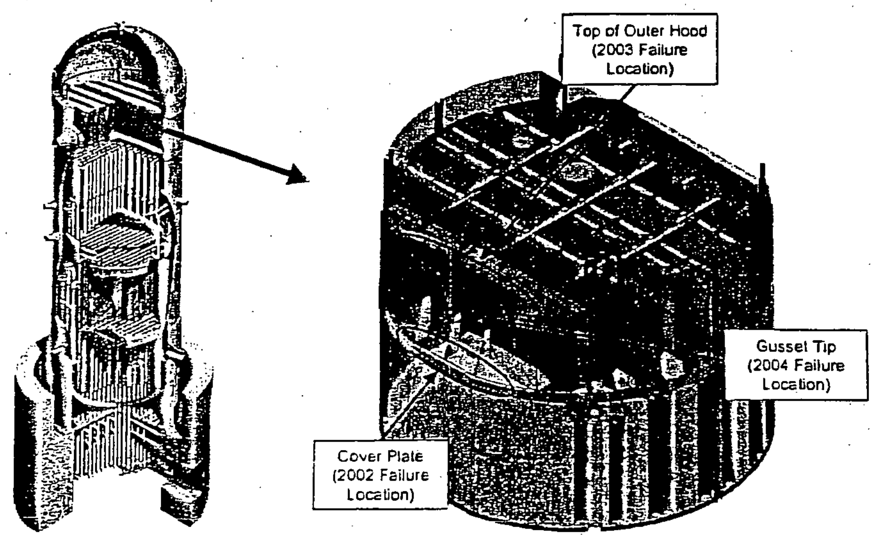
Overall Dryer Screening



BWR/3 Dryer Failure History (QC2)

June 2002	Dislodged 1/4" lower cover plate at QC2	High cycle fatigue due to high frequency fluctuating pressure (120-230 Hz), thin cover plate, small welds, potential resonance	Replaced cover plate with ½" plate Used more robust attachment welds.	Developed dryer component structural analysis
May 2003	Cracks in outer hood, broken braces and struts in the outer hood	High cycle fatigue due to low frequency fluctuating pressure loading (<50 Hz) Operation with damaged cover plate contributing factor	Removed diagonal braces from outer hoods Replaced outer hood plates with 1" plate Added external gussets	Modified dryer structural analysis to account for fluctuating pressure load definition over full frequency range, for all dryer types
March 2004	Cracks in plate at gusset tips, broken tie bar welds	Local stress concentrations not modeled in sufficient detail	Full height 1" vertical hood plate Full height external gussets Full penetration shop welds on external gussets	Solid submodels for high stress locations used to supplement 3D shell Finite Element model Analysis includes gusset tip design and weld design

Hood Failure Locations



Review Topics

- Load Definition
- Structural Analysis
- Plant Application

Conclusions

- Significant progress in structural analysis methodology
- Overall methodology is conservative
- Dryer modifications assure structural integrity at EPU conditions
  - Increased design margin at critical locations

Closed Session

Fluctuating Load Definition

- Generic load definition
  - Assumptions
  - In-plant test data
  - Scale model test data
  - Reference load definition
- Plant-specific application
  - Load scaling
- Load definition confirmation

Structural Analysis Techniques

- Equivalent static method
  - Frequency analysis using reference load
  - Load scaling
  - Dynamic amplification, stress concentration factors
- Response spectrum method
  - Pressure load to response spectrum transform
- Acceptance Criteria

Finite Element Model

- Model Assumptions
- Dryer components modeled
- Shell model
- Solid submodels

Fatigue Structural Analysis

- Analyze current power, EPU power conditions
- Benchmark current power results against acceptance criteria
- Evaluate EPU results against acceptance criteria

Load Combinations

- Operating conditions
  - Normal
  - Upset
  - Faulted
- Loads considered
  - Deadweight
  - Static differential pressure
  - Seismic

Transient and Accident Load Definitions

- Differential pressure loads
  - Forward flow transients (e.g., SORV)
  - Reverse flow transients (e.g., TSV)
  - Steamline break accident
- Seismic loads
  - OBE
  - SSE

Primary Stress Structural Analysis

- Analyze individual load components for each operating condition
- Combine stress results for individual components
- Assess overall stress results against acceptance criteria

Entergy

Entergy VY
Power Uprate Project

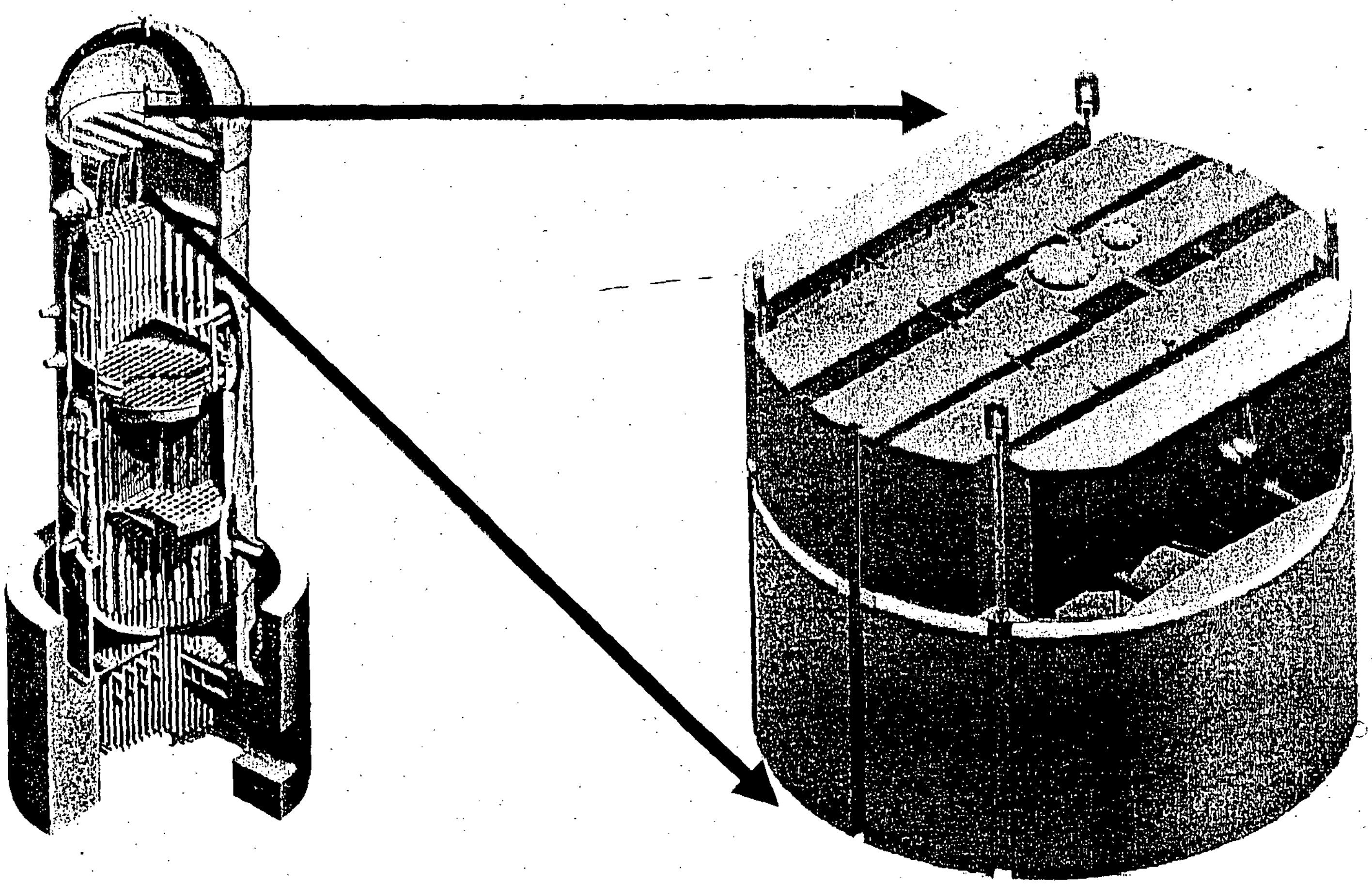
Steam Dryer RAI Review

July 22, 2004

ATTACHMENT 4

Entergy

Main Steam Dryer



What we know

- Significant improvement in methodology
- Dryer Finite Element Model adequately reflects dryer performance under defined load
- VY Modified Dryer relative stresses are less than other dryer types under the same load
- Dryer Loads are adequately defined
- VY Steam Line velocity at EPU is less than QC/Dresden original steam velocity
- Reasonable Assurance that Dryer will perform per current design requirements at Extended Power Uprate Conditions at Vermont Yankee

Future Activities

- Obtain and evaluate VY Plant Specific data
- Comprehensive, deliberate, well monitored power ascension

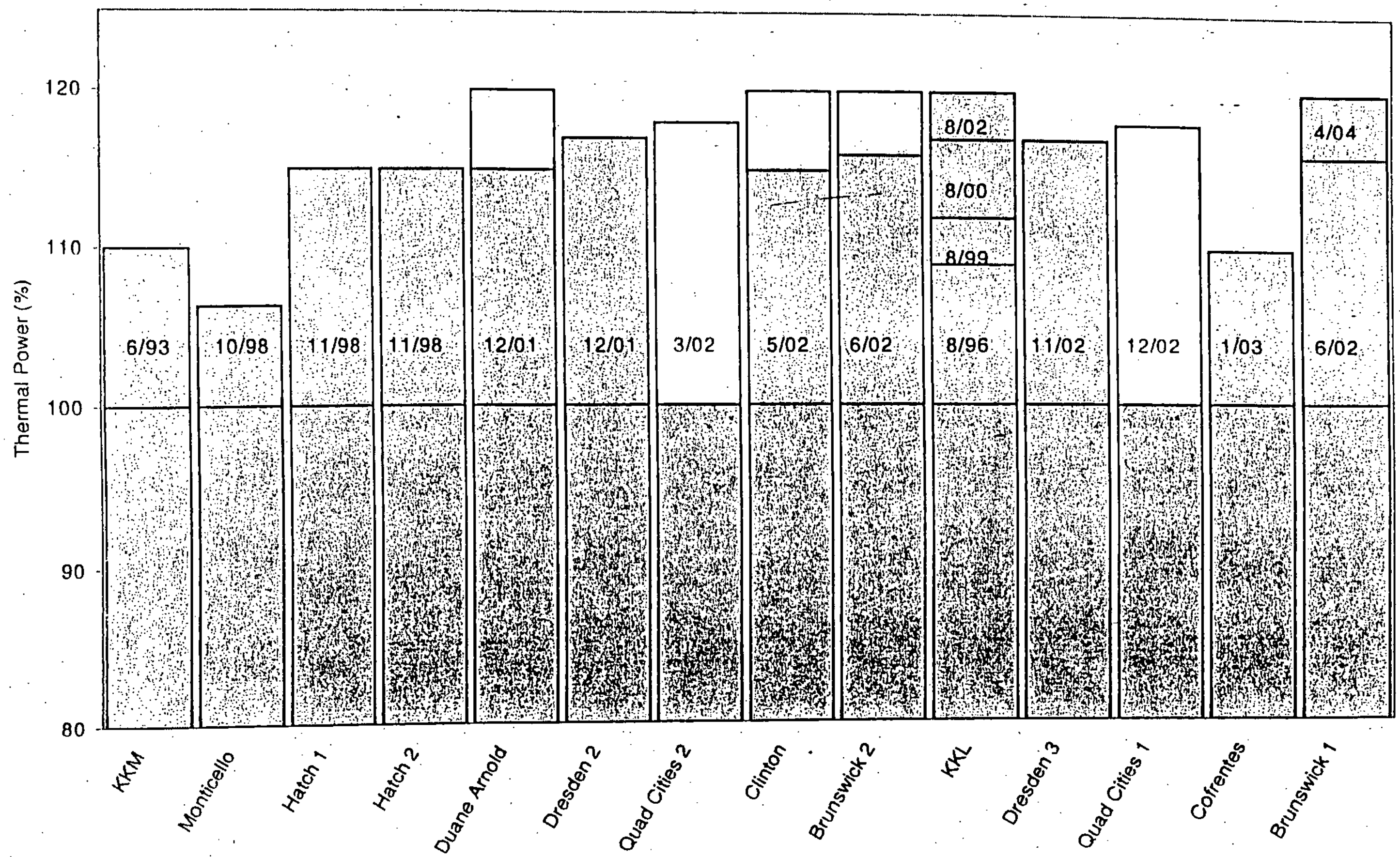
Quad Cities Experience

- Methodologies developed after QC2 failures accurately predict high stress locations
- Confirmed by actual high stress failure locations

Entergy

Industry Steam Dryer Experience

Nearly 50 Reactor Operating Years of EPU Experience



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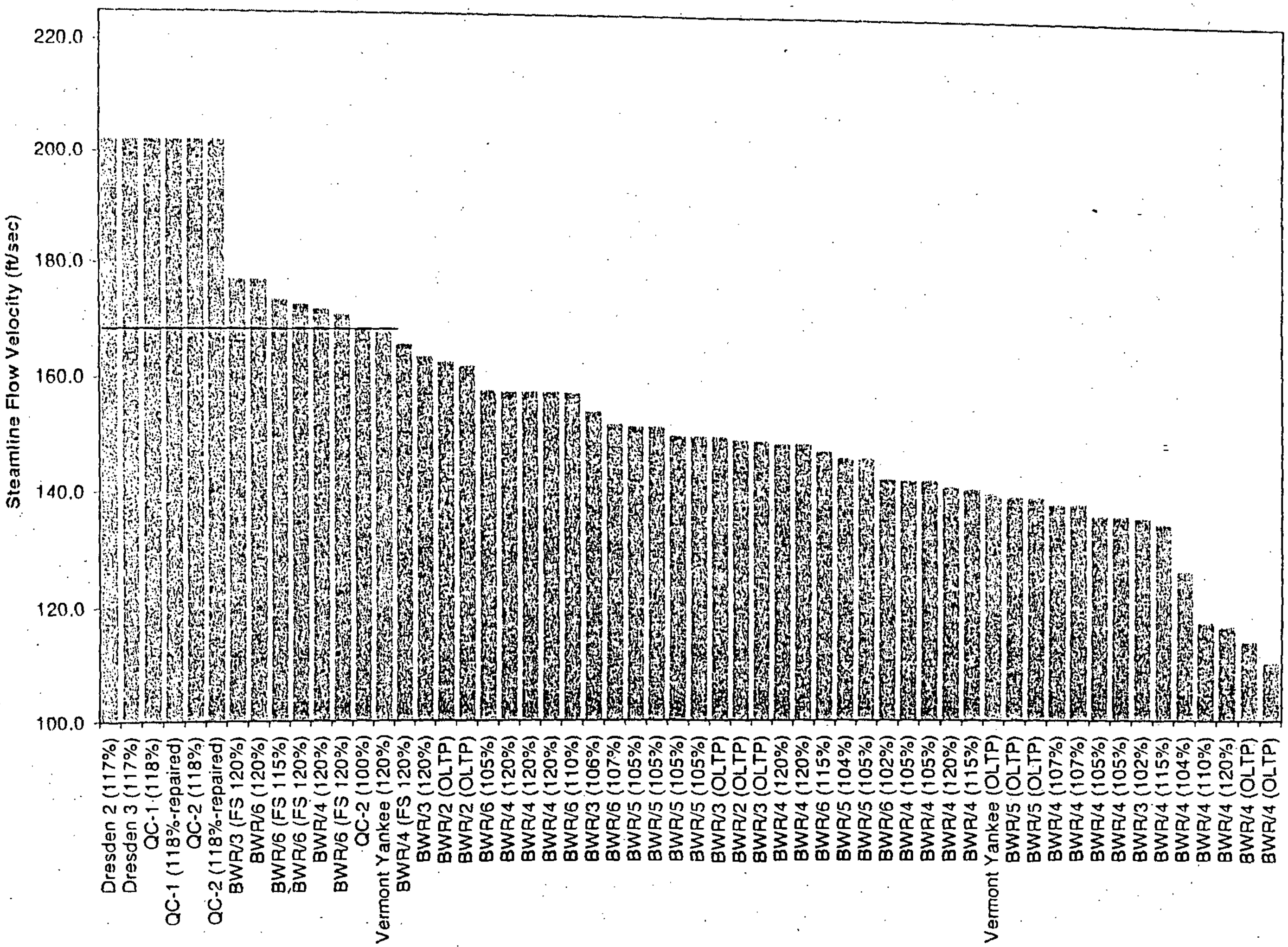
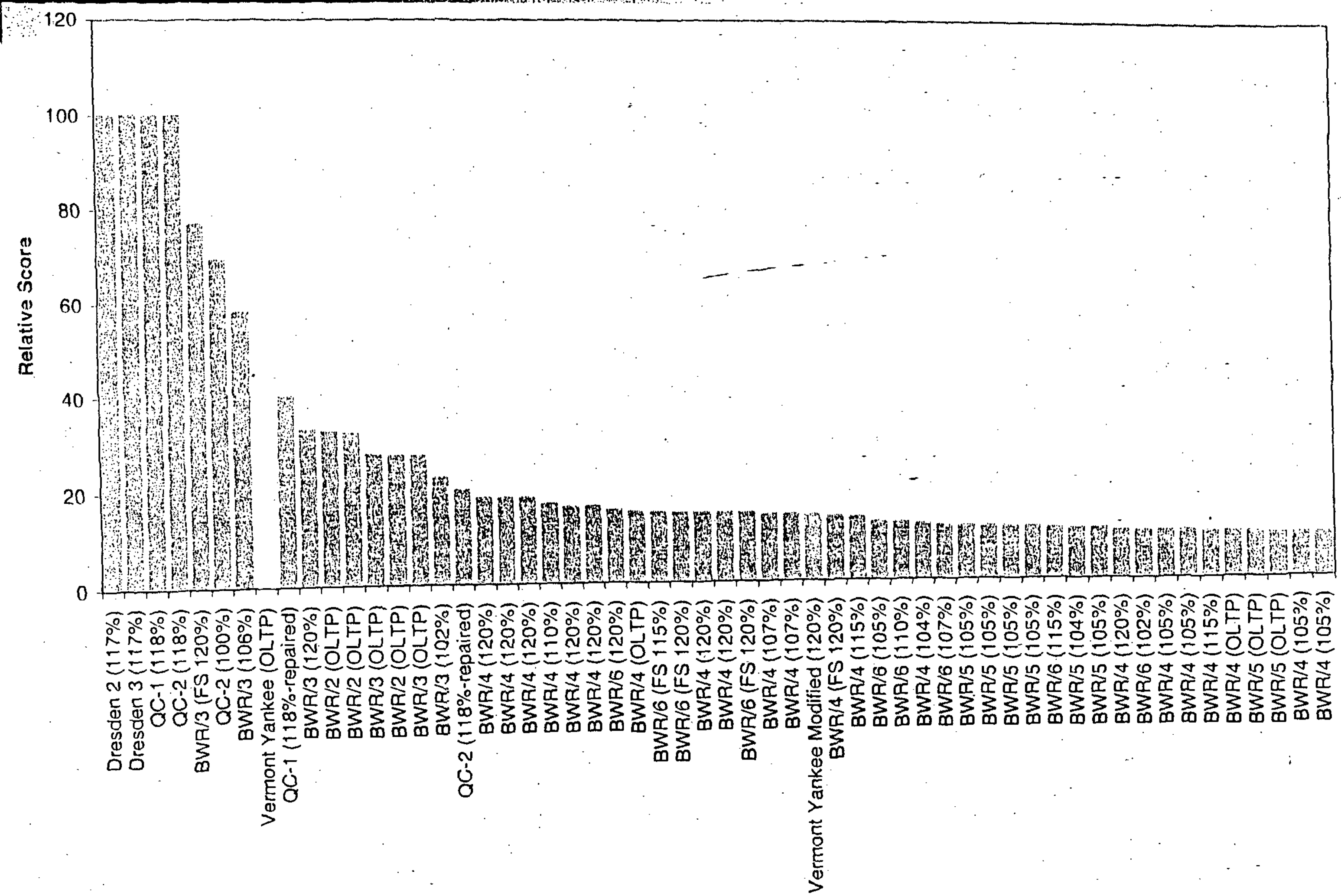
Main Steam Line Flow Velocities



Overall Dryer Screening



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VY Steam Dryer Analysis

- GE developed Finite Element Model of VY Dryer
- Loads defined based on similar plant instrumented dryer data
- Results: identified increased stress areas at uprate conditions
- Developed robust modification – industry experience incorporated
- Re-ran the Model incorporating the modification and validated stresses were below Code limits at uprate conditions
- Significantly increased structural margin

Entergy

VY Steam Dryer Inspection

- Internal & external visual inspection of steam dryer accessible areas
  - No outer bank or lower cover plate cracking found

Entergy

VY Steam Dryer Inspection

- Some visual indications were found: consistent with BWR industry experience
  - Two 3" cracks in dryer steam dam were repaired & strengthened
    - Caused by fabrication residual stresses
  - Several intergranular stress corrosion cracks (IGSCC) were found (dryer end bank and drain channel)
    - Caused by sensitization and weld residual stresses from original welding
    - Not structurally significant

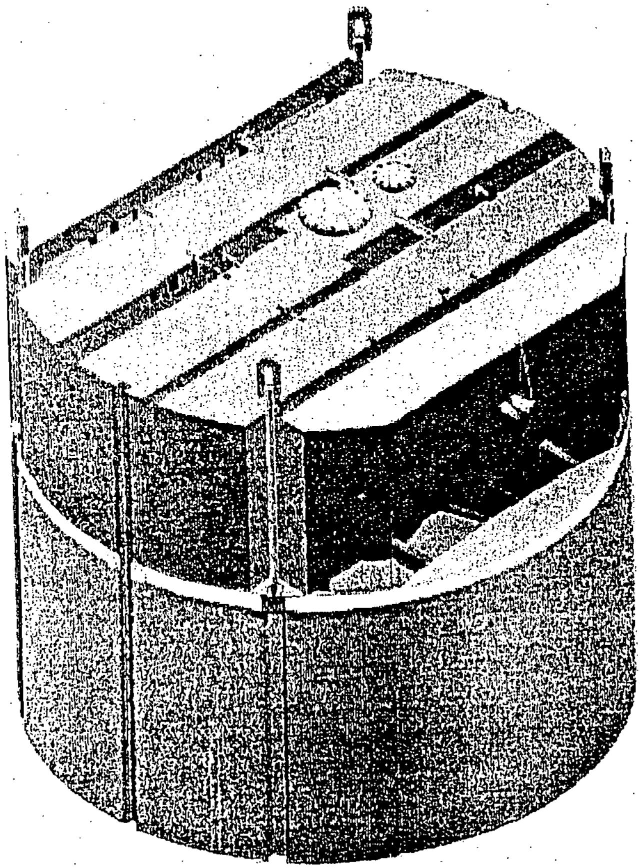
Entergy

Steam Dryer – Strengthening Design

- Modifications
  - Lower cover plate – Increase from ¼" to 5/8" Upper vertical and horizontal cover plates in outer hood – Increase from ½" to 1"
  - Remove internal diagonal shipping braces
    - Eliminate stress concentrators which were the crack initiators for the Quad Cities Failures
  - Replace dryer bank tie bars and improve weld attachment
  - Add six, full-length external gussets to hood plates
    - Full penetration versus fillet welds
    - Gusset shoe provides enhanced weld strength
  - Employed low carbon stainless steel – IGSCC resistant

Entergy

VY Dryer - Before & After Strengthening



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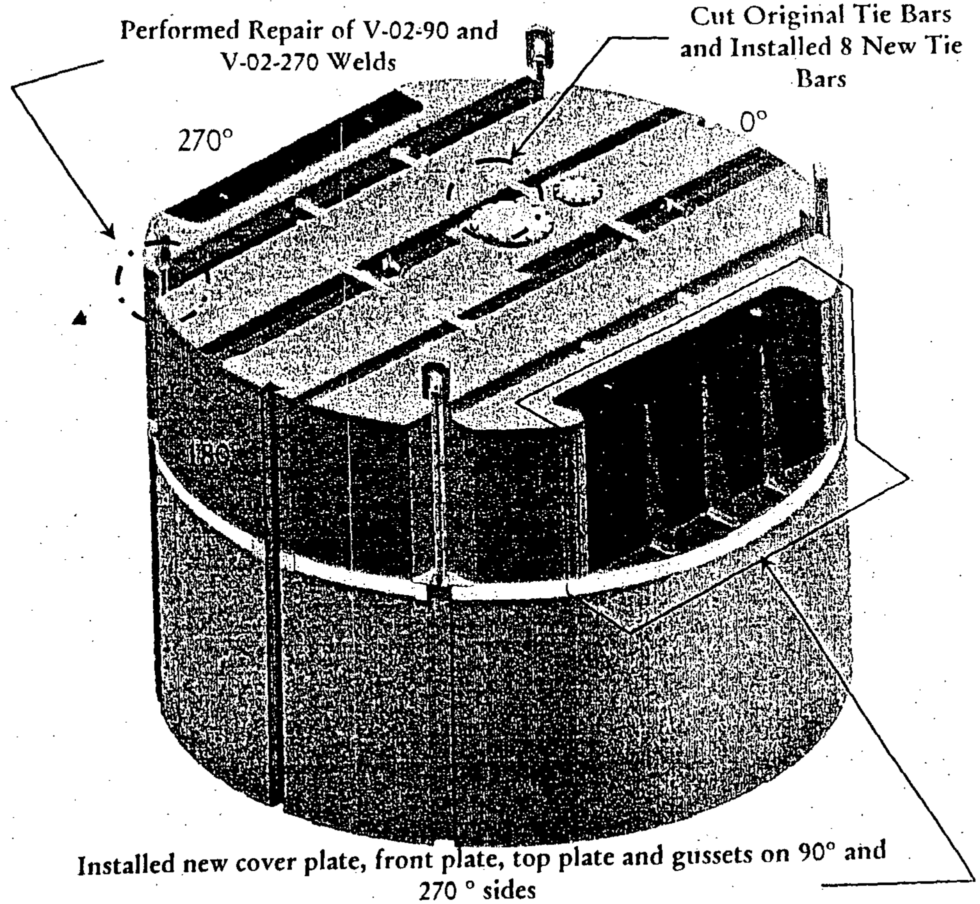
Before



After

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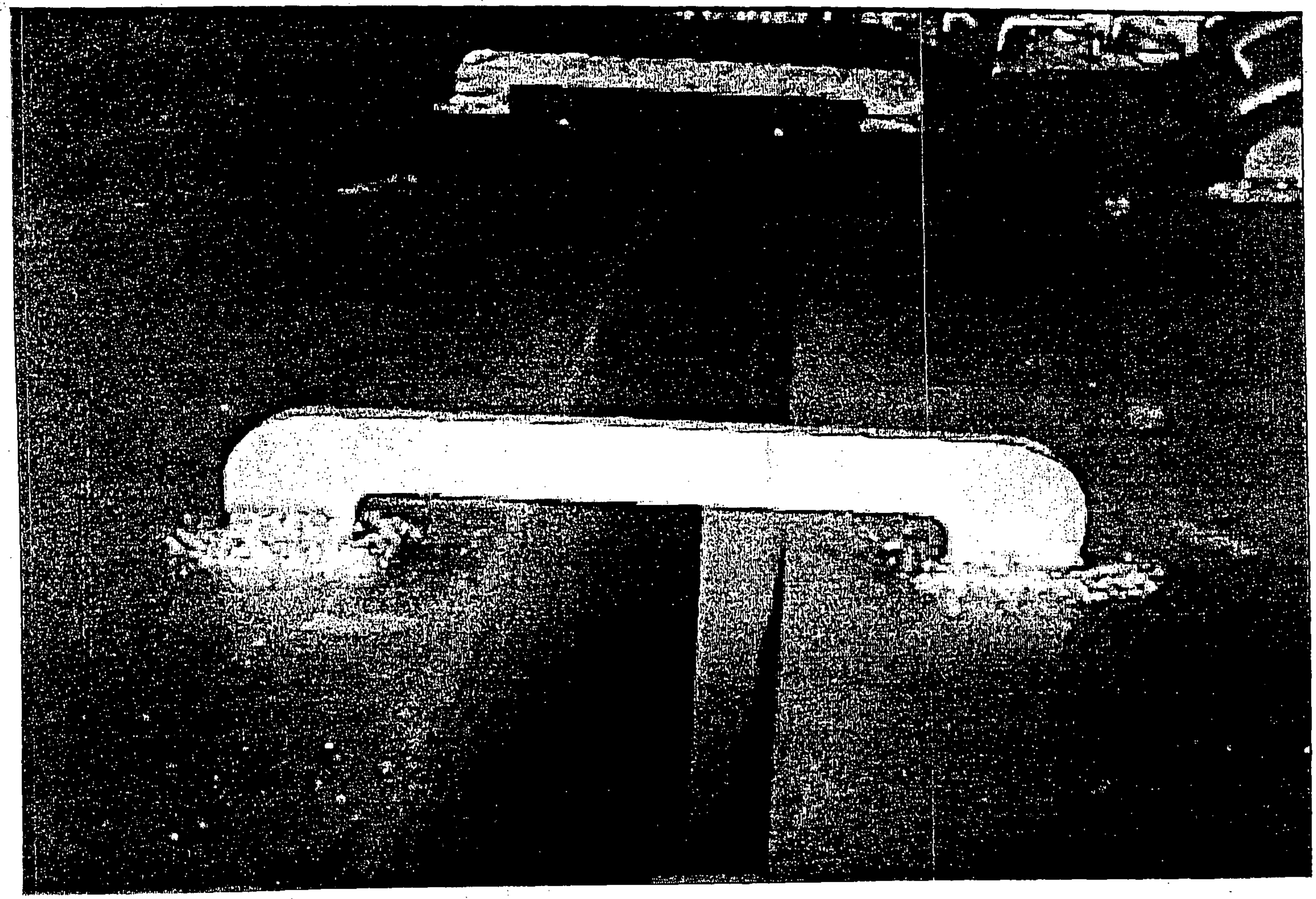
VY Steam Dryer Strengthening – Tie Bars



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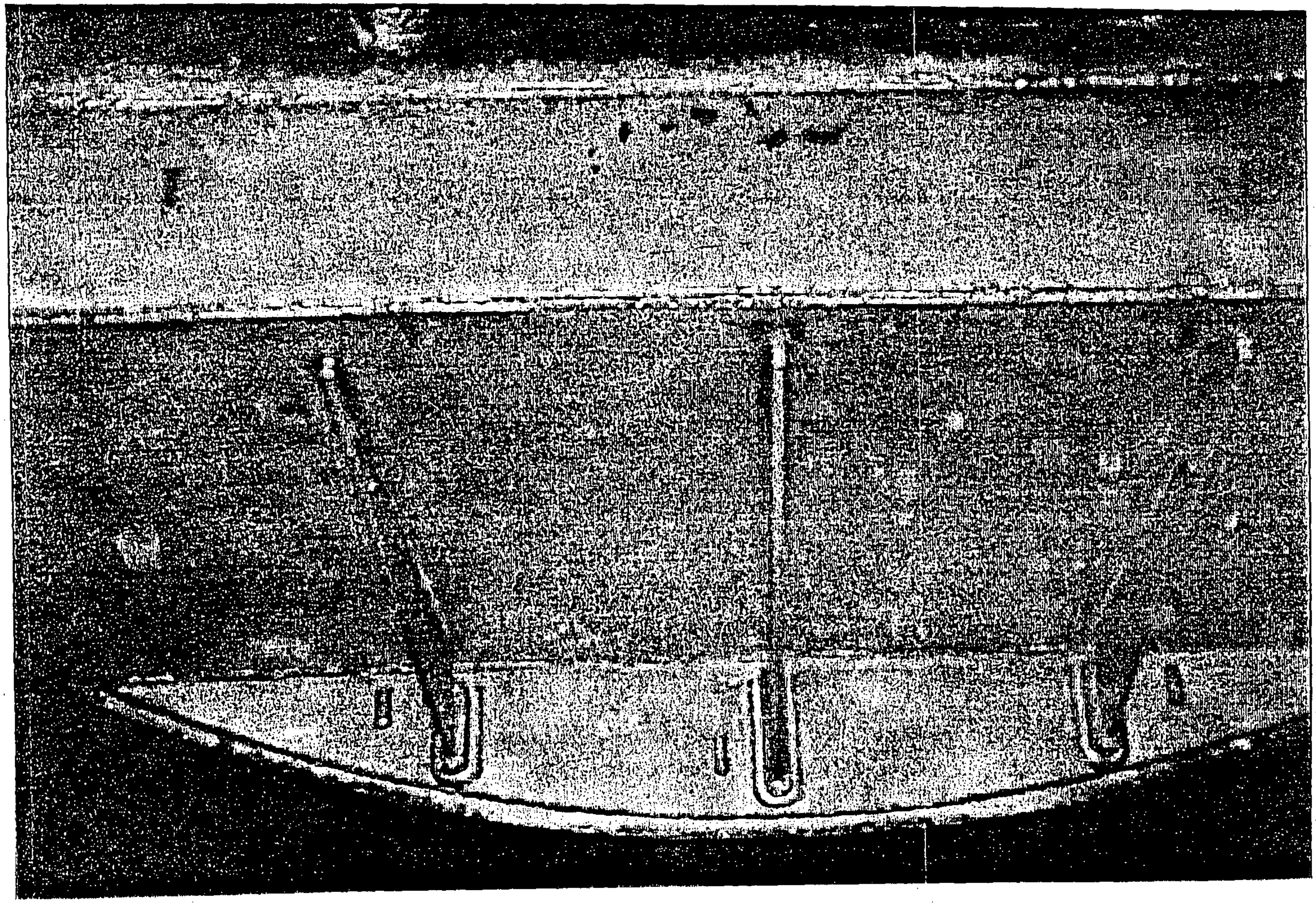
VY Steam Dryer Strengthening – Hood



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VY Steam Dryer Monitoring

- Measurements consistent with SIL 644
  - Moisture carryover levels
  - System parameters (flow and level)
- Inspection in planned refuel outage (~8 months of <115% uprate operation)

Entergy

VY Acoustic Circuit Model

- Collect VY Main Steam Data
- Develop Acoustic Circuit Model
- Reconcile Test Results with GE Analysis

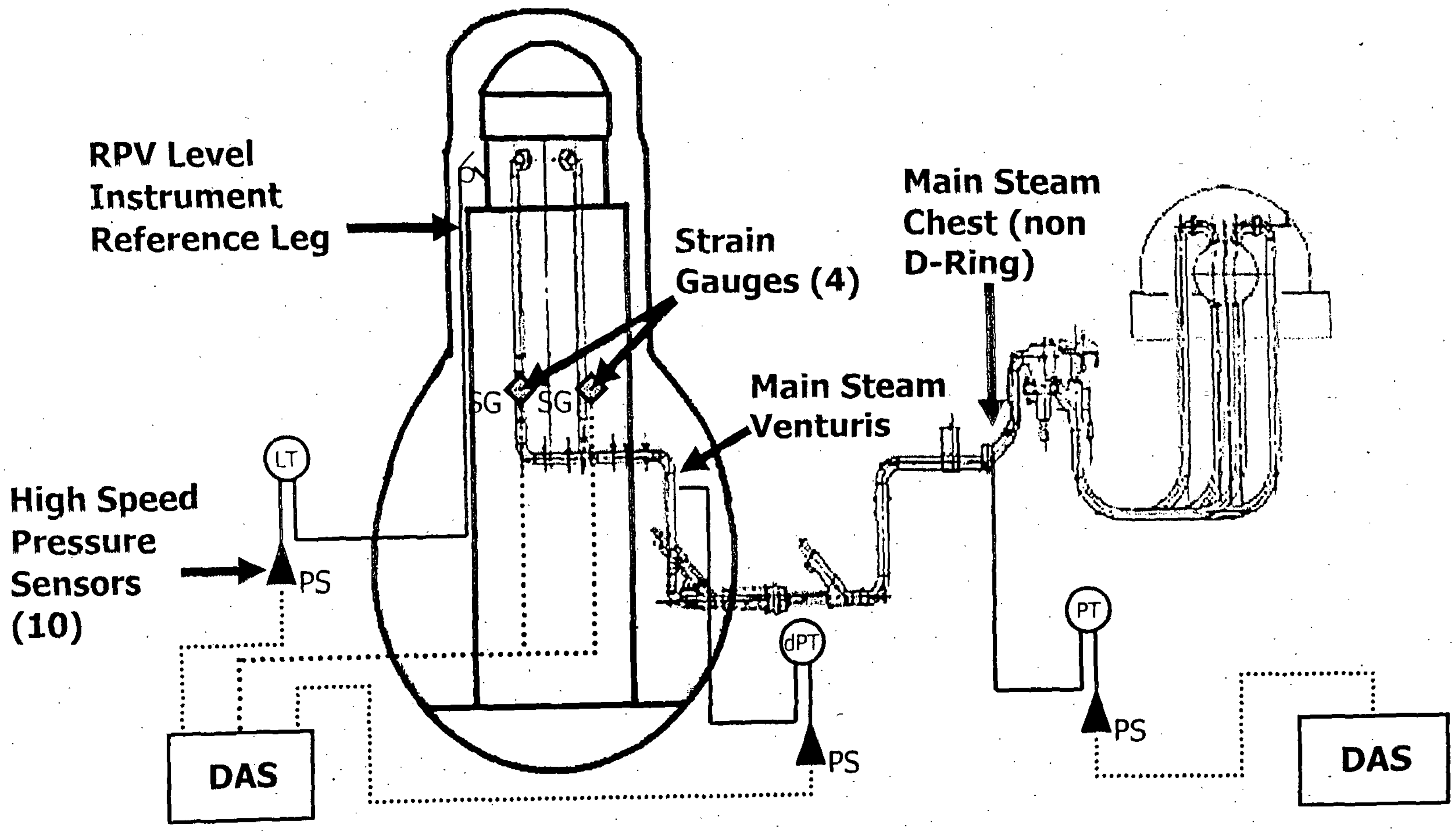
Entergy

VY Main Steam System Data Collection

- Measurement locations more extensive than other stations
  - Pressure data taken with high speed recorder at:
    - MSL venturis (one on each steamline)
    - Vessel instrument reference legs (2)
    - Main steam header
  - Strain Gauges located on each steam line close to vessel
- Data taken at 80%, 85%, 90%, 92%, 95%, 97% and 100% power

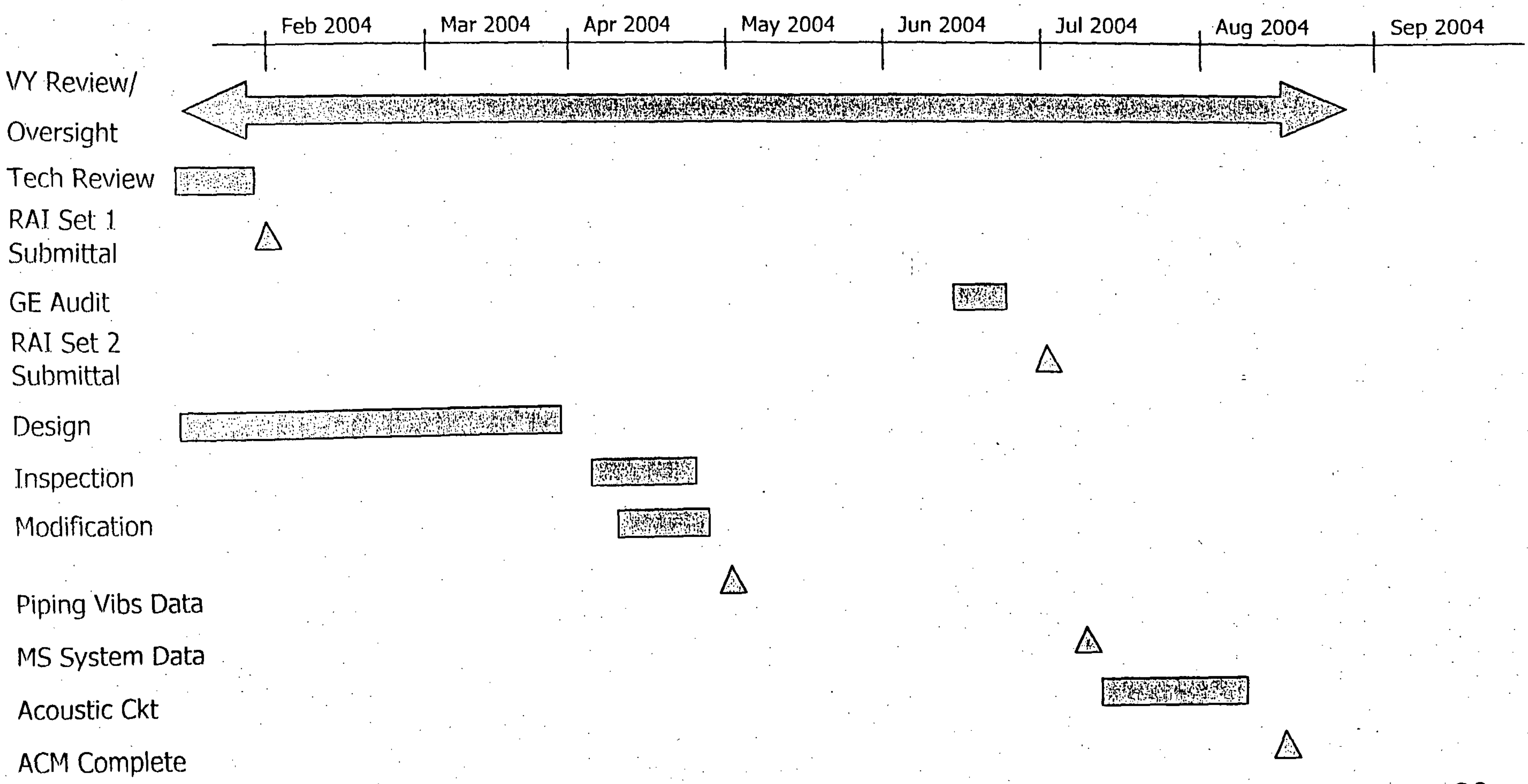
Entergy

VY Steam System Data Collection Map



Entergy

VY Steam Dryer Timeline



VY Uprate Testing and Inspection Plan

- Two Step Uprate
- Gradual Power Ascension Test Plan with predefined hold points
  - Pre-uprate testing provides baseline data
- Measurement program
  - Main Steam and Feedwater FIV Accelerometers
  - Steam System Pressure Transmitters
  - Main Steam Line Strain Gauges
  - Installed Plant Equipment
- Inspection in planned refuel outage (8 months of <115% uprate operation)
  - Detailed inspection consistent with SIL 644

Q&A

September 15, 2003

MEMORANDUM TO: Stephen Dembek, Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Alan Wang, Project Manager, Section 2 /RA/
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING HELD ON JULY 25, 2003, WITH GE NUCLEAR ENERGY (GENE) REGARDING STEAM DRYER FAILURES

On July 25, 2003, representatives of GENE met with the NRC staff to discuss the generic implications of the Quad Cities steam dryer failures. The staff had invited GENE to share some of their preliminary analyses and insights to date with regard to the generic implications of the Quad Cities steam dryer failures. GENE stated that the steam dryer does not perform any safety function. The staff did not disagree, but noted that the concern is not the failure of the steam dryer itself but the potential to damage or interfere with the ability of the plant to shut down the reactor. In addition, the staff was concerned that the failures could be a result of the increased steam flow due to the power uprate. GENE provided their root cause analyses for the two failures. GENE stated that the first failure was due to high cycle fatigue due to high frequency acoustic resonance and the second failure was due to high cycle fatigue due to low frequency pressure loading. GENE agreed that the increased flow contributed to both failures. GENE stated that a failure modes and effects analysis (FMEA) was performed to evaluate the likelihood and consequences for loose parts. This analysis determined that no loose part from a dryer failure would affect plant safety. In addition, GENE performed additional analyses to determine if the increased flow could potentially impact any other components in the reactor coolant system. This analyses determined for the identified components that they are acceptable at extended power uprate conditions.

GENE's root cause determined that there are three basic hood types: square hoods used in BWR/3 designs, slanted hoods in early BWR/4 designs and curved hoods in BWR/4 and later designs. GENE stated that they have determined that this is the critical factor in determining the failure susceptibility of the steam dryers. GENE is developing a service information letter (SIL) to incorporate the lessons learned from the Quad Cities failures. The staff had several comments and questions regarding the FMEA and root cause analyses. GENE stated that much of this work was still preliminary. GENE proposed that the staff wait for the issuance of the SIL, so that the various analyses could be discussed in detail at a later meeting. The staff agreed and requested GENE to provide the SIL when available. GENE stated they expect the SIL to be issued in mid-August 2003 (the SIL was issued in early September).

Docket No. 7195
Attachment 4-2
4 Pages

Joe Conen, Vice-Chairman of the Boiling Water Reactors Owners Group (BWROG) noted that the industry is taking these failures seriously even though the equipment is not safety-related. He stated that the BWROG is holding discussions with the BWR Vessels and Internals Projects to determine a course of action for accelerating activities related to cracking on non-safety components. A BWROG meeting is planned in late August when a draft of the GENE SIL becomes available.

The staff stated that it would like a meeting in September to discuss industry plans regarding the steam dryer failures and its impact on current and future uprates. In addition, the staff requested GENE to provide the SIL when available. The staff thanked GENE and the BWROG for the presentation and emphasized the need for an update on developments after the SIL has been issued. This meeting was informational. No regulatory decisions were made. The BWROG agreed to meet in 4 to 6 weeks. The meeting handout can be found in ADAMS under Accession No. ML032390172. The attendance list is attached.

Project No. 710

Attachment: Meeting Attendees

cc w/att: See next page

cc:
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Regulatory Services Project Manager
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Mr. Glen A. Watford, Manager
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MEETING WITH GE NUCLEAR ENERGY

ATTENDANCE LIST – JULY 25, 2003

GE NUCLEAR ENERGY

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T. Hurst

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A. Uhamkarant
J. Meister
K. Jury
U. Bohlke
G. DeBos
T. Talon
S. Eldridge
T. Wojcik
K. Nicely

OTHER

J. Conen (Vice Chairman, BWROG)
L. Collins (Westinghouse)
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NRC

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S. Bloom
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Z. Abdullahi
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October 12, 2005

Mr. Michael Kansler
President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - EXTENDED POWER UPRATE REVIEW SCHEDULE AND LICENSE CONDITIONS (TAC NO. MC0761)

Dear Mr. Kansler:

By letter dated September 10, 2003, as supplemented by letters dated October 1, and October 28 (2 letters), 2003, January 31 (2 letters), March 4, May 19, July 2, July 27, July 30, August 12, August 25, September 14, September 15, September 23, September 30 (2 letters), October 5, October 7 (2 letters), December 8, and December 9, 2004, and February 24, March 10, March 24, March 31, April 5, April 22, June 2, August 1, August 4, September 10, September 14, September 18, and September 28, 2005, Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy or the licensee) submitted a proposed license amendment to the Nuclear Regulatory Commission (NRC) for the Vermont Yankee Nuclear Power Station (VYNPS). The proposed amendment, "Technical Specification Proposed Change No. 263, Extended Power Uprate," would allow an increase in the maximum authorized power level for VYNPS from 1593 megawatts thermal (MWT) to 1912 MWT.

In a letter dated December 15, 2003, the NRC staff informed Entergy that, based on a review of the VYNPS extended power uprate (EPU) application dated September 10, 2003, the supplement dated October 1, 2003, and the two supplements dated October 28, 2003, sufficient information had not been provided to allow the NRC staff to establish a review schedule. Entergy provided additional information in two supplements dated January 31, 2004, to address the NRC staff's concerns. Subsequently, in a letter dated February 20, 2004, the NRC staff informed Entergy that the staff had completed its acceptance review of the VYNPS EPU license amendment application and had established a forecast review completion date of January 31, 2005.

In a letter dated October 15, 2004, the NRC staff notified Entergy that the staff's review schedule for the proposed VYNPS EPU amendment would be impacted, primarily due to concerns regarding the steam dryer analysis. The letter noted that during the review, in an attempt to resolve our steam dryer concerns, the NRC staff had requested additional information, held three public meetings with Entergy, and performed an audit of the steam dryer analysis at the General Electric (GE) office in San Jose, California. The letter also noted that information was needed to address technical issues raised during the VYNPS engineering inspection that was completed in September 2004. The letter stated that the EPU review schedule would be reassessed following receipt and review of supplemental information from Entergy.

Docket No. 7195
Attachment 6-1
10 Pages

On April 5, 2005, Entergy submitted a supplement to the EPU application that completed submittal of a series of supplements to address the concerns in the October 15, 2004, letter. These supplements collectively contained a substantial amount of information that necessitated significant NRC staff review time. As a result of the review of this information, the NRC staff issued a request for additional information (RAI) on July 27, 2005. The RAI contained 200 questions, of which 132 pertained to the steam dryer analysis, and 35 pertained to issues related to the methods used by GE to perform reactor neutronic and thermal/hydraulic analysis. To expedite the review, several draft versions of the RAIs were provided to Entergy prior to formal RAI issuance on July 27, 2005, a technical audit of the steam dryer analysis was conducted on June 15 and 16, 2005, at the GE office in Washington, DC, and a public meeting on the GE methods issues was held at the NRC on June 30, 2005. Entergy provided responses to the RAI in supplements dated August 1, and August 4, 2005.

The NRC staff reestablished the VYNPS EPU review schedule in a conference call with the Atomic Safety and Licensing Board (ASLB) on August 3, 2005. The transcript for the conference call can be accessed from the Agencywide Documents Access and Management System (ADAMS) Public Electronic Reading Room on the NRC Web site at http://www.nrc.gov/reading-rm/adams.html by entering Accession No. ML052210402. As discussed during the conference call, in which Entergy also participated, the next major milestone in the schedule is for the NRC staff to provide a draft safety evaluation (SE) to the Advisory Committee for Reactor Safeguards (ACRS) by October 21, 2005. The draft SE is needed to support an ACRS Subcommittee meeting in Vermont on November 15 and 16, 2005, and a second ACRS Subcommittee meeting at NRC Headquarters on November 30 and December 1, 2005. Other milestones discussed include an ACRS Full Committee meeting on December 8, 2005, and issuance of the final SE by February 24, 2006. As discussed during the conference call, and as also documented in the NRC staff's status report to the ASLB dated August 15, 2005 (ADAMS Accession No. ML052310345), the staff noted that the schedule could be delayed if the responses dated August 1 and August 4, 2005, do not fully address the issues raised in the RAI dated July 27, 2005.

The NRC staff's review of the August 1 and August 4, 2005, responses determined that the issues raised in the RAI dated July 27, 2005, were not fully addressed by Entergy and that further information would be required for the staff to complete its review. The staff's efforts to expedite receipt of this information included: (1) an audit of GE's steam dryer scale model test facility in Vallecitos, California on August 15 and 16, 2005; (2) an audit of the steam dryer analysis at GE's office in Washington, DC on August 22 through August 25, 2005; (3) an audit of the methods used by GE to perform reactor neutronic and thermal/hydraulic analysis at GE's office in Washington, DC on September 7, 2005; (4) issuance of an RAI on September 7, 2005; (5) a meeting at GE's office in Washington, DC on September 14 and 15, 2005, to discuss the GE methods issues; and (6) a meeting at the NRC on September 21, 2005, also to discuss the GE methods issues. Entergy provided additional information to address the issues raised in the RAI, audits, and meetings in supplements dated September 10, 14, 18, and 28, 2005.

The NRC staff's status report to the ASLB dated September 15, 2005, stated that the staff does not believe it is likely that the draft SE can be completed by October 21, 2005. Our assessment of the schedule was primarily based on the fact that Entergy has not been able to adequately resolve the staff's concerns regarding the steam dryer analysis and the GE methods issue. In addition, through several rounds of RAIs, Entergy has also not resolved the staff's concerns regarding the need for post-EPU testing of modifications made to the condensate and feedwater system.

The NRC staff has decided that several license conditions and a regulatory commitment, as shown in the enclosure to this letter, will be necessary to address the staff's concerns or to confirm predictions and assertions you have made. One of the conditions slightly modifies a condition proposed in Entergy's letter dated September 28, 2005, pertaining to the minimum critical power ratio (addresses concerns related to uncertainties in the GE methods). Another condition, pertaining to monitoring and evaluating potential adverse flow effects (including steam dryer structural integrity), adds new requirements to a condition proposed in Entergy's letter dated September 14, 2005. A third condition, proposed by the NRC staff, pertains to transient testing of the condensate and feedwater system. The proposed regulatory commitment pertains to actions associated with the license condition addressing potential adverse flow effects.

In order to support the issuance of the draft SE by October 21, 2005, Entergy is requested to submit a supplement to the EPU application by October 17, 2005, accepting the license conditions and regulatory commitment proposed in the enclosure to this letter. It should be noted, however, that your acceptance does not constitute completion of the staff's review of the EPU application.

If you have any questions, please contact the VYNPS Project Manager, Mr. Richard Ennis, at (301) 415-1420.

Sincerely,

/RA/

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosure: As stated

cc w/encl.: See next page

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Proposed New License Conditions and Regulatory Commitment for Facility License DPR-28
In Support of Vermont Yankee Nuclear Power Station Extended Power Uprate Review

Proposed License Conditions

As part of the proposed extended power uprate amendment for the Vermont Yankee Nuclear Power Station, license conditions 3.K, 3.L, and 3.M would be added to Facility Operating License DPR-28 as follows:

K. Minimum Critical Power Ratio

When operating at thermal power greater than 1593 megawatts thermal, the safety limit minimum critical power ratio (SLMCPR) shall be established by adding 0.02 to the cycle-specific SLMCPR value calculated using the NRC-approved methodologies documented in General Electric Licensing Topical Report NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," as amended, and documented in the Core Operating Limits Report.

L. Transient Testing

During the extended power uprate (EPU) power ascension test program and prior to exceeding 168 hours of plant operation at the nominal full EPU reactor power level, with feedwater and condensate flow rates stabilized at approximately the EPU full power level, Entergy Nuclear Operations, Inc. shall confirm (1) through performance of transient testing that the loss of one condensate pump will not result in a complete loss of reactor feedwater and (2) through performance of additional transient testing, or analysis of the results of the testing conducted in (1) above, that the loss of one reactor feedwater pump will not result in a reactor trip.

M. Potential Adverse Flow Effects

This license condition provides for monitoring, evaluating, and taking prompt action in response to potential adverse flow effects as a result of power uprate operation on plant structures, systems, and components (including verifying the continued structural integrity of the steam dryer).

1. The following requirements are placed on operation of the facility above the original licensed thermal power (OLTP) level of 1593 megawatts thermal (MWt):

   a. Entergy Nuclear Operations, Inc. shall monitor hourly the 32 main steam line (MSL) strain gages during power ascension above 1593 MWt for increasing pressure fluctuations in the steam lines.

   b. Entergy Nuclear Operations, Inc. shall hold the facility for 24 hours at 105%, 110%, and 115% of OLTP to collect data from the 32 MSL strain gages required by Condition M.1.a, conduct plant inspections and walkdowns, and evaluate steam dryer performance based on these data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.

c. If any frequency peak from the MSL strain gage data exceeds the limit curve established by Entergy Nuclear Operations, Inc. and submitted to the NRC staff prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall return the facility to a power level at which the limit curve is not exceeded. Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.

d. In addition to evaluating the MSL strain gage data, Entergy Nuclear Operations, Inc. shall monitor reactor pressure vessel water level instrumentation and MSL piping accelerometers on an hourly basis during power ascension above OLTP. If resonance frequencies are identified as increasing above nominal levels established at OLTP conditions, Entergy Nuclear Operations, Inc. shall stop power ascension, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.

e. Following start-up testing, Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis and provide that resolution to the NRC staff by facsimile or electronic transmission to the NRC project manager. If the uncertainties are not resolved within 90 days of issuance of the license amendment authorizing operation at 1912 MWt, Entergy Nuclear Operations, Inc. shall return the facility to OLTP.

2. As described in Entergy Nuclear Operations, Inc. letter BVY 05-084 dated September 14, 2005, Entergy Nuclear Operations, Inc. shall implement the following actions:

a. Prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall install 32 additional strain gages on the main steam piping and shall enhance the data acquisition system in order to reduce the measurement uncertainty associated with the acoustic circuit model (ACM).

b. In the event that acoustic signals are identified that challenge the limit curve during power ascension above OLTP, Entergy Nuclear Operations, Inc. shall evaluate dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency.

c. After reaching 120% of OLTP, Entergy Nuclear Operations, Inc. shall obtain measurements from the MSL strain gages and establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the dryer stress report, and re-establish the steam dryer monitoring plan (SDMP) limit curve with the updated ACM load definition and revised instrument uncertainty, which will be provided to the NRC staff.

d. During power ascension above OLTP, if an engineering evaluation is required in accordance with the SDMP, Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to ±10% and assure that peak responses that fall within this uncertainty band are addressed.

e. Entergy Nuclear Operations, Inc. shall revise the SDMP to reflect long-term monitoring of plant parameters potentially indicative of steam dryer failure; to reflect consistency of the facility's steam dryer inspection program with General Electric Services Information Letter 644, Revision 1; and to identify the NRC Project Manager for the facility as the point of contact for providing SDMP information during power ascension.

f. Entergy Nuclear Operations, Inc. shall submit the final extended power uprate (EPU) steam dryer load definition for the facility to the NRC upon completion of the power ascension test program.

g. Entergy Nuclear Operations, Inc. shall submit the flow-induced vibration related portions of the EPU startup test procedure to the NRC, including methodology for updating the limit curve, prior to initial power ascension above OLTP.

3. Entergy Nuclear Operations, Inc. shall prepare the EPU startup test procedure to include the (a) stress limit curve to be applied for evaluating steam dryer performance; (b) specific hold points and their duration during EPU power ascension; (c) activities to be accomplished during hold points; (d) plant parameters to be monitored; (e) inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during the hold points; (f) methods to be used to trend plant parameters; (g) acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections; (h) actions to be taken if acceptance criteria are not satisfied; and (i) verification of the completion of commitments and planned actions specified in its application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer prior to power increase above OLTP. Entergy Nuclear Operations, Inc. shall submit the EPU startup test procedure to the NRC by facsimile or electronic transmission to the NRC project manager prior to increasing power above OLTP.

4. When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04.

5. 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.

6. 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.

7. The requirements of paragraph 4 above for meeting the SDMP 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 paragraph 4 shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.

8. This license condition shall expire upon satisfaction of the requirements in paragraphs 5, 6, and 7 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.

Proposed Regulatory Commitment

In addition to the license conditions proposed above, the licensee is requested to make the following regulatory commitment:

With regard to License Condition 3.M, "Potential Adverse Flow Effects," Entergy will provide information on plant data, evaluations, walkdowns, inspections, and procedures associated with the individual requirements of that license condition to the NRC staff prior to increasing power above 1593 MWt or each specified hold point, as applicable. If any safety concerns are identified during the NRC staff review of the provided information, Entergy will not increase power above 1593 MWt or the applicable hold point, and the specific requirements in the license condition will not be satisfied.

March 2, 2006

Mr. Michael Kansler
President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - ISSUANCE OF AMENDMENT RE: EXTENDED POWER UPRATE (TAC NO. MC0761)

Dear Mr. Kansler:

The Commission has issued the enclosed Amendment No. 229 to Facility Operating License No. DPR-28 for the Vermont Yankee Nuclear Power Station (VYNPS), in response to your application dated September 10, 2003, as supplemented by letters dated October 1, and October 28 (2 letters), 2003; January 31 (2 letters), March 4, May 19, July 2, July 27, July 30, August 12, August 25, September 14, September 15, September 23, September 30 (2 letters), October 5, October 7 (2 letters), December 8, and December 9, 2004; February 24, March 10, March 24, March 31, April 5, April 22, June 2, August 1, August 4, September 10, September 14, September 18, September 28, October 17, October 21 (2 letters), October 26, October 29, November 2, November 22, and December 2, 2005; January 10, and February 22, 2006.

The amendment increases the maximum authorized power level for VYNPS from 1593 megawatts thermal (MWt) to 1912 MWt, which is an increase of approximately 20 percent. The increase in power level is considered an extended power uprate (EPU). The amendment includes revisions to the VYNPS Operating License and Technical Specifications that are necessary to implement the EPU.

The related Safety Evaluation (SE) has been determined to contain proprietary information pursuant to Title 10 of the *Code of Federal Regulations*, Section 2.390. Accordingly, the NRC staff has prepared a redacted, publicly-available, non-proprietary version of the SE. Copies of the proprietary and non-proprietary versions of the SE are enclosed.

Docket No. 7195
Attachment 6-2
15 Pages

A copy of the "Notice of Issuance of Amendment to Facility Operating License and Final Determination of No Significant Hazards Consideration," which is being forwarded to the Office of the Federal Register for publication, is also enclosed.

Sincerely,

/RA/

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosures:
1. Amendment No. 229 to License No. DPR-28
2. Non-proprietary SE
3. Proprietary SE
4. Notice

cc w/encls 1, 2, and 4: See next page

Distribution for letter dated: March 2, 2006

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - ISSUANCE OF AMENDMENT RE: EXTENDED POWER UPRATE (TAC NO. MC0761)

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ENTERGY NUCLEAR VERMONT YANKEE, LLC

AND ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-271

VERMONT YANKEE NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 229
License No. DPR-28

1. The Nuclear Regulatory Commission (the Commission) has found that:

A. The application for amendment filed by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (the licensee) on September 10, 2003, as supplemented by letters dated October 1, and October 28 (2 letters), 2003; January 31 (2 letters), March 4, May 19, July 2, July 27, July 30, August 12, August 25, September 14, September 15, September 23, September 30 (2 letters), October 5, October 7 (2 letters), December 8, and December 9, 2004; February 24, March 10, March 24, March 31, April 5, April 22, June 2, August 1, August 4, September 10, September 14, September 18, September 28, October 17, October 21 (2 letters), October 26, October 29, November 2, November 22, and December 2, 2005; January 10, and February 22, 2006, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Facility Operating License No. DPR-28 is hereby amended to read as follows:

(B) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 229, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

In addition, the license is amended to revise paragraph 3.A of Facility Operating License No. DPR-28 to reflect the new maximum licensed reactor core power level of 1912 megawatts thermal. The licensee is also amended to add new license conditions 3.K, 3.L, and 3.M as follows:

K. Minimum Critical Power Ratio

When operating at thermal power greater than 1593 megawatts thermal, the safety limit minimum critical power ratio (SLMCPR) shall be established by adding 0.02 to the cycle-specific SLMCPR value calculated using the NRC-approved methodologies documented in General Electric Licensing Topical Report NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," as amended, and documented in the Core Operating Limits Report.

L. Transient Testing

1. During the extended power uprate (EPU) power ascension test program and prior to exceeding 168 hours of plant operation at the nominal full EPU reactor power level, with feedwater and condensate flow rates stabilized at approximately the EPU full power level, Entergy Nuclear Operations, Inc. shall confirm through performance of transient testing that the loss of one condensate pump will not result in a complete loss of reactor feedwater.

2. Within 30 days at nominal full-power operation following successful performance of the test in (1) above, through performance of additional transient testing and/or analysis of the results of the testing conducted in (1) above, confirm that the loss of one reactor feedwater pump will not result in a reactor trip.

M. Potential Adverse Flow Effects

This license condition provides for monitoring, evaluating, and taking prompt action in response to potential adverse flow effects as a result of power uprate operation on plant structures, systems, and components (including verifying the continued structural integrity of the steam dryer).

1. The following requirements are placed on operation of the facility above the original licensed thermal power (OLTP) level of 1593 megawatts thermal (MWt):

a. Entergy Nuclear Operations, Inc. shall monitor hourly the 32 main steam line (MSL) strain gages during power ascension above 1593 MWt for increasing pressure fluctuations in the steam lines.

b. Entergy Nuclear Operations, Inc. shall hold the facility for 24 hours at 105%, 110%, and 115% of OLTP to collect data from the 32 MSL strain gages required by Condition M.1.a, conduct plant inspections and walkdowns, and evaluate steam dryer performance based on these data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.

c. If any frequency peak from the MSL strain gage data exceeds the limit curve established by Entergy Nuclear Operations, Inc. and submitted to the NRC staff prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall return the facility to a power level at which the limit curve is not exceeded. Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.

d. In addition to evaluating the MSL strain gage data, Entergy Nuclear Operations, Inc. shall monitor reactor pressure vessel water level instrumentation or MSL piping accelerometers on an hourly basis during power ascension above OLTP. If resonance frequencies are identified as increasing above nominal levels in proportion to strain gage instrumentation data, Entergy Nuclear Operations, Inc. shall stop power ascension, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.

e. Following start-up testing, Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis and provide that resolution to the NRC staff by facsimile or electronic transmission to the NRC project manager. If the uncertainties are not resolved within 90 days of issuance of the license amendment authorizing operation at 1912 MWt, Entergy Nuclear Operations, Inc. shall return the facility to OLTP.

2. As described in Entergy Nuclear Operations, Inc. letter BVY 05-084 dated September 14, 2005, Entergy Nuclear Operations, Inc. shall implement the following actions:

   a. Prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall install 32 additional strain gages on the main steam piping and shall enhance the data acquisition system in order to reduce the measurement uncertainty associated with the acoustic circuit model (ACM).

b. In the event that acoustic signals are identified that challenge the limit curve during power ascension above OLTP, Entergy Nuclear Operations, Inc. shall evaluate dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency.

c. After reaching 120% of OLTP, Entergy Nuclear Operations, Inc. shall obtain measurements from the MSL strain gages and establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the dryer stress report, and re-establish the steam dryer monitoring plan (SDMP) limit curve with the updated ACM load definition and revised instrument uncertainty, which will be provided to the NRC staff.

d. During power ascension above OLTP, if an engineering evaluation is required in accordance with the SDMP, Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to ±10% and assure that peak responses that fall within this uncertainty band are addressed.

e. Entergy Nuclear Operations, Inc. shall revise the SDMP to reflect long-term monitoring of plant parameters potentially indicative of steam dryer failure; to reflect consistency of the facility's steam dryer inspection program with General Electric Services Information Letter 644, Revision 1; and to identify the NRC Project Manager for the facility as the point of contact for providing SDMP information during power ascension.

f. Entergy Nuclear Operations, Inc. shall submit the final extended power uprate (EPU) steam dryer load definition for the facility to the NRC upon completion of the power ascension test program.

g. Entergy Nuclear Operations, Inc. shall submit the flow-induced vibration related portions of the EPU startup test procedure to the NRC, including methodology for updating the limit curve, prior to initial power ascension above OLTP.

3. Entergy Nuclear Operations, Inc. shall prepare the EPU startup test procedure to include the (a) stress limit curve to be applied for evaluating steam dryer performance; (b) specific hold points and their duration during EPU power ascension; (c) activities to be accomplished during hold points; (d) plant parameters to be monitored; (e) inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during the hold points; (f) methods to be used to trend plant parameters; (g) acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections; (h) actions to be taken if acceptance criteria are not satisfied; and (i) verification of the completion of commitments and planned actions specified in its application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer prior to power increase above OLTP. Entergy Nuclear Operations, Inc. shall provide the related EPU startup test procedure sections to the NRC by facsimile or electronic transmission to the NRC project manager prior to increasing power above OLTP.

4. When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04.

5. 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.

6. 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.

7. The requirements of paragraph 4 above for meeting the SDMP 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 paragraph 4 shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.

8. This license condition shall expire upon satisfaction of the requirements in paragraphs 5, 6, and 7 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.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

Attachment: Changes to the Operating License
and Technical Specifications

Date of Issuance: March 2, 2006

ATTACHMENT TO LICENSE AMENDMENT NO. 229

FACILITY OPERATING LICENSE NO. DPR-28

DOCKET NO. 50-271

Replace the following pages of the Facility Operating License and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility Operating License

Remove	Insert
3	3
9	9
---	10
---	11
---	12
---	13

Technical Specifications

Remove	Insert
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6	6
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228	228

U.S. NUCLEAR REGULATORY COMMISSION

ENTERGY NUCLEAR VERMONT YANKEE, LLC AND

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-271

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

AND FINAL DETERMINATION OF NO SIGNIFICANT

HAZARDS CONSIDERATION

The U.S. Nuclear Regulatory Commission (Commission) has issued Amendment No. 229 to Facility Operating License No. DPR-28, issued to Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (the licensee), which revised the Technical Specifications (TSs) and License for operation of the Vermont Yankee Nuclear Power Station (VYNPS) located in Windham County, Vermont. The amendment was effective as of the date of its issuance.

The amendment increases the maximum authorized power level for VYNPS from 1593 megawatts thermal (MWt) to 1912 MWt, which is an increase of approximately 20 percent. The increase in power level is considered an extended power uprate.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment.

The Commission published a "Notice of Consideration of Issuance of Amendment to Facility Operating License and Opportunity for a Hearing" related to this action in the FEDERAL REGISTER on July 1, 2004 (69 FR 39976). This Notice provided 60 days for the public to request a hearing. On August 30, 2004, the Vermont Department of Public Service and the New England Coalition filed requests for hearing in connection with the proposed amendment. By Order dated November 22, 2004, the Atomic Safety and Licensing Board (ASLB) granted those hearing requests and by Order dated December 16, 2004, the ASLB issued its decision to conduct a hearing using the procedures in 10 CFR Part 2, Subpart L, "Informal Hearing Procedures for NRC Adjudications."

The Commission published a "Notice of Consideration of Issuance of Amendment to Facility Operating License and Proposed No Significant Hazards Consideration Determination" related to this action in the FEDERAL REGISTER on January 11, 2006 (71 FR 1744). This Notice provided 30 days for public comment. The Commission received comments on the proposed no significant hazards consideration as discussed below.

Under its regulations, the Commission may issue and make an amendment immediately effective, notwithstanding the pendency before it of a request for a hearing from any person, in advance of the holding and completion of any required hearing, where it has determined that no significant hazards consideration is involved.

The Commission has applied the standards of 10 CFR 50.92 and has made a final determination that the amendment involves no significant hazards consideration. Public comments received on the proposed no significant hazards consideration determination were considered in making the final determination. The basis for this determination is contained in the Safety Evaluation related to this action. Accordingly, as described above, the amendment has been issued and made immediately effective and any hearing will be held after issuance.

The Commission published an Environmental Assessment related to the action in the FEDERAL REGISTER on January 27, 2006 (71 FR 4614). Based on the Environmental Assessment, the Commission concluded that the action will not have a significant effect on the quality of the human environment. Accordingly, the Commission determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to this action, see the application for amendment dated September 10, 2003, as supplemented by letters dated October 1, and October 28 (2 letters), 2003; January 31 (2 letters), March 4, May 19, July 2, July 27, July 30, August 12, August 25, September 14, September 15, September 23, September 30 (2 letters), October 5, October 7 (2 letters), December 8, and December 9, 2004; February 24, March 10, March 24, March 31, April 5, April 22, June 2, August 1, August 4, September 10, September 14, September 18, September 28, October 17, October 21 (2 letters), October 26, October 29, November 2, November 22, and December 2, 2005; January 10, and February 22, 2006, which is available for public inspection at the Commission's PDR, located at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the Agencywide Documents Access and Management System's (ADAMS) Public Electronic Reading Room on the Internet at the NRC Web site, http://www.nrc.gov/reading-rm/adams.html. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS, should contact the NRC PDR Reference staff by telephone at 1-800-397-4209, 301-415-4737, or by e-mail to pdr@nrc.gov.

Dated at Rockville, Maryland, this 2nd day of March, 2006.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

April 5, 2006

MEMORANDUM TO: Darrell J. Roberts, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Kamal A. Manoly, Chief /RA/
Engineering Mechanics Branch
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: STAFF TECHNICAL BASIS FOR CONTINUED POWER ASCENSION OF VERMONT YANKEE NUCLEAR POWER STATION UP TO 110% ORIGINAL LICENSED THERMAL POWER (TAC NO. MD0263)

Introduction

On March 2, 2006, the U.S. Nuclear Regulatory Commission (NRC) approved the request by Entergy Nuclear Operations, Inc. (Entergy) to increase the maximum authorized power level for Vermont Yankee Nuclear Power Station (Vermont Yankee) from 1593 Megawatts thermal (MWt) to 1912 MWt as an extended power uprate (EPU) equivalent to 120% of the original licensed thermal power (OLTP). During the subsequent power ascension at Vermont Yankee, plant instrumentation reached an initial administrative limit that required the licensee to evaluate the plant data before continuing the power ascension. On March 26, Entergy submitted its justification for continued power ascension at Vermont Yankee up to 110% OLTP. The NRC staff has reviewed the licensee's justification for continued power ascension at Vermont Yankee. Entergy will need to justify power ascension beyond 110% OLTP based on its review of plant data collected up to that power level. A narrative of the NRC staff's review of the licensee's justification for continued power ascension at Vermont Yankee is provided below.

Background

Following receipt of the EPU license amendment, Entergy began to slowly increase reactor power above OLTP on March 4, 2006, at Vermont Yankee in accordance with its power ascension test procedure. The EPU amendment included a license condition that provides for monitoring, evaluating, and taking prompt action in response to potential adverse flow effects as a result of power uprate operation on structures, systems, and components (including verifying the continued structural integrity of the steam dryer) at Vermont Yankee.

CONTACT: Thomas G. Scarbrough, DCI/CPTB
301-415-2794

Docket No. 7195
Attachment 7-1
4 Pages

The Vermont Yankee power ascension procedure specifies that (1) the power ascension rate be no more than 16 MWt per hour; (2) steam dryer performance data be monitored hourly and compared to acceptance criteria; (3) power level be held for 4 hours at each 40 MWt step (2.5% OLTP) to obtain and evaluate additional plant performance data; and (4) power level be held for 96 hours at each 80 MWt plateau (5% OLTP) to conduct plant walkdowns and to perform steam dryer analysis with NRC staff review. Entergy has made a regulatory commitment to not increase power at Vermont Yankee if the NRC staff identifies a safety concern during its evaluation of the plant data.

As part of the plant data evaluation, Entergy collects Main Steam Line (MSL) strain gage data to monitor pressure fluctuations within the main steam flow. The licensee inputs the MSL strain gage data into an acoustic circuit model (ACM) to calculate pressure loads on the steam dryer and the resulting stress in steam dryer components using a finite element model (FEM). The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) establishes a Level 1 limit curve for the MSL strain versus frequency spectra based on the American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (Code) fatigue stress limit of 13,600 pounds per square inch (psi), and a Level 2 limit curve based on 80% of that fatigue limit. If the Level 2 limit curve is reached, the SDMP specifies that power ascension be suspended until an engineering evaluation concludes that further power ascension is justified. If the Level 1 limit curve is reached, the licensee must reduce power until the curve is not exceeded.

On March 5, Entergy notified the NRC staff that the MSL strain gage data from the "A" MSL at Vermont Yankee had reached the Level 2 limit at 105% OLTP. Entergy's evaluation of the MSL strain gage and accelerometer data concluded that it was acceptable to maintain plant operation at 105% OLTP while the engineering evaluation was performed. The NRC staff independently evaluated the 105% OLTP data, and concluded that continued plant operation at 105% OLTP was reasonable and acceptable.

Licensee Justification for Power Ascension up to 110% OLTP

On March 26, 2006, Entergy completed its engineering evaluation of the Vermont Yankee steam dryer and its justification for continued power ascension to 110% OLTP. The engineering evaluation used (1) an improved ACM that is more bounding of actual steam dryer loads with reduced uncertainty; (2) an updated FEM that refines the assessment of the gusset shoe area that was of concern in a similar steam dryer at the Dresden nuclear power plant; (3) a more precise MSL strain gage data acquisition system designed to reduce the measurement uncertainty in the acoustic signals; and (4) MSL strain gage data collected at 105% OLTP.

Entergy verified that the stress in the Vermont Yankee steam dryer components remains significantly below the ASME Code fatigue stress limit of 13,600 psi at 105% OLTP. Further, the reduced uncertainty in the ACM and the MSL strain gage data acquisition system allowed Entergy to raise the limit curve for the MSL strain gage measurements while maintaining the resulting stress in the steam dryer below the ASME Code fatigue stress limit. The new limit curve has been incorporated into a revision of the Vermont Yankee SDMP.

Based on its engineering evaluation, Entergy has determined that continued power ascension to 110% OLTP will not cause stress exceedance in the steam dryer components that would challenge the structural integrity of the dryer.

NRC Staff Evaluation

The NRC staff, with support from its consultants from Argonne National Laboratory, has reviewed Entergy's engineering evaluation consisting of multiple analyses, data, and figures. The staff's review of the licensee's generic application of uncertainty assumptions for the revised ACM and improved MSL strain gage instrumentation is continuing. At this time, the staff has evaluated the licensee's basis for continued power ascension at Vermont Yankee up to 110% OLTP, including the calculation of the stresses on the steam dryer components at 105% OLTP and the establishment of new limit curves for MSL strain gage data in support of operation up to 110% OLTP.

The Vermont Yankee steam dryer analysis indicates that the steam dryer gusset shoe area is the most limiting stress location on the Vermont Yankee steam dryer for EPU operation. The stress on this component at 105% OLTP is calculated to be 2321 psi from the ACM and 599 psi from the Computational Fluid Dynamics (CFD) analyses. If the MSL strain gage measurements increase up to the new Level 1 limit curve in all four steam lines, the stress at this location is projected to be 9866 psi. This stress is about 40% less than the ASME Code fatigue limit of 13,600 psi. The Vermont Yankee SDMP provides additional margin in that power ascension must be halted and the collected data evaluated if any portion of the measured MSL strain-frequency spectra reaches the Level 2 limit (80% of the 13,600 psi limit) for any of the four steam lines.

As part of its review, the staff compared the Vermont Yankee MSL strain gage limit curves established for initial power ascension to the new limit curves based on the revised ACM and more accurate MSL strain gage data. Although the new limit curves permit a higher MSL strain gage signal than the initial curves, the allowed MSL strain levels continue to be low. Higher strain peaks at the resonance frequencies experienced at 105% OLTP were acceptable to be included in the limit curve based on their insignificant contribution to the total resulting stress. Since the only instrumented steam dryer among the operating U.S. boiling water reactors is that at Quad Cities Unit 2 and the original steam dryers at Quad Cities were the only dryers at U.S. plants that have experienced severe damage under EPU conditions, the revised Level 1 limit curve for Vermont Yankee was compared to the MSL data measured at Quad Cities Unit 2. The comparison indicated that the Vermont Yankee revised Level 1 limit was significantly below the MSL data measured at Quad Cities Unit 2. Further, the Vermont Yankee SDMP will require the licensee to halt power ascension if any acoustic signal from the Vermont Yankee MSL strain gage data in any MSL reaches the Level 2 limit curve, which is 80% of the Level 1 limit curve. With respect to the low-frequency regions of MSL strain gage data, the staff will ensure that Entergy closely monitors those low frequency areas during future power ascension where the Vermont Yankee Level 1 limit curve is above the measured Quad Cities Unit 2 MSL data.

The NRC staff is reviewing the recently identified cracking in the skirt region of the steam dryer at Quad Cities Unit 2. The Quad Cities licensee has initiated an extensive effort to determine the cause of the cracking. Prior to the current outage, Quad Cities Unit 2 operated at up to 117% of the original licensed power for about 6 months with substantial high-frequency acoustic loads on the steam dryer. Entergy has evaluated the applicability of the Quad Cities Unit 2 information to Vermont Yankee. The staff reviewed Entergy's evaluation of the applicability of the Quad Cities Unit 2 steam dryer cracking to Vermont Yankee. Entergy applied a more conservative damping assumption in its assessment of the steam dryer skirt at Vermont Yankee than that used at Quad Cities. Even with this more conservative damping assumption, the stress in the skirt region of the Vermont Yankee steam dryer is calculated to be less than 1000 psi at 105% OLTP. Therefore, there is considerable margin in the stress analysis for the skirt region at Vermont Yankee to account for damping and other assumptions. The staff does not consider the cracking in the skirt region of the Quad Cities Unit 2 steam dryer to raise a safety concern with power ascension at Vermont Yankee up to 110% OLTP.

Conclusion

Based on its review of the Entergy's engineering evaluation, the NRC staff concludes that the licensee has provided a reasonable basis for continuing power ascension up to 110% OLTP at Vermont Yankee, including (1) plant performance limit curves that maintain MSL strain gage data far lower than the Quad Cities data in the high-frequency acoustic range; (2) frequent monitoring of plant performance data, including hourly collection of the MSL strain gage data; and (3) plant procedures that halt power ascension if any portion of the measured MSL strain vs. frequency spectra reach the Level 2 limit curve for any Vermont Yankee MSL. On March 31, 2006, the NRC staff informed Entergy that the staff did not object to the continued power ascension process at Vermont Yankee up to 110% OLTP. The staff will continue to discuss the steam dryer analysis and its assumptions with Entergy as part of the review of the revised ACM for generic use at Vermont Yankee and other nuclear power plants. The staff will ensure that Entergy closely monitors the MSL strain gage data for any increases toward the limit curves during the power ascension at Vermont Yankee. The staff will review Entergy's justification for continued power uprate operation, including further power ascension, based on the plant data collected during this next power ascension step.

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*previously concurred

ADAMS NO.: ML060970111

OFFICE	NRR/DCI/CPTB	NRR/DE/EEMB	NRR/DE/EEMB		
NAME	TScarbrough	CWu	KManoly		
DATE	04/04/06	04/05/06	04/05/06		

OFFICIAL RECORD COPY

April 28, 2006

MEMORANDUM TO: Darrell J. Roberts, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Kamal A. Manoly, Chief /RA/
Engineering Mechanics Branch
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: STAFF TECHNICAL BASIS FOR CONTINUED POWER ASCENSION OF VERMONT YANKEE NUCLEAR POWER STATION UP TO 115% ORIGINAL LICENSED THERMAL POWER (TAC NO. MD0263)

Introduction

On March 2, 2006, the U.S. Nuclear Regulatory Commission (NRC) approved the request by Entergy Nuclear Operations, Inc. (Entergy) to increase the maximum authorized power level for Vermont Yankee Nuclear Power Station (Vermont Yankee) from 1593 Megawatts thermal (MWt) to 1912 MWt as an extended power uprate (EPU) equivalent to 120% of the original licensed thermal power (OLTP). During the initial power ascension at Vermont Yankee, plant instrumentation reached an administrative limit at 105% OLTP that required the licensee to evaluate the plant data before continuing the power ascension. As documented in a staff memorandum dated April 5, 2006, the licensee justified continued power ascension at Vermont Yankee. Upon achieving 112.5% OLTP (1791 MWt) on April 6 , Entergy informed the staff that plant instrumentation at Vermont Yankee had again reached an administrative limit that required evaluation. On April 20, Entergy submitted its evaluation to justify continued power ascension beyond 112.5% OLTP. On April 21, the staff informed Entergy that it did not object to the continued power ascension of Vermont Yankee up to 115% OLTP. A narrative of the NRC staff's review of the licensee's justification for continued power ascension at Vermont Yankee is provided below.

Background

Following receipt of the EPU license amendment, Entergy began to slowly increase reactor power at Vermont Yankee above OLTP on March 4, 2006, in accordance with its power ascension test procedure. The EPU amendment included a license condition that provides for monitoring and evaluating plant data at Vermont Yankee, and taking prompt action in response to potential adverse flow effects as a result of power uprate operation on structures, systems, and components (including verifying the continued structural integrity of the steam dryer).

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Docket No. 7195
Attachment 7-2
4 Pages

The Vermont Yankee power ascension procedure specifies that (1) the power ascension rate be no more than 16 MWt per hour; (2) steam dryer performance data be monitored hourly and compared to acceptance criteria; (3) power level be held for 4 hours at each 40 MWt step (2.5% OLTP) to obtain and evaluate additional plant performance data; and (4) power level be held for 96 hours at each 80 MWt plateau (5% OLTP) to conduct plant walkdowns and to perform steam dryer analysis whose results would be examined by the NRC staff. Entergy made a regulatory commitment to not increase power at Vermont Yankee if the NRC staff identified a safety concern during its evaluation of the plant data.

As part of the plant data evaluation, Entergy collects Main Steam Line (MSL) strain gage data to monitor pressure fluctuations within the main steam flow. The licensee inputs the MSL strain gage data into an acoustic circuit model (ACM) to calculate pressure loads on the steam dryer and the resulting stress in steam dryer components using a finite element model (FEM). The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) establishes a Level 1 limit curve for the MSL strain versus frequency spectra based on the American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (Code) fatigue stress limit of 13,600 pounds per square inch (psi), and a Level 2 limit curve based on 80% of that fatigue limit. If the Level 2 limit curve is reached, the SDMP specifies that power ascension be suspended until an engineering evaluation concludes that further power ascension is justified. If the Level 1 limit curve is reached, the licensee must reduce power until the curve is not exceeded.

On March 5, Entergy notified the NRC staff that the MSL strain gage data from the "A" MSL at Vermont Yankee had reached the Level 2 limit at 105% OLTP. On March 26, Entergy completed its engineering evaluation of the Vermont Yankee steam dryer and its justification for continued power ascension to 110% OLTP. Entergy verified that the stress in the Vermont Yankee steam dryer components remained significantly below the ASME Code fatigue stress limit of 13,600 psi at 105% OLTP. Based on its engineering evaluation, Entergy determined that continued power ascension to 110% OLTP would not cause stress exceedance in the steam dryer components that would challenge the structural integrity of the dryer. The NRC staff reviewed the licensee's justification for continued power ascension at Vermont Yankee beyond 105% OLTP. The NRC staff informed Entergy on March 31 that it did not have a safety concern with power ascension up to 110% OLTP, and documented its decision in a memorandum dated April 5, 2006. Subsequently, the licensee continued the power ascension at Vermont Yankee, and achieved 110% OLTP with the collected data remaining within the acceptance criteria. The staff reviewed the plant data, and did not object to continued power ascension up to 115% OLTP.

Licensee Justification for Power Ascension up to 115% OLTP

During further power ascension at Vermont Yankee, Entergy informed the NRC staff on April 6 that plant instrumentation at Vermont Yankee had reached an administrative limit at 112.5% OLTP that required evaluation. In particular, the licensee reported that the MSL strain gage data from the "A" MSL reached the Level 2 limit at a frequency resonance peak of 143 Hz. The licensee provided the specific plant data that supported its decision to remain at 112.5% OLTP while evaluating the data. The staff reviewed the plant data and held telephone discussions regarding the data with the licensee. Based on its review, the staff did not object to Vermont Yankee remaining at 112.5% OLTP while the licensee evaluated the plant data.

On April 20, Entergy submitted its evaluation of the plant data to justify continued power ascension at Vermont Yankee beyond 112.5% OLTP. The licensee recalculated the stress on the steam dryer using the plant data from 112.5% OLTP and its current version of the ACM. As part of its analysis, the licensee adjusted the uncertainty associated with the ability of the ACM to match the frequency spectra from 15% to 25%. The licensee then recalculated the Level 1 and Level 2 limit curves for the MSL strain gage data using plant data from 112.5% OLTP and the updated uncertainty values. The licensee incorporated the new limit curves into a revision of the Vermont Yankee SDMP. Based on its engineering evaluation, Entergy determined that continued power ascension to 115% OLTP would not cause stress exceedance in the steam dryer components that would challenge the structural integrity of the dryer.

NRC Staff Evaluation

The NRC staff, with support from its consultants from Argonne National Laboratory, reviewed Entergy's engineering evaluation consisting of multiple analyses, data, and figures. The staff's evaluation focused on the licensee's basis for continued power ascension at Vermont Yankee up to 115% OLTP. For example, the staff reviewed the calculation of the stresses on the steam dryer components at 112.5% OLTP, and the establishment of new limit curves for MSL strain gage data in support of operation up to 115% OLTP.

The Vermont Yankee steam dryer analysis indicates that the steam dryer gusset shoe area is the most limiting stress location on the Vermont Yankee steam dryer for EPU operation. The stress on this component at 112.5% OLTP was calculated to be 2688 psi from the ACM and 599 psi from the Computational Fluid Dynamics (CFD) analyses. If the MSL strain gage measurements increase up to the new Level 1 limit curve in all four steam lines, the stress at this location is projected to be 9514 psi. This stress is about 30% less than the ASME Code fatigue limit of 13,600 psi. The Vermont Yankee SDMP provides additional margin in that power ascension must be halted and the collected data evaluated if any portion of the measured MSL strain-frequency spectra reaches the Level 2 limit (80% of the 13,600 psi limit) for any of the four steam lines.

As part of its review, the staff compared the Vermont Yankee MSL strain gage limit curves from 105% OLTP to the new limit curves established at 112.5% OLTP. The 112.5% limit curves have a lower baseline limit resulting from the increased ACM uncertainty, but permit higher MSL strain gage signals at the resonance frequencies experienced at 112.5% OLTP. The higher resonance peaks are allowed to be included in the new limit curve based on their small contribution to the total resulting stress on the steam dryer. Also, the Vermont Yankee Level 1 limit remains below the MSL data measured in the high-frequency range of interest at Quad Cities Unit 2, which experienced severe steam dryer damage under EPU conditions. Further, the Vermont Yankee SDMP will require the licensee to halt power ascension if any acoustic signal from the Vermont Yankee MSL strain gage data in any MSL reaches the Level 2 limit curve, which is 80% of the Level 1 limit curve. With respect to the low-frequency regions of MSL strain gage data, the staff will ensure that Entergy closely monitors those low frequency areas during future power ascension.

Conclusion

Based on its review of the Entergy's engineering evaluation, the NRC staff concluded that the licensee provided a reasonable basis for continuing power ascension up to 115% OLTP at Vermont Yankee. The staff's conclusion is based on: (1) the calculated stress on the most limiting component of the Vermont Yankee steam dryer at 112.5% OLTP is significantly below the ASME Code fatigue limit; (2) plant performance limit curves maintain MSL strain gage data lower than the Quad Cities data in the high-frequency acoustic range; (3) frequent monitoring of plant performance data, including hourly collection of the MSL strain gage data, during power ascension; and (4) plant procedures halt power ascension if any portion of the measured MSL strain vs. frequency spectra reach the Level 2 limit curve for any Vermont Yankee MSL. On April 21, 2006, the NRC staff informed Entergy that the staff did not object to the continued power ascension process at Vermont Yankee up to 115% OLTP. The staff will ensure that Entergy closely monitors the MSL strain gage data for any increases toward the limit curves during the power ascension at Vermont Yankee. The staff will review Entergy's justification for continued power uprate operation, including further power ascension, based on the plant data collected during the next power ascension step. Further, the staff notes that a license condition requires that Entergy resolve the steam dryer analysis uncertainties within 90 days of issuance of the EPU license amendment.

June 20, 2006

MEMORANDUM TO: Darrell J. Roberts, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Kamal A. Manoly, Chief /RA/
Engineering Mechanics Branch
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: STAFF TECHNICAL BASIS FOR CONTINUED POWER ASCENSION OF VERMONT YANKEE NUCLEAR POWER STATION TO FULL EXTENDED POWER UPRATE CONDITIONS OF 120% ORIGINAL LICENSED THERMAL POWER (TAC NO. MD0263)

Introduction

On March 2, 2006, the U.S. Nuclear Regulatory Commission (NRC) approved the request by Entergy Nuclear Operations, Inc. (Entergy) to increase the maximum authorized power level for Vermont Yankee Nuclear Power Station (Vermont Yankee) from 1593 Megawatts thermal (MWt) to 1912 MWt as an extended power uprate (EPU) equivalent to 120% of the original licensed thermal power (OLTP). During the power ascension at Vermont Yankee, plant instrumentation reached an administrative limit at 105% OLTP (1673 MWt) and 112.5% OLTP (1791 MWt) that required the licensee to evaluate the plant data before continuing the power ascension. In memoranda dated April 5 and 28, 2006, the NRC staff documented its review of the licensee's justification for continued power ascension at Vermont Yankee from 105% and 112.5% OLTP, respectively.

Upon achieving 117.5% OLTP (1872 MWt) on April 28, Entergy informed the NRC staff that plant instrumentation at Vermont Yankee had again reached administrative limits that required evaluation. On May 1, Entergy made available for NRC review its evaluation to justify continued power ascension beyond 117.5% OLTP up to full EPU conditions of 120% OLTP (1912 MWt). The licensee submitted this information to the NRC in a letter dated May 4, 2006. Subsequently, the NRC staff informed Entergy on May 4 that it did not object to the continued power ascension of Vermont Yankee up to full EPU conditions (120% OLTP). A narrative of the NRC staff's review of the licensee's justification for continued power ascension at Vermont Yankee is provided.

CONTACT: Thomas G. Scarbrough, NRR/DCI/CPTB
(301) 415-2794

Docket No. 7195
Attachment 7-3
5 Pages

Background

Following receipt of the EPU license amendment, Entergy began to slowly increase reactor power at Vermont Yankee above OLTP on March 4, 2006, in accordance with its power ascension test procedure. The EPU amendment included a license condition that provides for monitoring and evaluating plant data at Vermont Yankee, and taking prompt action in response to potential adverse flow effects as a result of power uprate operation on structures, systems, and components (including verifying the continued structural integrity of the steam dryer).

The Vermont Yankee power ascension procedure specifies that (1) the power ascension rate be no more than 16 MWt per hour; (2) steam dryer performance data be monitored hourly and compared to acceptance criteria; (3) power level be held for 4 hours at each 40 MWt step (2.5% OLTP) to obtain and evaluate additional plant performance data; and (4) power level be held for 96 hours at each 80 MWt plateau (5% OLTP) to conduct plant walkdowns and to perform steam dryer analysis whose results would be examined by the NRC staff. Entergy made a regulatory commitment to not increase power at Vermont Yankee if the NRC staff identified a safety concern during its evaluation of the plant data.

As part of the plant data evaluation, Entergy collects Main Steam Line (MSL) strain gage data to monitor pressure fluctuations within the main steam flow. The licensee inputs the MSL strain gage data into an acoustic circuit model (ACM) to calculate pressure loads on the steam dryer and the resulting stress in steam dryer components using a finite element model (FEM). The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) establishes a Level 1 limit curve for the MSL strain versus frequency spectra based on the American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (Code) fatigue stress limit of 13,600 pounds per square inch (psi), and a Level 2 limit curve based on 80% of that fatigue limit. If the Level 2 limit curve is reached, the SDMP specifies that power ascension be suspended until an engineering evaluation concludes that further power ascension is justified. If the Level 1 limit curve is reached, the licensee must reduce power to the next lower power hold point when the limit curve was not exceeded.

On March 5, Entergy notified the NRC staff that the MSL strain gage data from the "A" MSL at Vermont Yankee had reached the Level 2 limit at 105% OLTP. On March 26, Entergy completed its engineering evaluation of the Vermont Yankee steam dryer and its justification for continued power ascension to 110% OLTP. Entergy verified that the stress in the Vermont Yankee steam dryer components remained significantly below the ASME Code fatigue stress limit of 13,600 psi at 105% OLTP. Based on its engineering evaluation, Entergy determined that continued power ascension to 110% OLTP would not cause stress exceedance in the steam dryer components that would challenge the structural integrity of the dryer. The NRC staff reviewed the licensee's justification for continued power ascension at Vermont Yankee beyond 105% OLTP, and informed Entergy on March 31 that it did not have a safety concern with power ascension up to 110% OLTP. The staff documented its decision in a memorandum dated April 5, 2006. Subsequently, the licensee continued the power ascension at Vermont Yankee, and achieved 110% OLTP with the collected data remaining within the acceptance criteria. The staff reviewed the plant data, and did not object to continued power ascension up to 115% OLTP.

On April 6, Entergy reported that the MSL strain gage data from the "A" MSL at Vermont Yankee reached the Level 2 limit at a frequency resonance peak of 143 Hz at 112.5% OLTP. On April 20, Entergy submitted its evaluation of the plant data to justify continued power ascension beyond 112.5% OLTP. The licensee verified that the stress in the Vermont Yankee steam dryer components remained significantly below the ASME Code fatigue stress limit of 13,600 psi. Based on its engineering evaluation, Entergy determined that continued power ascension to 115% OLTP would not cause stress exceedance in the steam dryer components that would challenge the structural integrity of the dryer. The NRC staff reviewed the licensee's justification for continued power ascension at Vermont Yankee beyond 112.5% OLTP, and informed Entergy on April 21 that it did not have a safety concern with power ascension up to 115% OLTP. The staff documented its decision in a memorandum dated April 28, 2006. Subsequently, the licensee continued the power ascension at Vermont Yankee, and achieved 115% OLTP on April 22, 2006. The data collected at 115% OLTP remained within the acceptance criteria. The staff reviewed the plant data, and did not object to continued power ascension beyond 115% OLTP on April 26, 2006.

<u>Licensee Justification for Power Ascension up to Full EPU Conditions (120% OLTP)</u>

During continued power ascension at Vermont Yankee, Entergy informed the NRC staff on April 28 that plant instrumentation had reached an administrative limit at 117.5% OLTP that required evaluation. In particular, the licensee reported that the upper and lower sets of MSL strain gages on the "A" MSL reached the Level 2 limit at a resonant peak frequency of 143 Hz. Plant chemistry measurements also indicated that the Level 2 limit of 0.1% for moisture carryover was exceeded at 117.5% OLTP. The licensee provided specific plant data that supported its decision to remain at 117.5% OLTP while evaluating the data. The staff reviewed the plant data and held telephone discussions regarding the data with the licensee. Based on its review, the staff did not object to Vermont Yankee remaining at 117.5% OLTP while the licensee evaluated the plant data.

On May 1, Entergy made available for NRC review its evaluation of the plant data in justifying continued power ascension at Vermont Yankee beyond 117.5% OLTP. Rather than applying the acoustic circuit model (ACM) at this intermediate power step, the licensee calculated the stress on the most limiting component (hood gusset shoe) of the Vermont Yankee steam dryer based on the combination of resulting stresses in the dryer that are derived using the measured MSL strain gage data at peak resonant frequencies during the power ascension. As a result, the licensee calculated that the steam dryer gusset shoe had a maximum stress of 3599 psi from acoustic loading. The stress from steam dryer loading calculated by the computational fluid dynamics (CFD) analysis remained at 599 psi. The licensee then recalculated the Level 1 and Level 2 limit curves for the MSL strain gage data using the plant data from 117.5% OLTP and the trend analysis. The licensee incorporated the new limit curves into a revision of the Vermont Yankee SDMP submitted on May 4, 2006.

With respect to moisture carryover, Entergy initiated increased monitoring of plant data in response to the Level 2 limit of 0.1% being exceeded. The increased monitoring found the moisture carryover values to remain about 0.11%. Entergy predicted that the moisture carryover would trend up to about 0.15% as power was increased to 120% OLTP.

Based on its engineering evaluation, Entergy determined that continued power ascension from 117.5% OLTP to full EPU conditions (120% OLTP) would not cause stress exceedance in the steam dryer components that would challenge the structural integrity of the dryer.

NRC Staff Evaluation

The NRC staff, with support from its consultants from Argonne National Laboratory, reviewed Entergy's engineering evaluation consisting of multiple analyses, data, and figures. The staff's evaluation focused on the licensee's basis for continued power ascension at Vermont Yankee from 117.5% up to full EPU conditions (120% OLTP). For example, the staff reviewed the calculation of the stresses on the steam dryer components at 117.5% OLTP, and the establishment of new limit curves for MSL strain gage data in support of operation up to 120% OLTP. The NRC license amendment for Vermont Yankee EPU operation dated March 2, 2006, specifies that, after reaching 120% OLTP, the licensee shall obtain measurements from the MSL strain gages, establish the steam dryer flow-induced vibration load fatigue margin, update the steam dryer stress report, and re-establish the SDMP limit curve with the updated ACM load definition; and shall resolve the steam dryer analysis uncertainties within 90 days of issuance of the EPU license amendment. The staff will review the continued operation of Vermont Yankee at EPU conditions upon submittal of the EPU plant data and the licensee's analysis to support long-term EPU operation.

For continued power ascension at Vermont Yankee from 117.5% OLTP to full EPU conditions (120% OLTP), the NRC staff reviewed the licensee's trend analysis of the MSL strain gage data used in calculating the stress in the steam dryer gusset shoe of 3599 psi from the acoustic loads at 117.5% OLTP for Vermont Yankee. The stress on the steam dryer gusset shoe from CFD loads continued to be calculated as 599 psi. When combined, the resulting stress on the steam dryer gusset shoe remains significantly below the ASME Code fatigue limit of 13,600 psi. To support the reliability of MSL strain gage trend analysis for the power increase from 1872 to 1912 MWt, the licensee showed that the Level 1 limit curve calculated by the MSL strain gage data trend analysis compared closely to the Level 1 limit curve calculated using the ACM analysis at 1792 MWt.

Based on its trend analysis of the MSL strain gage data, Entergy developed new limit curves for the continued power ascension up to 120% OLTP at Vermont Yankee. If the MSL strain gage measurements increase up to the new Level 1 limit curve in all four steam lines, the licensee projected that the stress in the steam dryer gusset shoe would be 9529 psi. This stress is about 30% less than the ASME Code fatigue limit of 13,600 psi. The Vermont Yankee SDMP provides additional margin in that power ascension must be halted and the collected data evaluated if any portion of the measured MSL strain-frequency spectra reaches the Level 2 limit (80% of the 13,600 psi limit) for any of the four steam lines.

As part of its review, the NRC staff compared the previous Vermont Yankee MSL strain gage limit curves to the new limit curves established at 117.5% OLTP. The 117.5% OLTP limit curves have a lower baseline limit, but permit higher MSL strain gage signals at the resonance frequencies experienced at 117.5% OLTP. The higher resonance peaks are allowed to be included in the new limit curve based on their small contribution to the total resulting stress on the steam dryer. Also, the Vermont Yankee Level 1 limit remains below previous MSL data measured in the high-frequency range of interest at Quad Cities Unit 2, which experienced severe steam dryer damage under EPU conditions at that time. Further, the Vermont Yankee SDMP will require the licensee to halt power ascension if any acoustic signal from the Vermont Yankee MSL strain gage data in any MSL reaches the Level 2 limit curve, which is 80% of the Level 1 limit curve.

The NRC staff is continuing to monitor the licensee's response to the increased values of moisture carryover with power ascension at Vermont Yankee. The moisture carryover values of about 0.11% at 117.5% OLTP are significantly below the Level 1 limit of 0.35%. Moisture carryover also remained steady with the more frequent data collection initiated with the Level 2 limit being exceeded. The predicted trend of moisture carryover to about 0.15% with additional power ascension is not unexpected with the reduced efficiency of the steam dryer during increased steam flow conditions.

Conclusion

Based on its review of the Entergy's engineering evaluation, the NRC staff concluded that the licensee provided a reasonable basis for continuing power ascension up to full EPU power (120% OLTP) at Vermont Yankee. The staff's conclusion is based on: (1) the calculated stress on the most limiting component of the Vermont Yankee steam dryer at 117.5% OLTP is significantly below the ASME Code fatigue limit; (2) plant performance limit curves maintain MSL strain gage data lower than previous Quad Cities data in the high-frequency acoustic range; (3) frequent monitoring of plant performance data, including MSL strain gage data and moisture carryover, during power ascension; and (4) plant procedures halt power ascension if any portion of the measured MSL strain vs. frequency spectra reach the Level 2 limit curve for any Vermont Yankee MSL. On May 4, 2006, the NRC staff informed Entergy that the staff did not object to the continued power ascension process at Vermont Yankee up to full EPU power level (120% OLTP). The staff will review Entergy's justification for long-term power uprate operation, based on the plant data collected during the power ascension to full EPU conditions.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

CHAIRMAN

May 4, 2004

Mr. Michael H. Dworkin, Chairman
Vermont Public Service Board
112 State Street, Drawer 20
Montpelier, Vermont 05620-2701

Dear Mr. Dworkin:

I am responding on behalf of the U.S. Nuclear Regulatory Commission (NRC) to your letters dated March 15 and 31, 2004, regarding the request by Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc. (Entergy), to amend the Vermont Yankee Nuclear Power Station license to increase the power level of the facility. In those letters, the Vermont Public Service Board requested that the NRC conduct its review of the proposed power uprate in a way that would provide Vermont a level of assurance about plant reliability equivalent to an *independent engineering assessment*. The NRC has decided to conduct a detailed engineering inspection that we believe will be appropriate for addressing our oversight responsibilities and is also responsive to the Board's concerns. This inspection will be performed as part of a new engineering inspection program that the NRC has been developing to enhance the Reactor Oversight Process.

NRC regulations and its oversight process focus on ensuring nuclear safety, whether the facility is operating at power or shut down. The NRC's statutory authority does not extend to regulating the reliability of electrical generation. The NRC recognizes, however, that there is some overlap between attributes that result in safe operation and those that contribute to overall plant reliability.

The Commission understands that the Board is concerned about the reliability of Vermont Yankee following an increase in power level, especially in light of operational issues that have occurred at some other plants that have recently implemented extended power uprates. The NRC recognizes the importance of these issues and is taking steps to ensure that they are satisfactorily addressed to maintain safety. For example, in response to instances of steam dryer cracking at some boiling water reactors, outside technical experts are assisting NRC staff in performing an audit of General Electric's analyses related to steam dryer performance and specific issues related to Vermont Yankee. We continue to engage the industry to ensure resolution of these issues and will consider additional regulatory action, if needed.

The NRC's established review process for power uprate applications is independent, thorough, and comprehensive. A description of the review process is enclosed. Engineering assessments have always been an integral part of the NRC's safety activities. Under our current Reactor Oversight Process, NRC resident inspectors and regional specialists routinely evaluate the work performed by the licensee's engineering organization to determine whether engineering analyses adequately support safe operation. Over the past several months, the NRC has been developing a new engineering inspection program which we intend to pilot at selected plants. The NRC staff considered a number of factors, including the Board's request for an independent engineering assessment, and concluded it is appropriate to conduct this engineering inspection at Vermont Yankee. This new engineering assessment inspection incorporates the best practices of the existing and past engineering inspections. The NRC will use this inspection to verify that design bases have been correctly implemented for a sampling of components across multiple systems and to identify latent design issues. The inspection process uses operating experience, risk assessment, and engineering analysis to select risk-significant components and operator actions, and will ensure that adequate safety margins exist. Although the specific sampling of components is still being developed, it will include components from multiple systems that are potentially affected by a power uprate such as the emergency core cooling systems, the containment system, power conversion systems, and auxiliary systems. The inspection will be performed by a team of approximately six inspectors, including some NRC inspectors who do not have recent oversight experience with Vermont Yankee and at least two contractors with design experience. Three weeks of on-site inspection and over 700 hours of direct inspection time will be conducted. This level of effort exceeds that of the biennial safety system design inspection. The Commission believes it is appropriate for addressing the NRC's oversight responsibilities and is also responsive to the Board's concerns. The NRC staff will inform the State of Vermont of the schedule for this inspection to facilitate participation by State representatives, consistent with NRC policy.

The NRC Advisory Committee on Reactor Safeguards (ACRS) will also review the Vermont Yankee power uprate request. The ACRS is a statutory committee that reports directly to the Commission and is structured to provide a forum where experts representing many technical perspectives can provide advice that is factored into the NRC's decision-making process. The NRC staff will provide the results of its review efforts, including relevant inspection findings, to the ACRS for review. After the ACRS completes its review, it will make an independent recommendation regarding whether the proposed power uprate amendment should be approved.

The NRC will not approve the Vermont Yankee uprate, or any proposed change to a plant license, unless the NRC staff can conclude that the proposed change will be executed in a manner that assures the public's health and safety. In response to your request, the NRC staff has taken a close look at proposed inspections and technical reviews to ensure that they will identify and address potential safety concerns for operating at uprated power conditions. The staff has concluded that the detailed technical review, prescribed in the Extended Power Uprate Review Standard, coupled with the normal associated program of power uprate and engineering inspections, will provide the information necessary for the NRC staff to make a decision on the safety of operation of Vermont Yankee under uprated power conditions. The Commission believes that the results of NRC reviews and inspections, particularly the new engineering inspection, will assist in addressing the Board's concerns regarding the future reliability of Vermont Yankee. The NRC staff is prepared to meet with the Board to explain further our review process and scope, including the engineering assessment inspection.

Sincerely,

Nils J. Diaz

Enclosure:
Established NRC Power Uprate Review Process

Established NRC Power Uprate Review Process

The NRC's established review process for power uprate applications is independent, thorough, and comprehensive. A team of engineers with specialties in a minimum of 17 different technical areas will review the Vermont Yankee power uprate application. The NRC plans to expend about 4000 hours to perform a comprehensive assessment of the engineering, design, and safety analyses related to the uprate. The NRC's "Review Standard for Extended Power Uprates" guides the staff in its review of the application. The Review Standard also provides guidance for determining when and what type of audits should be performed at the plant or vendor sites, as well as for performing our own confirmatory analyses and independent calculations to supplement the review.

The NRC's review of the power uprate application also includes on-site inspections. NRC inspections will review selected activities and modifications made to allow operation at higher power levels to verify that changes to plant systems will support safe plant operation and are in accordance with Vermont Yankee's licensing and design bases. The NRC will use Inspection Procedure 71004, "Power Uprates," as well as a number of our baseline inspection procedures to inspect issues specifically related to power uprate. These inspections will assess changes that could impact the integrity of barriers (e.g., higher flow rates which could increase vibration at specific support points), safety evaluations, plant modifications, post maintenance and surveillance testing, heat exchanger performance, and integrated plant operation. Additionally, our other baseline inspection activities, while not specifically directed at power uprate activities, will provide additional information about Vermont Yankee's ability to operate safely at a higher power level.

The NRC will adjust, as necessary, our technical review, audit plans, confirmatory analyses, or inspection activities if any issues are identified which may have a bearing on our decision on the Vermont Yankee power uprate application. For example, a recent examination of the steam dryer at Vermont Yankee identified cracks on both interior and exterior structures of the steam dryer. The steam dryer is an important component in the process for converting steam to electrical energy, but is not used to mitigate any accidents. The NRC is interested in steam dryer cracking because of the potential for parts to break loose and impact the performance of safety-related equipment. Entergy has indicated that the cracks are in low-stress, low-steam flow areas of the dryer and not in the areas where cracks were observed at other plants that implemented extended power uprates. NRC inspectors monitored Entergy's steam dryer inspection activities, and we will thoroughly review Entergy's follow-up actions as part of our evaluation of Vermont Yankee's request to operate at a higher power level.

Assessment of engineering has always been an integral part of the NRC's safety mission. In the 1990s, the NRC performed extensive reviews at plants across the country to determine if licensees were operating plants in accordance with their design bases. As part of this review, two team inspections were conducted at Vermont Yankee in 1997. One of these inspections was led by staff from NRC headquarters and included six contractors. In 1998, the NRC conducted an engineering inspection, as well as a team inspection to address operability issues resulting from Vermont Yankee's configuration improvement program. Under our current Reactor Oversight Process, NRC resident inspectors and regional specialists routinely evaluate the work performed by the licensee's engineering organization to determine whether the engineering analyses adequately supports safe operation. Our inspectors conduct both routine engineering inspections, as well as an in-depth team inspection every two years. Since the Reactor Oversight Process was implemented in 2000, the NRC has conducted two such safety system design team inspections.

Powerupgrade Inspections

At VY 3-6-06

1. At 80MWt
One touch on level 2 curve for A MSL — further strain gages At 137 Hz

Updating Acoustic Model 2 days
GE FEM updated - 3 days 3-8-06
Generate new limit curves
Tue 3-14-06

Dreyfus - statement - Resonate frequency of Steam Dryer 80 Hz

1300 call
A———A

{Rick Ennis, Tom Scarbrough, John Wu} 1300 - Conference Call w/ NRC (with D Pelton)

Theyre Keller

Dreyfus - Run Through Acoustic Model to get stresses

Will redo finite element model & get new stress curves

Docket No. 7195
Attachment 8-1
6 Pages

"CBI"

Scarborough - which version of ACM

Rico - new model - more conservative than Quad Cities (previous)

· TS - describe actual vs. expected

Rico — Blue peak to right
"A harmonic of the Recirc Driving frequency"

Recirc frequency "increases" as pump flow is increased

TS - Asked about Peaks at 190 Hz

Rico - Frequencies from Recirc Pump

Walkdown Question —

Dick D-ser - visible vibration of Low Point MS drains - expected but watching

From Accelerometer Data -

Rico: Peaks are real. VY analyzed pipes to show that these peaks have little effect on pipe stress at those frequencies.

There was a meeting in Bethesda? audit of call met!

John Wu — does not expect will be a problem

Peaks are very small. (p.10 of 13) Hanna didn't know.

Piping frequency's – around 10-20 hz

Wu:
Evaluate using the peaks of the spectrum. --

TS – If cross peak (higher) Then more analysis.

AT VY 3-27-06

1. Discussion w/ J. Dreyfuss - phone calls & observing
2. Discussion w/ B. MacKenna - observing
3. Reviewed information from website.

AT VY 4-3-06

License Renewal Meeting - AM

Review 110% curves against 105% curves
Similar -
"D" lower - one (137hz) is worse
several others to match

At VY 4-26-06

Asked about GE letter & Primary Stress Ratio table

At VY 4-27-06

Steam Flow Mismatch - Putting Uprate Ascension on Hold -
NRC Call - 11:30 am

NRC Call

Indicated higher than actual steam flow
Steam Flow has not been
compensated for density
High confidence in feedwater flow

Entergy building a density correction
into a "summer"

1.8 inches - level issue
At Full Power 2.4 inches
Pelton - mismatch - control valve position

Indicated SL Pressure drop is
higher than expected by about
5 ~~lbs~~ PSI. Currently at expected
for 120% power.

Entergy sees no impact from this.

Power Ascension likely FRIDAY 2.5%
Next Bump - 2.5% SUNDAY

3544

At Plant - 5-5-6

<Final 2.5% - increase>

Reviewed 1-Backup Data

In Control Room - Last 2 Bumps

1912 MW - at 10:15 am

Sherman, William

From: Sherman, William
Sent: Friday, March 31, 2006 1:50 PM
To: 'Rick Ennis'
Subject: RE: VY Power Ascension

Thank you. No questions.
I am assuming that your specialists are satisfied with the characterization of (i.e., the reducing of) uncertainties by Entergy, to give them more "room" on the strain/frequency curves.

Thanks for the heads up. I plan to monitor the ascension by phone contact over the weekend, and review the results at the site on Monday.

-----Original Message-----
From: Rick Ennis [mailto:RXE@nrc.gov]
Sent: Friday, March 31, 2006 1:45 PM
To: Sherman, William
Subject: VY Power Ascension

Bill,

The NRC staff has completed its evaluation of Entergy's justification for further power ascension to 110%. The NRC staff has no objections to Vermont Yankee continuing the power ascension process to 110%. Entergy has been contacted and is expected to start power ascension tomorrow morning. I'll call you also to see if you have any questions.

thanks,

Rick
301-415-1420

Docket No. 7195
Attachment 8-2
1 Page

Sherman, William

From: McElwee, David [dmcelwe@entergy.com]
Sent: Monday, May 01, 2006 1:11 PM
To: Sherman, William
Subject: FW: Steam dryer data methodology

Bill, please scroll down and see Craig's responses.

David K. McElwee
Senior Liaison Engineer
Entergy Nuclear Vermont Yankee
Office 802-258-4112
Cell 802-258-0096

From: Nichols, Craig
Sent: Monday, May 01, 2006 12:30 PM
To: McElwee, David
Subject: RE: Steam dryer data methodology

See below for brief responses. Please let me know if more detail is needed.

Thanx,

Craig J. Nichols
Entergy Nuclear Operations, Inc. (Vermont Yankee)
Manager, Strategic Capital Projects
Power Uprate Project Manager
Telephone: 802-451-3190
Pager: 802-742-9095
Cell: 802-380-0893

From: McElwee, David
Sent: Monday, May 01, 2006 9:56 AM
To: Nichols, Craig
Subject: FW: Steam dryer data methodology

Craig, can you or Rico answer this?

David K. McElwee
Senior Liaison Engineer
Entergy Nuclear Vermont Yankee
Office 802-258-4112
Cell 802-258-0096

From: Sherman, William [mailto:William.Sherman@state.vt.us]
Sent: Monday, May 01, 2006 9:39 AM
To: McElwee, David
Subject: FW: Steam dryer data methodology

David,

Please see below the question I asked Rick Ennis. Perhaps Entergy can answer more promptly. As you know, I haven't had the opportunity to review the data collection methodology. Maybe if I had, the answer would be obvious.

Thanks. -- Bill

From: Sherman, William
Sent: Monday, May 01, 2006 9:36 AM
To: 'Rick Ennis'
Subject: Steam dryer data methodology

Rick,

I have a question about the data methodology from the strain gages at VY. I asked D. Pelton about it and we decided that I should next ask Hdqts.

When we review the frequency curve results that Entergy sends, we review a single curve per location. I believe this single curve is the average - some type of combined result - of the six instruments at each location.

However, I suspect that these readings are not stable but rather "jump" around. I had this question before the last call, but on Friday's call Rico seemed to refer to the frequency peak "jumping between 137 and 142 hz." If this is so:

1. When does Rico "push the button" to generate the data of record?

Entergy Response: We start taking data after the PACC/Control Room notify us that they are finished with power ascension and that plant conditions are stable.

2. Does the collection methodology include a number of "button pushes" and selection of the "most representative?"

Entergy Response: We will take a minimum of two sets of readings (they take several minutes to obtain and then more to process). We evaluate the average at each of eight points but also look at the six individual at each point. We look for signal validity, noise, acceptance criteria, and erroneous data.

3. Does the collection methodology include some kind of an average over a time period to smooth out this variability of instanteous data?

Entergy Response: The data taken is a 40 second sample followed by a 40 second noise sample (system power off). This 40 seconds allows for natural variability as we always look at the FFT's in the frequency domain. We use the second (and more as necessary) runs to look for variability/issues/erroneous data.

4. Is the staff familiar with this aspect of the collection methodology or has the staff reviewed VY's data collection in progress?

Entergy Response: Although the staff is generally aware of the process used by Entergy (which is very similar to that employed by others) and they have asked many questions on the equipment, data acquisition, and analysis, they have not witnessed plant monitoring during power ascension.

This is probably an obvious question and there is probably an obvious answer. It seems strange to me that the data of record for times we've been on hold have (almost each time) exactly just touched the Level 2 limit.

Thanks.

Bill Sherman
State Nuclear Engineer
Vermont Department of Public Service
(802) 828-3349

Sherman, William

From: Sherman, William
Sent: Monday, May 01, 2006 9:17 AM
To: 'Rick Ennis'
Subject: Steam dryer question

Rick,

On the steam dryer phone calls, as you know I have not had questions as part of the calls. Tom has been very good to ask each call. Several times I've asked questions privately (and I have another one of those that I will send separately).

However, on the next call I think the time is appropriate to ask the question that is the state's basic concern. Considering the care taken in the power ascension tests, I believe the staff can be reasonably confident that there will be no safety problem with the dryer. Monitoring should identify whether problems occur before creating a safety issue. My question is, given all the staff and its consultants have seen so far in the power ascension tests, what level of confidence would they assign to whether the steam dryer will be found to have (additional) cracking at the Spring 2007 refuelling outage?

I would appreciate the opportunity to ask. Thanks.

Bill Sherman
State Nuclear Engineer
Vermont Department of Public Service
(802) 828-3349

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Attachment 8-4
1 Page

Steam Dryer Meeting 6-15-06

TJ
JD
Birkguine
Rico
DKay

Jim Brown
Steve Page

DO
SH WIV
DL

① Wed - 21st extension

ASME Endurance Limit 13600 psi
UY Results 408 psi

Point about Massive
carryover. —
admin limit -
expected one
Thing but
higher.

1 Existing Cracks
2. Upset condition
at Quad Cities
3. What about
comparison
to Dresden
instead of
Quad Cities

Slide 9 — 4. Same Fact
Dresden failed

Jim Brown
Steve Page

They Feel more
comfortable after
The meeting.

5 The basis
between
13600 &
408 is
The uncertainty

Steve - Dresden performance

Rogan - Seeking Insurance

Picton - Draconian Measures

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2 Pages

ART 5(a)

[% × BP × Up to Sch B]   [% × MCP × over Sched B]

Sched B goes up but % goes down

& { % times Sched B } exactly same as current

ART 3(a)   Seller delivers } Company Entitlement
Company accepts }   (%)

In a derate to old 100

Company receives 81% of its previous — or 81% of Schedule B.

— o —

Peter - #3

(a) There is no increase in Sch B ceiling because you receive only 81% of sch B. You must buy separately 19% of Power.

(b) dilution - you paid someone else more.

Sherman, William

From: Sherman, William
Sent: Monday, June 19, 2006 11:21 AM
To: 'McElwee, David'
Cc: BURKE, TERENCE A; SMITH, JAGER; Hofmann, Sarah
Subject: questions re: RBetti presentation

Dave,

I would like you to forward this to Rico if you would, and then perhaps we can speak about it. Also, please consider this part of compromise negotiations.

In the meeting here last Thursday, Rico seemed to be saying that the Level 1 and 2 limit curves were simple scale ups of last-previous acoustical measurement data. That was in response to my question whether "intelligence" was added in developing the limit curves. (By "intelligence," I mean the best evaluation of how the system was expected to perform.)

A. Based on Rico's answer, I have the following questions:

1. On the original 1593 MWt curves, for example:

On MSL A U, the limit curve peak at approx. 117 hz is much higher than the limit curve peak at 137 hz. And yet the baseline acoustical data for 137 hz is higher than for 117 hz. Why is that?

The same is true for MSL A L.

2. Comparing the limit curves used at 1712 MWt, derived from the 1671 MWt data, for example:

On MSL D L, the limit peak at 137 hz is higher than the two limit peaks at approx. 130 hz. Yet the baseline data from the 1671 runs appears to have higher peaks (minus noise) at 130 hz. Why that relationship?

3. Comparing the limit curves used at 1832 MWt , derived from the 1792 MWt data, for example:

On MSL A U, the data for 137 hz and 143 hz appear to be at the same level, but the limit curves are higher for 143 hz than for 137 hz.

On MSL D L, the limit curves have similar height peaks at approx. 102 hz, 108 hz, and 122 hz. However, the input data from 1732 MWt, doesn't appear to have peaks at the same height.

B. I thought Rico said that part of Dresden's problem was the discovery of high peaks at 77 % power. I presume this is 77% of uprated power. I think the math goes this way:

CLTP equals OLTP + .178 OLTP equals 1.178 OLTP

Former 100% power equals OLTP equals CLTP/1.178 equals 85% CLTP

Therefore 77% CLTP equals (.77)(1.178) OLTP equals 91% OLTP.

1. If the Dresden high peaks are at 77% power, that is 91% of original power, why didn't they develop steam dryer problems before power uprate?

2. Has VY developed acoustical data for operating points below 100% original power level?

Thanks. – Bill

Sherman, William

From: Sherman, William
Sent: Thursday, July 20, 2006 10:52 AM
To: Sherman, William
Subject: FW: VY Uprate news release yesterday

Sent: Wednesday, March 08, 2006 10:47 AM
Subject: VY Uprate news release yesterday

Update: Vermont Yankee Power Increase Program Now at First Plateau

Brattleboro -- On March 2, Entergy Vermont Yankee received permission from the Nuclear Regulatory Commission to increase its power output by up to 20 percent. On March 4, operators initiated the first planned increase of five percent and have since held at that plateau for planned data gathering and analysis as prescribed in a formal Power Ascension Test Program.

As planned, there will be several such plateaus at each five percent increment that will allow for data gathering and evaluation on all aspect of plant operation before proceeding to the next power level. During this process, engineers are closely monitoring the plant's steam dryer performance based on industry experience at other plants which implemented similar power increases.

The steam dryer performance is monitored remotely via specialized instruments that measure acoustical signal produced as the steam flows through piping. The data gathered is then analyzed by Vermont Yankee and specialized engineering contractors to determine the overall effect on the steam dryer.

The extent of analysis required is determined by the acoustic signal characteristics at various frequencies. At the present five-percent level, one frequency requires additional analysis because its level reached an internal Vermont Yankee administrative limit. As required by the Power Ascension Test Program, that data is presently being evaluated by Entergy and General Electric engineers.

The plant will remain at the current power plateau until the additional analysis is completed. Contrary to some press reports, the hold on the power increase was not imposed by regulators as the frequency in question is well below federal limits.

At this plateau, the plant is producing an additional 26 megawatts for the New England electrical grid. The 26 megawatts is enough to power approximately 26,000 homes.

Entergy Nuclear's online address is www.entergy-nuclear.com

- 30 -

Bill Sherman
State Nuclear Engineer
Vermont Department of Public Service
(802) 828-3349

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1 Page

September 26, 2003

Mr. Kenneth Putnam, Chairman
BWR Owners Group
Nuclear Management Company
Duane Arnold Energy Center
3277 DAEC Rd.
Palo, IA 52324

SUBJECT: BOILING WATER REACTOR STEAM DRYER INTEGRITY

Dear Mr. Putnam:

On August 21, 2001, GE Nuclear Energy (GENE) issued Services Information Letter (SIL) No. 644, "Boiling Water Reactor Steam Dryer Integrity," to the licensees of nuclear power plants with boiling water reactor (BWR) nuclear steam supply systems designed by General Electric (GE). The SIL described an event at a BWR/3 that involved the failure of a steam dryer cover plate and the generation of loose parts. In response to a second steam dryer failure at the same plant approximately one year later, GENE on September 5, 2003, issued Supplement 1 to SIL No. 644. Supplement 1 described the second failure of a BWR/3-style steam dryer that occurred earlier in 2003 and updated and expanded the scope of the recommendations initially provided in SIL No. 644 on steam dryer integrity to all GE-designed BWR nuclear power plants if currently operating, or planning to operate, above their original licensed thermal power (OLTP).

During a July 25, 2003, meeting with the Boiling Water Reactors Owners Group (BWROG) and GENE on steam dryer failures, the BWROG stated that the steam dryer in a BWR does not perform a safety-related function. The NRC staff agreed. However, the NRC staff noted that the steam dryer must maintain its structural integrity such that an operational problem is not caused, or safe shutdown of the reactor is not prevented, by loose steam dryer parts in the reactor vessel or main steam lines (MSLs) leading to the turbine generator. Therefore, the NRC staff requested that the BWROG meet with the staff as soon as practicable after GENE had issued the revised SIL to discuss the recommendations in Supplement 1 and the response of BWR licensees to those recommendations. The NRC staff had requested that this meeting be held in the September 2003 timeframe.

The NRC staff reviewed the SIL and conducted a teleconference with you on September 17, 2003, to discuss the SIL and future actions. During the teleconference, we noted that the recommendations in SIL No. 644, Supplement 1 represent a good start in addressing the steam dryer integrity issue. In addition, we stated that the staff would like to discuss several aspects of these recommendations with the BWROG in a future meeting. To assist the BWROG in preparing for this public meeting, the staff's comments on SIL No. 644, Supplement 1 are summarized as follows:

1. SIL No. 644, Supplement 1 does not appear to address all of the potential factors that could affect the susceptibility of a steam dryer to failure during operation of a BWR above the OLTP. For example, in addition to steam dryer design and maximum MSL

steam velocity discussed in the SIL, the extent of the power level change from the OLTP, or the change in the MSL steam velocity, might also influence the susceptibility of a particular steam dryer to failure. Further, less stringent recommendations related to steam dryer integrity might be permissible where a BWR has only implemented or will only implement a minimal measurement uncertainty recapture power uprate. Please be prepared to discuss your criteria for establishing susceptible plants and the bases.

2. The recommendations in SIL No. 644, Supplement 1 focus on identifying steam dryer failure, such as by increased moisture content in the MSL steam flow and visual inspection of the steam dryer for cracks. However, these recommendations will only identify future failures of steam dryers after the fact. We believe that additional effort should be made to provide reasonable assurance that future steam dryer failures are highly unlikely, through such means as predictive analyses or instrumentation.

3. The basis for the applicability of internal steam dryer inspection recommendations in SIL No. 644, Supplement 1 only to the BWR/3 steam dryer design with internal braces is not apparent in that experience has suggested that cracking might initiate on the interior surface of the steam dryer.

4. SIL No. 644, Supplement 1 recommends the performance of "best effort" VT-1 visual inspections of the applicable steam dryers during an upcoming refueling outage. Although steam dryers in BWRs might not be subject to ASME Code inservice inspections, the intent of SIL No. 644, Supplement 1 with respect to satisfying the Code provisions in performing VT-1 visual inspections of steam dryers should be clarified.

5. SIL No. 644, Supplement 1 recommends inspection of BWR/4 and later steam dryer designs prior to initial operation above the OLTP, or within the next two scheduled refueling outages if already operating above the OLTP. This recommendation has the potential to allow the steam dryer at some BWRs operating above the OLTP not to be inspected for almost 4 years. Please discuss your basis for the timeliness of this recommendation.

6. SIL No. 644, Supplement 1 discusses recent steam dryer failures at one BWR in the United States. Recommendations to address steam dryer integrity should also incorporate applicable experience from other BWRs in the U.S. and in other countries. Please be prepared to discuss significant steam dryer failures in the U.S. and overseas.

7. With regard to power uprates, please be prepared to discuss what actions you intend to propose for BWRs planning to apply for future power uprates (i.e., measurement uncertainty recapture, stretch, and extended).

8. Please be prepared to discuss what actions not addressed in SIL No. 644, Supplement 1 should be taken for BWRs previously approved for power uprates.

The NRC staff is evaluating the development of an appropriate regulatory vehicle to ensure that all operational BWRs address the lessons-learned from the recent steam dryer failures and other applicable operating experience in a timely manner. As part of the upcoming public meeting, we request your assistance in providing the status of licensees' responses to

SIL No. 644, Supplement 1 for each operational U.S. BWR, including the results of any recent steam dryer inspections. We also would like your views on an efficient and effective means for the NRC staff to monitor licensees' activities in response to SIL No. 644, Supplement 1 and to verify the completion of those activities.

Please contact me at 301-415-1445 to arrange the date for a public meeting to discuss the recommendations in SIL No. 644, Supplement 1 and the items noted above.

Sincerely,

/RA/

Alan B. Wang, Project Manager, Section 2
Project Directorate IV-2
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 691

cc: See next page

cc:
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1 Page

ICAP

Contact: Tarreck Yennes at 502-327-1416
For Current Nepool Prices

Nepool Quote Sheet

21-Jul-06 13-Jan

Nepool Term	Nepool 5 x16 Bid	Nepool On 5 x16 Offer	Nepool Off 5x8, 2x24 Bid	Nepool Off 5x8, 2x24 Offer	Nepool Flat 7 x 24 Bid	Nepool Flat 7 x 24 Offer
Jan 12th	$ 76.00	$ 76.50	$ 55.00	$ 56.00		
13-Jan	$ 74.75	$ 75.25				
01/13-01/31	$ 84.25	$ 86.00	$ 72.00	$ 73.50		
01/16-01/20	$ 82.00	$ 83.00				
Feb'06	$ 102.75	$ 103.25	$ 84.75	$ 85.25		
March '06	$ 95.75	$ 96.25	$ 78.00	$ 78.25		
April '06	$ 92.00	$ 92.50	$ 73.75	$ 74.25		
May '06	$ 92.00	$ 92.50	$ 73.50	$ 74.00		
June '06	$ 97.00	$ 97.50	$ 74.00	$ 74.50		
July-Aug 06	$ 107.00	$ 108.00	$ 82.75	$ 83.50		
Sept '06	$ 96.25	$ 97.00	$ 74.50	$ 75.50		
Q406	$ 98.00	$ 99.00	$ 78.50	$ 79.00		
Jan-Feb 07	$ 131.50	$ 132.50	$ 97.00	$ 98.00		
Mar-Apr 07	$ 101.50	$ 102.50	$ 77.75	$ 78.50		
Cal' 07	$ 102.25	$ 102.50	$ 77.75	$ 78.25		
Cal' 08	$ 98.00	$ 98.50	$ 74.25	$ 74.75		
Cal' 09	$ 94.25	$ 95.00	$ 71.00	$ 71.50		

Entergy

Entergy Nuclear Operations, Inc.
Vermont Yankee
P.O. Box 0500
185 Old Ferry Road
Brattleboro, VT 05302-0500
Tel 802 257 5271

February 26, 2006

Docket No. 50-271
BVY 06-019
TAC No. MC0761

RECEIVED MAR 01 2006

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Vermont Yankee Nuclear Power Station**
Extended Power Uprate – Regulatory Commitment
Information Regarding Steam Dryer Monitoring and FIV Effects

References:

1) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, License No. DPR-28 (Docket No. 50-271), Technical Specification Proposed Change No. 263, Extended Power Uprate," BVY 03-80, September 10, 2003

2) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, Technical Specification Proposed Change No. 263 – Supplement No. 36, Extended Power Uprate – Response to NRC's Letter re: License Conditions," BVY 05-096, October 17, 2005

3) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, Technical Specification Proposed Change No. 263 – Supplement No. 33, Extended Power Uprate – Response to Request for Additional Information," BVY 05-084, September 14, 2005

This letter provides information pursuant to a regulatory commitment made in connection with the application by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy) for a license amendment (Reference 1, as supplemented) to increase the maximum authorized power level of the Vermont Yankee Nuclear Power Station (VYNPS) from 1593 megawatts thermal (MWt) to 1912 MWt.

In Reference 2, Entergy proposed a license condition and made a regulatory commitment to provide information regarding potentially adverse flow effects on plant structures, systems, and components (SSCs) that might result from extended power uprate (EPU) operation. The subject regulatory commitment relates to actions required prior to exceeding 1593 MWt, and states in relevant part:

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266 Pages

With regard to [proposed] License Condition 3.M, "Potential Adverse Flow Effects," Entergy will provide information on plant data, evaluations, walkdowns, inspections, and procedures associated with the individual requirements of that license condition to the NRC staff prior to increasing power above 1593 MWt or each specified hold point, as applicable...

Attachment 1 to this letter is the Steam Dryer Monitoring Plan (SDMP) that will be applicable during power ascension to full EPU conditions. The SDMP will remain in effect until proposed License Condition 3.M expires. The SDMP, together with the EPU Power Ascension Test Procedure (PATP) provide for monitoring, inspecting, evaluating, and prompt action in response to potential adverse flow effects on the steam dryer as a result of power uprate operation. These actions provide assurance of the continued structural integrity of the steam dryer under EPU conditions.

Included in the SDMP are the "steam dryer stress limit curves." These curves establish operating limits in accordance with proposed License Condition 3.M (Reference 2). Continuous monitoring of pressure fluctuations from strain gage signals relative to the curves provides assurance of the structural integrity of the steam dryer. If necessary, changes to the SDMP will be made in accordance with the provisions of License Condition 3.M.

Attachment 2 to this letter are those portions of the power ascension test procedure (PATP) for EPU that are applicable to flow-induced vibration monitoring during power ascension testing for a representative power plateau. Any future changes to the PATP will be made in accordance with governing VYNPS change processes and will be available on-site to NRC inspectors.

Attachment 3 to this letter provides a description of the data acquisition system that will be used to collect and record signals indicative of pressure loads on the steam dryer. This description is an update to the information provided in Reference 3.

The information contained herewith is provided in accordance with the cited regulatory commitment and in anticipation of actions required to comply with proposed License Condition 3.M. There are no new regulatory commitments contained in this submittal.

If you have any questions or require additional information, please contact Mr. James DeVincentis at (802) 258-4236.

Sincerely,

Norman L. Rademacher
Director, Nuclear Safety Assurance
Vermont Yankee Nuclear Power Station

Attachments (3)

cc: Mr. Samuel J. Collins (w/o attachments)
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USNRC Resident Inspector (w/o attachments)
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Mr. David O'Brien, Commissioner
VT Department of Public Service
112 State Street – Drawer 20
Montpelier, Vermont 05620-2601

Attachment 1

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 263

Extended Power Uprate – Regulatory Commitment

Information Regarding Steam Dryer Monitoring and FIV Effects

Steam Dryer Monitoring Plan

Total number of pages in Attachment 1
(excluding this cover sheet) is 19.

STEAM DRYER MONITORING PLAN

Vermont Yankee Nuclear Power Station

Revision 0

Preparer: C. J. Nichols Date: 02/26/06

Reviewer: J. M. DeVincentis Date: 02/26/06

Approver: J. R. Dreyfuss Date: 2-26-06

VERMONT YANKEE NUCLEAR POWER STATION
STEAM DRYER MONITORING PLAN

Introduction and Purpose

The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) 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. The SDMP also addresses long-term actions necessary to implement proposed License Condition 3.M. Through operating limits, periodic surveillances, and required actions, the impact of potentially adverse flow effects on the structural integrity of the steam dryer will be minimized.

Unacceptable steam dryer performance is a condition that could challenge steam dryer structural integrity and result in the generation of loose parts, cracks or tears in the steam dryer that result in excessive moisture carryover. During reactor power operation, performance is demonstrated through the measurement of a combination of plant parameters.

Scope

The SDMP is primarily an initial power ascension test plan designed to assess steam dryer performance from 100% OLTP (i.e., 1593 MWt) to 120% OLTP (i.e., 1912 MWt) and to perform confirmatory inspections for a period of time following initial and continued operation at uprated power levels. Power ascension to 120% OLTP will be achieved in a series of power step increases and holds at plateaus corresponding to 80 MWt increments above OLTP. Elements of this plan will be implemented before EPU power ascension testing, and others may continue after power ascension testing.

There are three main elements of the SDMP:

1. Slow and deliberate power ascension with defined hold points and durations, allowing time for monitoring and analysis;

2. A detailed power ascension monitoring and analysis program to trend steam dryer performance (primarily through the monitoring of steam dryer load signals and moisture carryover); and

3. A long term inspection program to verify steam dryer performance at EPU operating conditions.

Several elements of the SDMP also provide for completion of the necessary actions to satisfy the requirements of license conditions associated with the EPU license amendment. A complete tabulation of the provisions of the license condition and the implementing strategy to complete them is contained in Table 3.

Power Ascension

VYNPS procedure ERSTI-04-VY1-1409-000, "Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth," (PATP) will provide controls during power ascension testing and confirm acceptable plant performance. Other procedures may be entered to conduct specialized testing, such as condensate and feedwater testing. The VYNPS power ascension will occur over an extended period with gradual increases in power, hold periods, and engineering analyses of monitored data that must be approved by station management. Relevant data and evaluations will be transmitted to the NRC staff in accordance with the provisions of the license condition. The PATP includes:

1. Power ascension rate of 16 MWt/hr;

2. Hourly monitoring of steam dryer performance during power ascension (required by License Condition 3.M);

3. Four hour holds at each 40 MWt; and

4. Minimum 96 hour holds at each 80 MWt power plateau to perform steam dryer analysis allowing for NRC review, as appropriate (required by License Condition 3.M).

Monitoring Plans

Table 1 outlines the steam dryer surveillance requirements during reactor power ascension testing for EPU. The monitoring of moisture carryover and main steam line (MSL) pressure data provide measures for ensuring acceptable performance of the steam dryer. Frequent monitoring of these parameters will provide early detection capability of off-normal performance.

Proposed License Condition 3.M will require that steam dryer performance criteria are met and prompt action is taken if unacceptable performance is detected. Entergy has established two performance levels (Level 1 criteria and Level 2 criteria) as described in Table 2 for evaluating steam dryer performance during EPU power ascension testing. The Level 1 criteria correspond to the limits specified in the proposed license condition, while the Level 2 criteria are operating action levels that may indicate reductions in margin.

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.

- Main Steam Line Strain Gages

  - During power ascension, steam dryer performance will be monitored hourly through the evaluation of pressure fluctuation data collected from strain gages installed on the MSLs. Entergy has installed strain gages at eight locations on the MSLs in the primary containment and a data acquisition system (DAS) designed to reduce uncertainties in the evaluation of steam dryer loads.

  - The strain gage data collected hourly during power ascension will be compared against the stress limit curve that is provided as Figures 1 - 8 of the SDMP and is based on Entergy Calculation VYC-3001. If any frequency peak from the MSL strain gage data exceeds the stress limit curve (Level 1), Entergy will reduce the reactor power to a level at which the stress limit curve is not exceeded.

  - Additionally, Entergy will monitor data collected from accelerometers mounted to the main steam piping inside the drywell to provide additional insights into the strain gage signals.

- During hold points at each 80 MWt power level above current licensed thermal power, the collected data, along with a comparison to the steam dryer limit curve, will be transmitted to the NRC staff.

- For any circumstance requiring a revision to the steam dryer limit curve, Entergy will resolve uncertainties in the steam dryer analysis and provide the results of that evaluation to the NRC staff prior to further increases in reactor power.

- Entergy will resolve uncertainties in the steam dryer analysis with the NRC staff within 90 days of issuance of the EPU license amendment. If resolution is not made within this time interval, reactor operation will not exceed 1593 MWt. These planned actions are in compliance with proposed License Condition 3.M.

• Moisture Carryover

  - Moisture carryover trending provides an indicator of steam dryer integrity.

  - At each 40 MWt step, moisture carryover data will be taken and compared to the predetermined acceptance criteria (Table 2).

    • Level 1 criteria (0.35%) is based on the maximum analyzed value.

  - The data taken at each 80 MWt plateau will be evaluated and documented in the assessment sent to the NRC for information.

• Other Monitoring

  - Plant data that may be indicative of off-normal steam dryer performance will be monitored during power ascension (e.g., reactor water level, steam flow, feed flow, steam flow distribution between the individual steam lines). Plant data can provide an early indication of unacceptable steam dryer performance. The enhanced monitoring of selected plant parameters will be controlled by the PATP and other plant procedures.

• NRC Notifications

  - In accordance with proposed License Condition 3.M., at discrete power levels, and if the steam dryer stress limit curve (i.e., Level 1 criterion) is exceeded, Entergy will provide notifications to the NRC staff consisting of data and evaluations performed during EPU power ascension testing above 1593 MWt. Detailed discussions regarding new plant data, inspections, and evaluations will be held with NRC staff upon request. The designated NRC point of contact for such information is the NRC Project Manager for the VYNPS EPU.

  - The results of the SDMP will 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 (i.e., steam dryer stress limit curve) will be submitted to the NRC staff within 90 days of license amendment issuance. Contemporary data and results from steam 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 steam 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 steam dryer structural integrity monitoring.

Long Term Monitoring

The long-term monitoring of plant parameters potentially indicative of steam dryer failure will be conducted, as recommended by General Electric Service Information Letter 644, Rev. 1 and consistent with License Condition 3.M.

Moisture Carryover

Per VYNPS station operating procedure OP-0631, "Radiochemistry," moisture carryover is periodically monitored for moisture carryover during normal plant operations. VYNPS off-normal procedure ON-3178, "Increased Moisture Carryover," provides guidance to evaluate any elevated moisture carryover results including that resulting from potential vessel internals damage. This monitoring will also provide insight into changes in moisture carryover values during changing reactor core configurations (control rod patterns).

Strain Gage Monitoring

As the strain gages will remain operational and can provide for future data collection, additional strain gage monitoring will be performed as determined appropriate during the remainder of the operating cycle following EPU implementation.

Inspections

The VYNPS steam dryer will be inspected during the refueling outages scheduled for the 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 be in accordance with the guidance in SIL 644, Rev. 1.

Reporting to NRC

Steam Dryer Visual Inspections: The results of the visual inspections of the steam dryer conducted during the next three refueling outages shall be reported to the NRC staff within 60 days following startup from the respective refueling outage.

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 40 MWt (nominal) power step above 100% OLTP (Note 3)
3. Main steam line data from accelerometers	At least once at every 40 MWt (nominal) power step above 100% OLTP (Note 3) AND Within one hour after achieving every 40 MWt (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 an 80 MWt 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 40 MWt, 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 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 MSL pressure data is also required to be performed once at each 40 MWt power step above 1593 MWt and within one hour of achieving each 40 MWt 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 (i.e., 1593 MWt). If the surveillance is met at a given power level, additional surveillances do not need to be performed at a 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 40 MWt power step from at least three of the four MSLs, 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
Level 2: • Moisture carryover exceeds 0.1% OR • Moisture carryover exceeds 0.1% and increases by > 50% over the average of the three previous measurements taken at > 1593 MWt OR • Pressure data exceed Level 2 Spectra[1]	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.
Level 1: • Moisture carryover exceeds 0.35% OR • Pressure data exceed Level 1 Spectra[1]	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 steam 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 20 MWt and 40 MWt, 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 ≤ 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).

Table 3
Steam Dryer License Conditions

License Condition	Requirement	Implementing Actions
3.M.1.a	Entergy shall monitor hourly the 32 main steam line (MSL) strain gages during power ascension above 1593 MWt for increasing pressure fluctuations in the steam lines.	During initial power ascension above 1593 MWt, data from at least 32 strain gages will be collected and evaluated by Entergy's power ascension test team to verify that acoustic signals indicative of increasing pressure fluctuations in the steam lines are not challenging the steam dryer stress limit curve. Monitoring will be conducted hourly during any power ascension above a previously attained power level. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.b	Entergy shall hold the facility for 24 hours at 105%, 110%, and 115% of OLTP (i.e., 1593 MWt) to collect data from the 32 MSL strain gages required by License Condition 3.M.1.a, conduct plant inspections and walkdowns, and evaluate steam dryer performance based on these data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.	The PATP has established test plateau increments of approximately 80 MWt (corresponding to 105%, 110%, and 115% of 1593 MWt). Reactor power will not be increased above the plateau for a minimum of 96 hours. During the first 24 hours of steady state operation at each plateau, strain gage data will be collected from all available strain gages (minimum of 32) and evaluated to demonstrate acceptable steam dryer performance. Additionally, moisture carryover measurements will be made at each plateau and every 24 hours during power ascension testing. At the 80 MWt plateau hold points, Entergy will conduct plant walkdowns and inspections of plant equipment, including piping and components identified as potentially vulnerable to flow-induced vibration (FIV) in accordance with the PATP and other plant procedures. Steam dryer performance will be evaluated based on these data. The 24-hour period and the 96-hour period may overlap once the transmittal is provided to the NRC staff. The evaluations of steam dryer performance, based on the data collected during each of the 80 MWt plateaus, as well as the results of walkdowns and other measurements of FIV for various piping and plant components, will be provided to the NRC staff. Arrangements have been made for electronic transmission through email and/or uploading to a

License Condition	Requirement	Implementing Actions
		designated website. Upon the NRC Project Manager confirming receipt of the steam dryer data and performance evaluation, the 96 hours of hold time will commence. Power will not be increased above each of the 80 MWt hold points until the expiration of the 96-hour hold. If during the hold periods, or at any other time, the NRC staff requests a discussion or requires clarification of the engineering evaluations provided in fulfillment of this requirement, Entergy will promptly arrange for such discussions. Entergy will maintain a power ascension control center, including management oversight, available 24/7 on-site during power increases to previously unattained power levels. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.c	If any frequency peak from the MSL strain gage data exceeds the limit curve established by Entergy Nuclear Operations, Inc. and submitted to the NRC staff prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall return the facility to a power level at which the limit curve is not exceeded. Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.	The steam dryer stress limit curve provided herewith contains Level 1 and Level 2 criteria. If frequency peaks from MSL strain gage data exceed either Level 1 or Level 2 criteria, prompt action will be taken in response to the potential adverse flow effects that might result. Similar actions will occur if moisture carryover is excessive and previously established Level 1 or Level 2 criteria are exceeded. The Level 2 criteria represent a conservative action level for evaluation and close monitoring of steam dryer performance—not a limit. The Level 1 criteria represent analytical limits and additional actions may be warranted. If any frequency peak from the MSL strain gage data exceeds the Level 1 steam dryer stress limit curve, Entergy will reduce reactor power to a power level at which the limit curve is not exceeded. (Reference ERSTI-04-VY1-1409-000) Prior to any further increase in power above the reduced power level, Entergy will (1) resolve the uncertainties in the steam dryer analysis, (2) evaluate and document the adequate structural integrity of the steam dryer, and (3) provide that documentation to the NRC staff. Any revision to the

License Condition	Requirement	Implementing Actions
		limit curve based on this evaluation will be provided to the NRC staff. (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.d	In addition to evaluating the MSL strain gage data, Entergy Nuclear Operations, Inc. shall monitor reactor pressure vessel water level instrumentation or MSL piping accelerometers on an hourly basis during power ascension above OLTP. If resonance frequencies are identified as increasing above nominal levels in proportion to strain gage instrumentation data, Entergy Nuclear Operations, Inc. shall stop power ascension, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.	Accelerometers mounted on MSL piping will be monitored on an hourly basis during power ascension testing to identify if resonances are increasing above nominal levels in proportion to MSL strain gage data. If abnormally increasing resonant frequencies are detected, power ascension will be halted. Prior to any further increase in power, Entergy will (1) evaluate and document the adequate structural integrity of the steam dryer, and (2) provide that documentation to the NRC staff. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.e	Following start-up testing, Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis and provide that resolution to the NRC staff by facsimile or electronic transmission to the NRC project manager. If the uncertainties are not resolved within 90 days of issuance of the license amendment authorizing operation at 1912 MWt, Entergy Nuclear Operations, Inc. shall return the facility to OLTP.	After collecting strain gage data at approximately the EPU full power level, Entergy will resolve the uncertainties in the steam dryer analysis and provide documentation of the resolution to the NRC staff. If these actions cannot be achieved within 90 days of issuance of the license amendment, reactor power will be limited to 1593 MWt. This uncertainty evaluation may be prepared and provided to the NRC prior to reaching EPU full power levels associated with any proposed revision to the steam dryer limit curve. (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.2.a	Prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall install 32 additional strain gages on the main steam piping and shall enhance the data acquisition system in order to reduce the measurement uncertainty	To enhance performance and improve the accuracy of the steam dryer measurement system, Entergy has installed 48 strain gages on MSL piping and will maintain a minimum of 32 operable strain gages during power ascension testing. The data acquisition system (DAS) was upgraded to reduce the uncertainty associated with the ACM.

License Condition	Requirement	Implementing Actions
	associated with the acoustic circuit model (ACM).	(Reference Entergy VYNPS Temporary Alteration TA-2005-15 R1)
3.M.2.b	In the event that acoustic signals are identified that challenge the limit curve during power ascension above OLTP, Entergy Nuclear Operations, Inc. shall evaluate steam dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency.	If acoustic signals indicative of increasing pressure fluctuations in the steam lines are identified as challenging the steam dryer stress limit curve (i.e., Level 1 criterion), in addition to reducing reactor power to a previously acceptable power level, Entergy will conduct an evaluation and re-establish the limit curve based on the latest strain gage data. As part of the redevelopment of the limit curve, Entergy will prepare a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency. This uncertainty evaluation may be prepared and provided to the NRC in advance of this condition being met. (Reference ERSTI-04-VY1-1409-000)
3.M.2.c	After reaching 120% of OLTP, Entergy Nuclear Operations, Inc. shall obtain measurements from the MSL strain gages and establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the steam dryer monitoring plan (SDMP) limit curve with the updated ACM load definition and revised instrument uncertainty, which will be provided to the NRC staff.	After collecting strain gage data at approximately the EPU full power level, Entergy will establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the stress limit curve with the updated ACM load definition and revised instrument uncertainty. This information will be included in the report to the NRC staff being made in accordance with License Condition 3.M.1.e. (Reference PCRS tracking item WT-VTY-2006-00000-00249)
3.M.2.d	During power ascension above OLTP, if an engineering evaluation is required in accordance with the SDMP, Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to ±10% and assure that peak responses that fall within this uncertainty band are addressed.	If an evaluation or analysis of the structural integrity of the steam dryer is required because acoustic signals indicative of increasing pressure fluctuations in the steam lines are identified as potentially challenging the steam dryer stress limit curve (i.e., Level 1 criterion), Entergy will address frequency uncertainties up to ± 10% and assure that peak responses that fall within this uncertainty band are addressed. This uncertainty evaluation may be prepared and provided to the NRC in advance of this condition being met. (Reference ERSTI-04-VY1-1409-000)

License Condition	Requirement	Implementing Actions
3.M.2.e	Entergy Nuclear Operations, Inc. shall revise the SDMP to reflect long-term monitoring of plant parameters potentially indicative of steam dryer failure; to reflect consistency of the facility's steam dryer inspection program with General Electric Services Information Letter 644, Revision 1; and to identify the NRC Project Manager for the facility as the point of contact for providing SDMP information during power ascension.	The revised SDMP provides long-term monitoring of steam dryer performance in accordance with GE SIL 644 Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00250) The SDMP and the PATP identify the NRC Project Manager for the VYNPS EPU as the point of contact for providing SDMP information during power ascension. (Reference ERSTI-04-VY1-1409-000) For moisture carryover, procedures OP-0631 and ON-3178 provide for long-term monitoring and controls.
3.M.2.f	Entergy Nuclear Operations, Inc. shall submit the final extended power uprate (EPU) steam dryer load definition for the facility to the NRC upon completion of the power ascension test program.	The final EPU steam dryer load definition will be included in the report provided to the NRC staff in accordance with License Conditions 3.M.1.e. and 3.M.2.c. (Reference PCRS tracking item WT-VTY-2006-00000-00251)
3.M.2.g	Entergy Nuclear Operations, Inc. shall submit the flow-induced vibration related portions of the EPU startup test procedure to the NRC, including methodology for updating the limit curve, prior to initial power ascension above OLTP.	Entergy letter BVY 06-019 forwards the FIV-related portions of the EPU power ascension test procedure to the NRC. (Reference ERSTI-04-VY1-1409-000) The methodology for updating the steam dryer stress limit curve is as follows: Prerequisite: Generate report resolving uncertainties in the steam dryer analysis. 1. Collect representative data from 32 strain gages at eight MSL locations. 2. Using a plant-specific ACM, analyze strain gage data to determine steam dryer loads. 3. Input ACM loads into a finite element model to determine dryer stresses. 4. Perform an updated uncertainty evaluation. 5. Generate revised steam dryer stress limit curve(s). (Reference PCRS tracking item WT-VTY-2006-00000-00252)

License Condition	Requirement	Implementing Actions
3.M.3(a)	Entergy shall prepare the EPU startup test procedure to include the stress limit curve to be applied for evaluating steam dryer performance.	The steam dryer stress limit curve to be applied for evaluating steam dryer performance during power ascension is provided herewith. The limit curve was developed on the basis of calculation VYC-3001, which is incorporated by reference into the EPU PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(b)	Entergy shall prepare the EPU startup test procedure to include specific hold points and their duration during EPU power ascension.	Specific hold points and durations are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(c)	Entergy shall prepare the EPU startup test procedure to include activities to be accomplished during hold points.	Activities to be accomplished during hold points are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(d)	Entergy shall prepare the EPU startup test procedure to include plant parameters to be monitored.	Plant parameters to be monitored are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(e)	Entergy shall prepare the EPU startup test procedure to include inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during the hold points.	Inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during hold points are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(f)	Entergy shall prepare the EPU startup test procedure to include methods to be used to trend plant parameters.	Methods to be used to trend plant parameters are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(g)	Entergy shall prepare the EPU startup test procedure to include acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections.	Acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(h)	Entergy shall prepare the EPU startup test procedure to include actions to be taken if acceptance criteria are not satisfied.	Actions to be taken if acceptance criteria are not satisfied are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

License Condition	Requirement	Implementing Actions
3.M.3(i)	Entergy shall prepare the EPU startup test procedure to include verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer.	Verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer is specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.4	When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04.	These restrictions are provided in the PATP and/or the SDMP. (Reference ERSTI-04-VY1-1409-000)
3.M.5	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00253) (Reference PCRS tracking item WT-VTY-2006-00000-00254)

License Condition	Requirement	Implementing Actions
		(Reference PCRS tracking item WT-VTY-2006-00000-00255)
3.M.6	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. The results will be documented in a report and submitted to the NRC within 60 days following completion of all EPU power ascension testing. (Reference PCRS tracking item WT-VTY-2006-00000-00256) (Reference PCRS tracking item WT-VTY-2006-00000-00257) (Reference PCRS tracking item WT-VTY-2006-00000-00258)
3.M.7	The requirements of paragraph 3.M.4 above for meeting the SDMP 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 paragraph 4 shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.	When operating above 1593 MWt, the operating limits, required actions, and surveillances specified in the SDMP will be met. Those key attributes of the SDMP specified in License Condition 3.M.4 will not be made less restrictive without prior NRC approval. (Reference PCRS tracking item WT-VTY-2006-00000-00259)
3.M.8	This license condition shall expire upon satisfaction of the requirements in paragraphs 5, 6, and 7 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.	(Reference PCRS tracking item WT-VTY-2006-00000-00260)

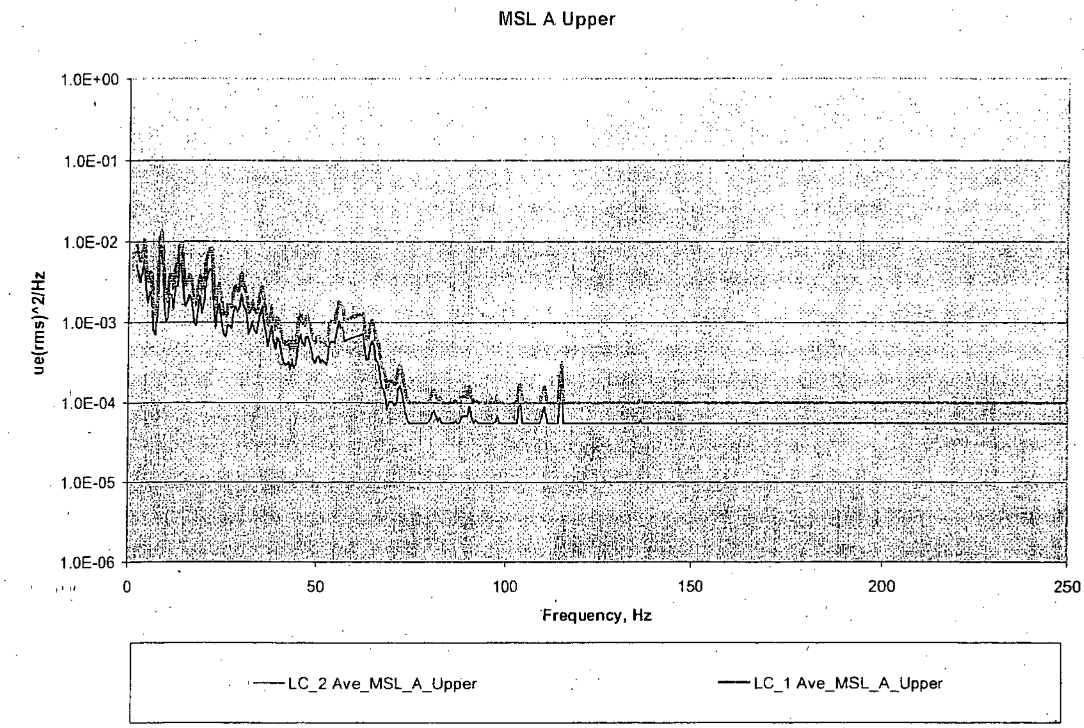

Figure 1: Steam Dryer Stress Limit Curve – MSL 'A' Upper

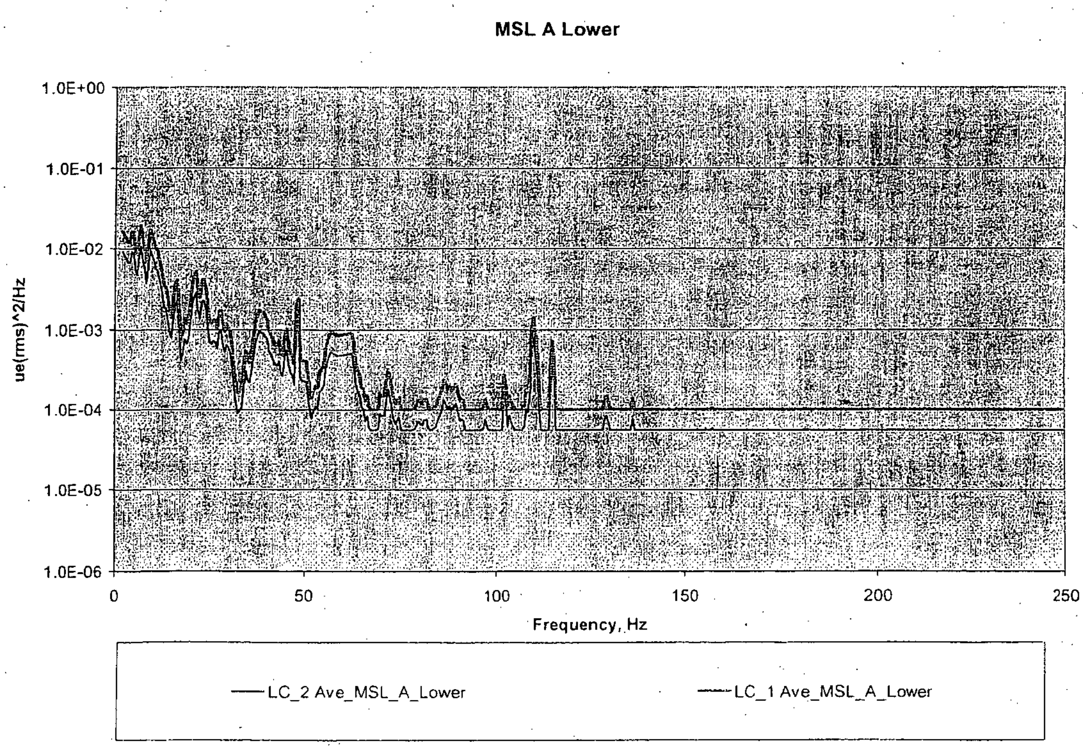

Figure 2: Steam Dryer Stress Limit Curve – MSL 'A' Lower

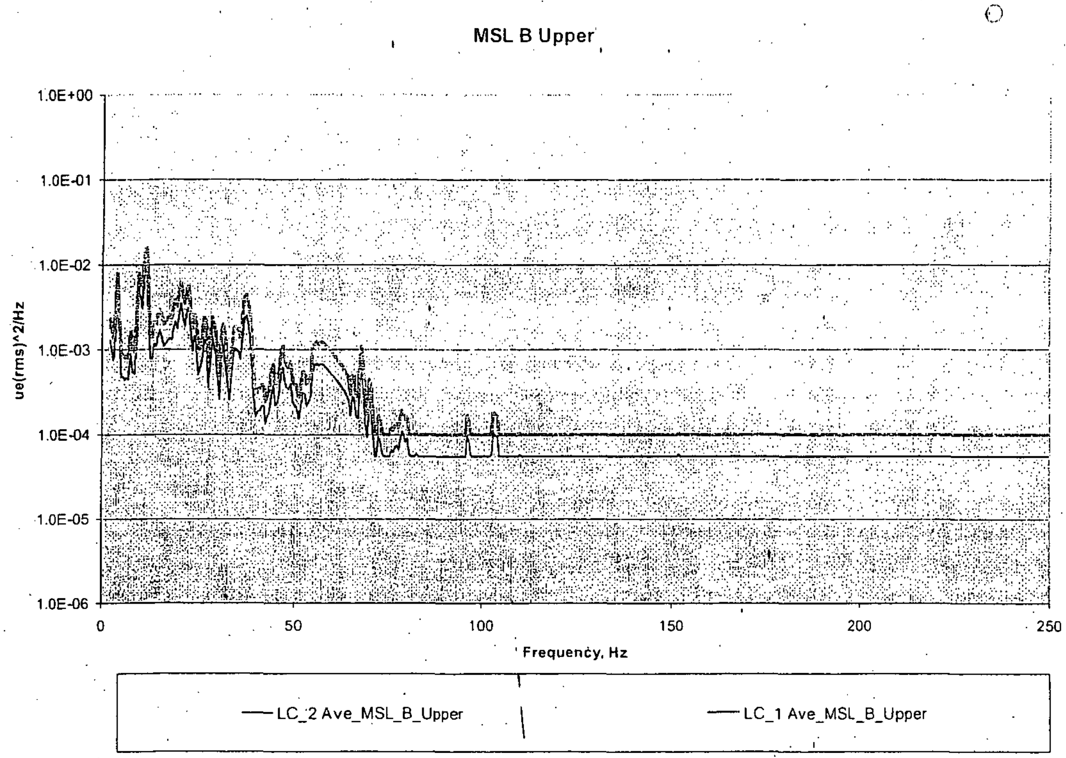

Figure 3: Steam Dryer Stress Limit Curve – MSL 'B' Upper

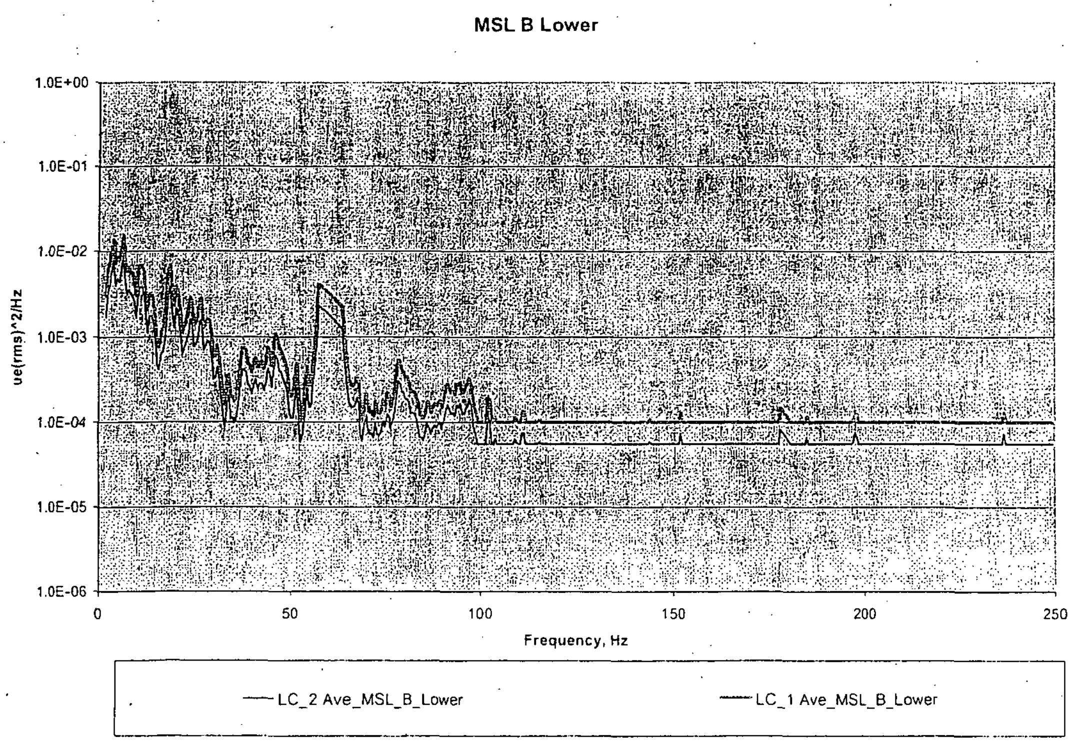

Figure 4: Steam Dryer Stress Limit Curve – MSL 'B' Lower

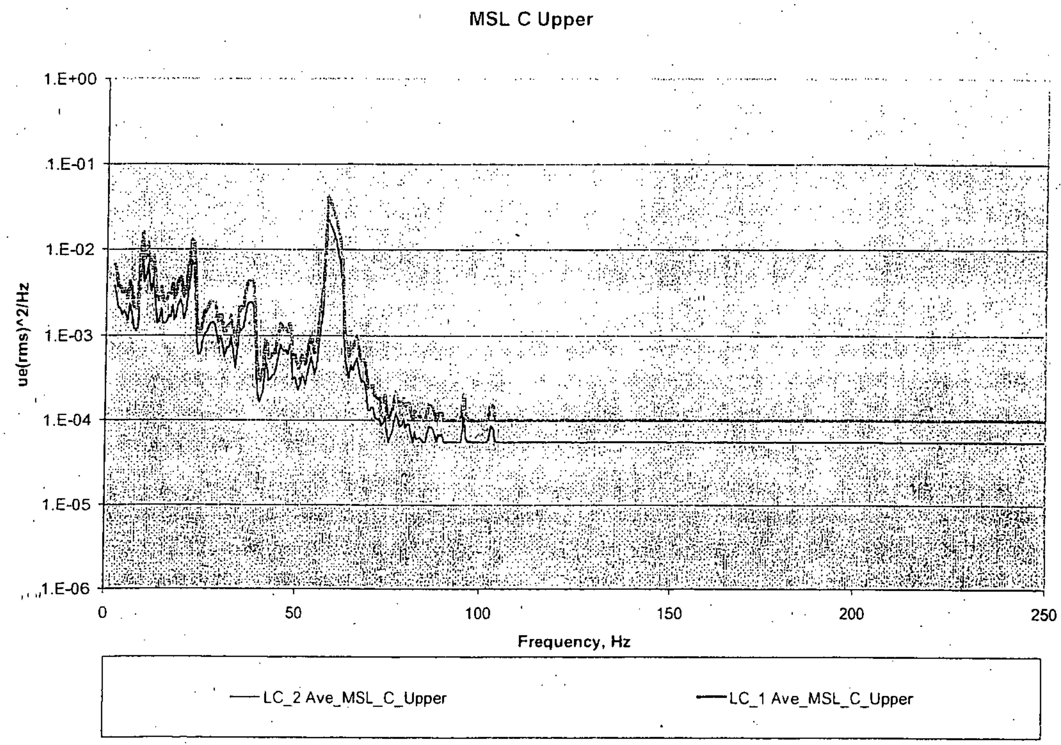

Figure 5: Steam Dryer Stress Limit Curve – MSL 'C' Upper

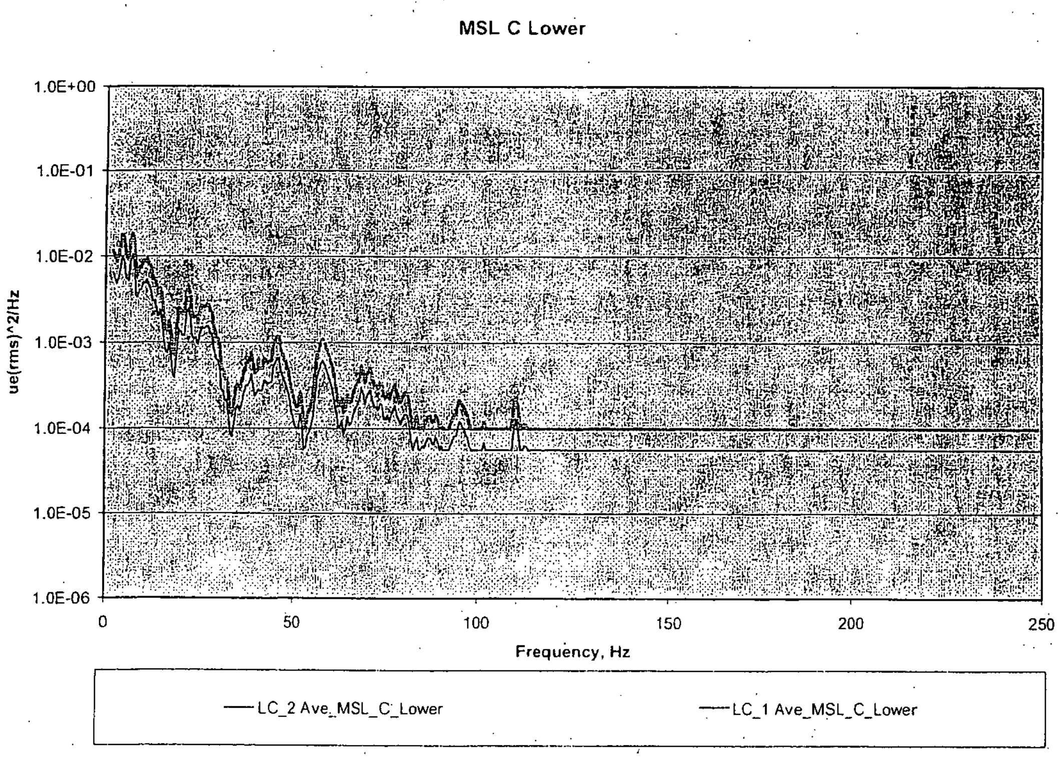

Figure 6: Steam Dryer Stress Limit Curve – MSL 'C' Lower

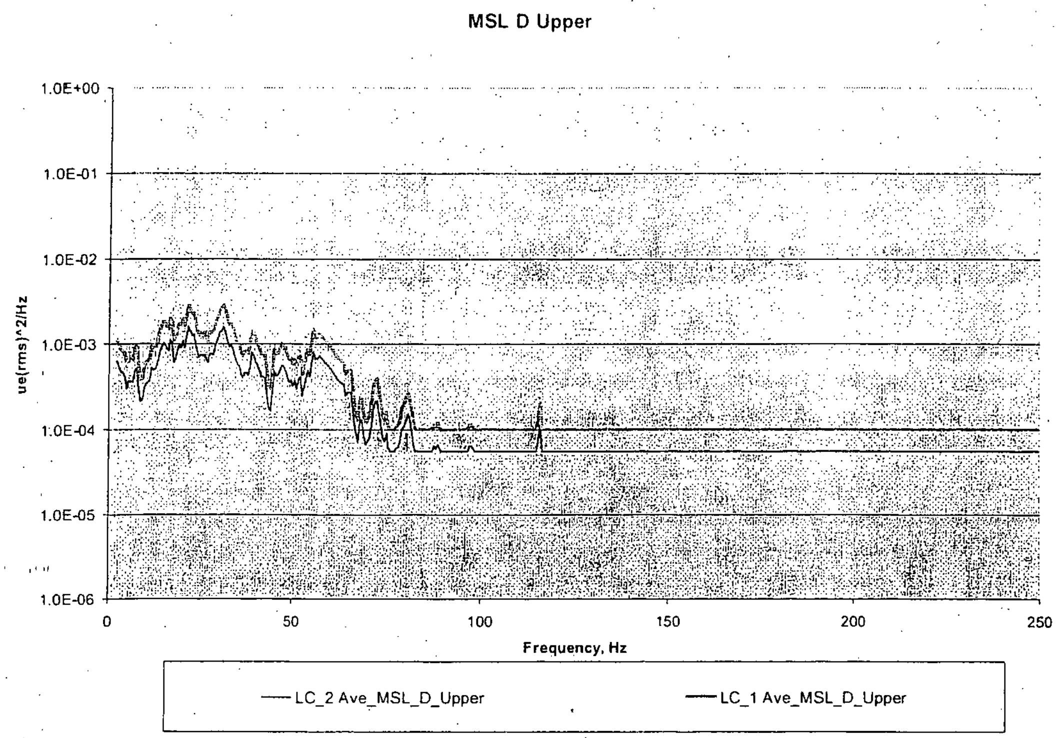

Figure 7: Steam Dryer Stress Limit Curve – MSL 'D' Upper

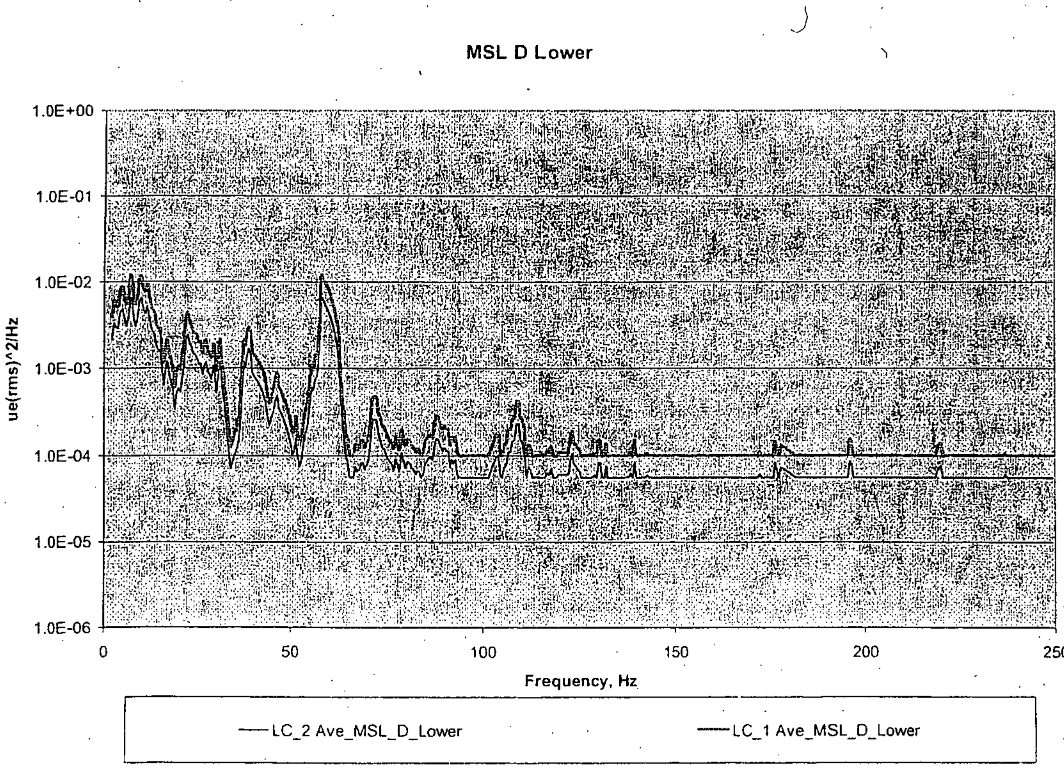

Figure 8: Steam Dryer Stress Limit Curve – MSL 'D' Lower

BVY 06-019
Docket No. 50-271

Attachment 2

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 263

Extended Power Uprate – Regulatory Commitment

Information Regarding Steam Dryer Monitoring and FIV Effects

Power Ascension Test Procedure (FIV Portions)

Total number of pages in Attachment 2 (excluding this cover sheet) is 228.

TEST COVER SHEET

TEST TYPE: ☐ ERT Procedure ☒ ERSTI Procedure Page 1 of 118

TEST #: ERSTI-04-VY1-1409-000 **Quality Class:** ☒ QR ☐ NQR

TEST TITLE: Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth

REVIEW (Print/Sign/Date)

Test Engineer (TE): Bryan Croke [signature] / 2/14/06

Technical Reviewer: Paul Stello [signature] / 2-14-06

CROSS-DISCIPLINE REVIEW Edward L. Harris DE E/I&C D.M. Hogan Dave Hogan 2-15-06

Operations Department: [signature] / 2/14/06 Chemistry Organization: SAHoover per S. Leader 2-10-06

Radiation Protection Organization: [signature] / 2/15/06 Engineering Organization: [signature] / 2/15/06

Quality Assurance Organization: B E Hall / 2/10/06 Maintenance: [signature] 2/15/06

Civil/Struc DE R.G. Drunn 2/14/06 (Piping FIV only)

MECHANICAL DE FOR ATT 6A ONLY P.E. Rainey / P. RAINEY 2/14/06 E.G. Beth DE 2/14/06 Att 1 only

REACTOR ENGINEERING: [signature] D. JAMUNAS 2/15/2006

ADDITIONAL ERSTI (ONLY) PROCEDURE REQUIREMENTS

ENN-LI-100 Review: ☒ Attached ☒ Other (~~0091 Risk Review~~) VYAPF 0172.02

10CFR50.59 Evaluation: ☒ Not Required ☐ Attached ☐ Other

OSRC Approval ☐ Not Required Mtg No 2006-007 Date: 2/24/06 Chairman: [signature] Norm Rademacher

APPROVAL (Print/Sign/Date)

TE Supervisor: Craig Nichols [signature] / 2/24/06

TEST COMPLETION REVIEW / ACCEPTANCE

Summary of Test Results: ______

Test Engineer (TE): ______ / ______

TE Supervisor: ______ / ______

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5R Moisture Carryover 1912 MWth
5S Moisture Carryover 1912 MWth
5T Moisture Carryover 1912 MWth

Power Ascension Testing for Extended Power Uprate Conditions

1. Objective

The objective is to confirm acceptable plant performance for operation at extended power uprate to 1912 MWth per Nuclear Change 2005-1409, EPU.

This Test Instruction provides step by step guidance and verification for performing Power Ascension Testing requirements for Extended Power Uprate (EPU) conditions. The Test Instruction supplements OP-0105, Reactor Operations, to provide direction to maneuver the plant from 1593 MWth [83.32% LPU] to 1912 MWth [100.00% LPU].

First and foremost is the safety of the reactor, nuclear plant and personnel. This procedure was written with this specifically in mind, providing the necessary criteria, instruction, oversight, and precautions to successfully execute the Power Ascension Testing for Extended Power Uprate Conditions.

Separate procedures are written to:

- Determine the maximum safe power level when MSIV, turbine bypass and turbine stop valve testing can be performed. This determination is accomplished separately from this procedure.

- Demonstrate plant response to a condensate pump trip.

1.1. Intent

1.1.1. Document the plant physical modifications, instrumentation setpoint changes, and prerequisite testing have been satisfactorily completed and to meet the established acceptance criteria to raise reactor power above 1593 MWth to 1912 MWth.

1.1.2. Implement tests contained in EPU Project Task Report VY-RPT-05-00041, "T1005: Startup Test Specifications"

1.1.2.1. Maintain control of and knowledge of the reactor coolant chemistry and radiochemistry at extended uprate conditions.

1.1.2.2. Monitor radiation levels at the extended uprate power conditions to assure that personnel exposures are maintained ALARA, radiation survey maps are accurate, radiation zones are properly posted, site boundary doses are as expected, and offsite boundary doses comply with state and federal regulations.

1.1.2.3. Measure and evaluate core thermal power and fuel thermal margins to ensure a careful, monitored approach to the next power uprate level.

1.1.2.4. Monitor feedwater level control system for acceptable reactor water level control.

1.1.2.5. Confirm acceptable calibration of the feedwater flow elements at uprated power conditions.

1.1.3. Demonstrate that affected plant parameters and equipment performance remains within the acceptable limits as power is increased from 1593 MWth to 1912 MWth.

1.1.4. Monitor plant system response via the System Engineering System Monitoring Plans.

1.1.5. Provide Shift Operations personnel clear instructions on testing and operational maneuvers to be performed as power level is increased in a step-wise manner to assure safe plant operation.

1.1.6. Provide management reviews and approvals of the test data and the authorization needed to increase power level in a safe, controlled, step wise manner.

1.1.7. Assure that procedures requiring revision to operate at uprated power conditions have been revised as required and are available to plant personnel.

1.1.8. Assure that regulatory commitments have been completed as required to increase power above 1593 MWth. This includes commitments contained within the License Amendment Request (LAR), correspondence to the NRC Request for Additional Information (RAI), the NRC issued Safety Evaluation Report (SER) and any license conditions. This will be accomplished via the Pre-requisite section of this procedure.

1.1.9. Verify that training has been completed to meet licensing commitments and provide safe operation of the plant.

1.1.10. Document and collect data, including baseline data at 1593 MWth, which will be used to prepare an EPU Test Report to be submitted to the NRC upon completion.

1.2. Discussion

1.2.1. The EPU Project utilized a generic methodology from General Electric for evaluating plant systems and equipment for operating at uprated power levels. This methodology provided system, program, and equipment task evaluations, which identified the acceptability to operate at an increased power level. These task evaluation documents provided input into the testing program which is implemented by this test procedure.

1.2.2. The steps contained in this document were a culmination of inputs from numerous sources. The GE Licensing Topical Report (GELTR) required operational tests for systems which have revised performance requirements because of the extended power uprate. A test plan was submitted with the License Amendment Request, which specified the operational tests to be performed. A review of the original start-up test specifications was completed and tests were selected based on the change resulting from the extended power uprate. Test requirements were also added to this procedure based on the System Task Reports to ensure that analyses were accurate and closely monitored. Finally, test requirements were added based on Engineering judgment, discussion with plant personnel and Lessons Learned from other plant power uprates.

1.2.3. Test requirements that are satisfied by completion of existing surveillances, calibrations or post modification testing need not be repeated for the purposes of this procedure unless specifically identified in this procedure.

1.2.4. Plant maneuvers and operation shall be performed in accordance with applicable VY Station Procedures including power changes in accordance with OP 2404, Determination and Implementation of Rod Movement Sequences and OP 0105, Reactor Operations.

1.2.5. A Power Ascension Control Center (PACC) is established to support implementing this procedure. Personnel from various functional areas, together with senior managers, are assigned to provide continuously available resources to address issues that may arise during the performance of this procedure. Additional peer assessments and reviews will be available, if required.

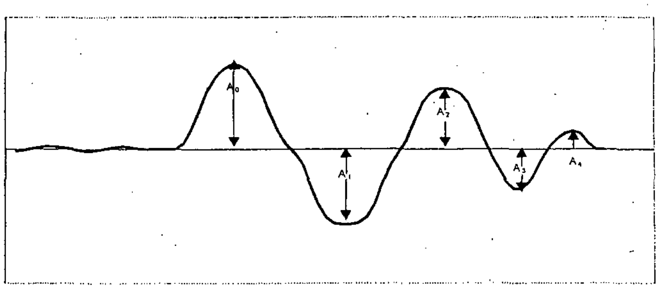
1.3. Definitions

1.3.1. CPPU – Constant Pressure Power Uprate - Operating at increased steam and feedwater flows without increasing maximum reactor recirculation flow or reactor vessel operating pressure.

1.3.2. Decay ratio – is a term used to describe the amplitude dampening of an oscillatory signal.

Decay ratio is less than 0.25 if there are no more than two positive peaks. IF more than two positive peaks exist, THEN decay ratio must be calculated as follows:

- Draw baseline through inflection points of trace.
- Amplitudes of peaks should be measured from this reference line, e.g., A0, A1, A2, A3, and A4 as shown in Figure below.
- Calculate ratios of amplitudes between successive peaks of same polarity, e.g., A2/A0, A3/A1, A4/A2.
- Decay ratio determined by averaging all ratios determined in previous step, e.g.,
- Decay Ratio = (A2/A0 + A3/A1 + A4/A2) / 3.



1.3.3. EPR - Electrical Pressure Regulator - the electrical/mechanical system which controls the turbine control valves and turbine bypass valves based on main steam pressure. This is the primary turbine pressure control system.

1.3.4. FIV – Flow Induced Vibration

1.3.5. FRV – Feedwater Regulating Valves – air operated feedwater control valves FCV-6-12A and FCV-6-12B that throttle reactor feedwater flow based on signals received from the Feedwater Level Control System.

1.3.6. Intrusive Activities – activities that do have the potential to or change parameters associated with reactor power including backwashing and pre-coating condensate demineralizers, pump swaps, raising or lowering reactor power, changing reactor pressure, etc.

1.3.7. Lead Test Performer – In accordance with ENN-DC-117, a person or group assigned by the Test Engineer to assist in the performance of an ERT or STI. The Lead Test Performer may perform the duties of the Test Engineer, in performing the test, as directed by the Test Engineer.

1.3.8. LPU – License Power Uprate = 1912 MWth

1.3.9. MHC Mechanical Hydraulic Control – the combined pressure control system made up of the EPR and MPR.

1.3.10. MPR – Mechanical Pressure Regulator – the mechanical system which controls the turbine control valves and turbine bypass valves based on main steam pressure. This is the backup turbine pressure control system.

1.3.11. Non intrusive activities – activities that do not change any parameters associated with reactor power including data collection, obtaining chemistry samples, etc.

1.3.12. RE - Reactor/Computer Engineering

1.3.13. Responsible Engineer – in accordance with ENN-DC-117, an individual assigned primary responsibility and cognizance for development of an ER Response.

1.3.14. Termination and Hold Criteria

1.3.14.1. Level 1: Criteria associated with plant safety.

When a criterion is not met, TERMINATE the test and:

1.3.14.1.1. Hold at the most secure point and place the plant in a condition that is judged to be satisfactory and safe, based upon prior testing, reducing power if necessary.

1.3.14.1.2. Follow plant operating procedures, test procedures or the Technical Specifications on the decision of actions to be taken.

1.3.14.1.3. Generate a CR (condition report) and pursue resolution of the problem through investigating related adjustments as well as measurement and analytical methods.

1.3.14.1.4. Following resolution, repeat the applicable test portion to verify that the Level 1 requirement is satisfied.

1.3.14.2. Level 2 Criteria is associated with design performance or plant parameters that are not expected to be exceeded while implementing this procedure and at that value are not immediately adverse to plant or equipment safety.

When a criterion is not met, place the test on HOLD and:

1.3.14.2.1. Hold at the most secure point and place the plant in a safe condition including reducing power if necessary.

1.3.14.2.2. Generate a CR and pursue resolution of the problem through investigating related adjustments as well as measurement and analytical methods.

1.3.14.2.3. Repeat the applicable test portion to verify that the Level 2 requirement is satisfied following the resolution unless the as-found condition is found to be satisfactory.

1.3.14.3. Level 3: Criteria associated with plant surveillance acceptance criteria.

When criteria is not met:

- Normal plant procedures will be followed if Level 3 Acceptance Criteria is exceeded.

1.3.14.4. Level 4: Criteria associated with plant operating procedures, for example, operator rounds, operating procedures, alarm response sheets, etc.

When criteria is not met:

- Normal plant procedures will be followed if Level 4 Acceptance Criteria is exceeded.

1.3.15. Test Engineer – Per ENN-DC-117 a qualified individual for any organization, designated by the Testing Authority to perform the responsibilities of the Test Engineer. Qualifications for filling the Test Engineer function are in accordance with ENN-TQ-104.

1.3.16. Testing Authority – Per ENN-DC-117, the Testing Authority is the individual who owns the testing process. The System Engineering Manager is the Testing Authority.

1.4. Responsibilities

The roles and responsibilities established to support this procedure are as follows:

1.4.1. Management Designee: A management person who holds an SRO license/certification, DCO qualified, a superintendent or higher level member of the plant staff or other individual that has been designated by the General Manager Plant Operations with responsibility for management oversight as defined in this procedure. He/she shall provide overall line management authority for the safe conduct of an infrequently performed test or evolution. The Management Designee does not replace any individual involved in the test or evolution, nor supervise the evolution. The Management Designee's function is management oversight.

1.4.2. Shift Manager – The SM has the responsibility for the safe operation of the plant at all times. The SM's approval is required prior to performance of this test and has the authority to stop the test at any time. The SM's approval is also required to continue testing if a test was terminated.

1.4.3. Control Room Supervisor (CRS) provides direction to Licensed Operators and other on-shift Operations personnel involved in the performance of this test.

1.4.1. Principal IPTE Coordinator [PIPTEC] - is responsible for overall implementation of the procedure. His responsibilities are spelled out in AP 6100. The PIPTEC will maintain control of all test activities and seek assistance from support departments as necessary. The PIPTEC or their designees will be responsible for signing off steps as completed within this procedure. The PIPTEC have the following duties and responsibilities with respect to the activities being controlled by this procedure. The SM shall not be assigned as a PIPTEC.

- Reports test status and significant issues to station management.
- Coordinates the activities requiring completion by this procedure to assure they are completed in a safe and timely manner.
- Responsible for assuring this procedure is updated and maintained current with work and testing activities controlled by this procedure.
- Reviews the exceptions to this procedure and expedites the resolution if exceptions affect power ascension testing.
- Authorizes the next step in power ascension testing if the test data results meet the acceptance criteria.
- May add additional equipment performance monitoring data collection at any time during the performance of this procedure.
- Assures that shift personnel are knowledgeable of test activities being controlled and performed by this procedure.

1.4.2. Test Engineer – Per ENN-DC-117 a qualified individual for any organization, designated by the Testing Authority to perform the responsibilities of the Test Engineer. Qualifications for filling the Test Engineer function are in accordance with ENN-TQ-104. The Test Engineer will have the following duties and responsibilities with respect to the activities being controlled by this procedure.

- The Test Engineer may assist in the development and/or presentation of technical aspects of this evolution.
- Has administrative and physical control of this procedure.
- Maintains a log.
- Maintains technical control of this procedure and is authorized to make changes to the acceptance limits of the system and equipment following an engineering evaluation that justifies the change in accordance with ENN-DC-117

1.4.3. Operations Support Personnel (AO's) – Operations Control Room personnel and auxiliary operators will perform the necessary plant control manipulation to operate various valves, equipment, and systems.

1.4.4. Test Team [IPTE Team]: A team of individuals, led by the Management Designee, will monitor extended or complex IPTEs. Oversight team members do not replace any individuals involved in the test or evolution. The team's function is to provide additional oversight.

1.4.5. Responsible Engineers, in conjunction with the Test Engineer and Shift Manager, have authority to change system and equipment acceptance limits or predicted performance values following an engineering evaluation that justifies the change in accordance with ENN-DC-117.

2. References:

   2.1. AP 0020 Control Of Temporary And Minor Modifications

   2.2. AP 0052 Pre Job Briefing

   2.3. AP 0503 Establishing And Posting Restricted Areas

   2.4. AP 6100, Infrequently Performed Test or Evolutions

   2.5. DP 0636 Collection and Digestion of Metal Samples

   2.6. DP 0643 Filterable Solids

   2.7. EN-AD-103 Document Control and Records Management Activities

   2.8. EN-LI-102 Corrective Action Process

   2.9. ENN-DC-117 Post Modification Testing and Special Test Instructions

   2.10. ENN-IT-104 Software Quality Assurance Program

   2.11. ENN-OP-104 Resolution of Equipment Operability Concerns Related to Degraded or Nonconforming Conditions

   2.12. ER 04-0529 ""EPU Instrumentation Upgrade Non Outage"

   2.13. GE EPU Final Task Reports:

      2.13.1. VY-RPT-05-00041, "T1005: Startup Test Specifications"

      2.13.2. VY-RPT-05-00065, "T0500: Neutron Monitoring System"

      2.13.3. VY-RPT-05-00066, "T0504: Feedwater Control System"

      2.13.4. VY-RPT 05-00067, "T0506: NSSS TS Instrument Setpoints"

      2.13.5. VY-RPT-05-00104, "T0316: NSSS Piping Flow Induced Vibration Evaluation"

   2.14. GE SIL 467, Recirculation System Bi-stable Flow in Jet Pump BWRs

   2.15. GEI 88578 "Overspeed Operation Preparatory Procedure for Cold Starts"

2.16. GEK 459371, "Recommendation for Reading and Recording Generator Resistance Temperature Detectors and Thermocouples"

2.17. GEK 75526A "Operator Action on High Temperature Alarms"

2.18. I&T 2003-004.01 FWH Level Control System Installation and Test procedure

2.19. Licensing Topical report, "Generic Evaluations for General Electric Boiling Water Reactor Extended Power Uprate," NEDC-32523P-A Class III, February 2000 (ELTR-2)

2.20. Licensing Topical report, "Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate," NEDC-32424P-A Class III, February 1999 (ELTR-1)

2.21. MM 2004-002 "EPR Modification for EPU"

2.22. MM 2004-039 "NSSS/BOP Instrumentation Upgrades for EPU"

2.23. NF 102 Corporate Fuel Reliability

2.24. Nuclear Change ER 2004-1409, Extended Power Uprate

2.25. OP 2199 Hydrogen Water Chemistry System

2.26. OP 0105 Reactor Operations

2.27. OP 0631 Radiochemistry

2.28. OP 2172 Feedwater System

2.29. OP 2404 Determination And Implementation Of Rod Movement Sequences

2.30. OP 2429 Recirculation Flow System Baseline Data Collection and Instrument Calibration

2.31. OP 2457, PCIOMR Implementation

2.32. OP 2613, Sampling and Analysis of the Off Gas System

2.33. OP 4110 Reactor Recirc System Surveillance

2.34. OP 4160 Turbine Generator Surveillance

2.35. OP 4401 Core Thermal Hydraulics Limits Evaluation

2.36. OP 4612 Sampling and Treatment of the Reactor Water System

2.37. OP 4617 Calculation of Chemistry Controlled Setpoints

2.38. OP 5399 I/C Calibration Of Important Computer Analog Inputs

2.39. Original GE Startup Test Instructions, Spec. No. 22A2219 KV Rev.0

2.40. Original GE Startup Test Instructions, Spec. No. 22A2219 KV Rev.0

2.41. OT 3110 Positive Reactivity Insertion

2.42. OT 3113 Reactor Low Level

2.43. OT 3114 Reactor High Level

2.44. OT 3115 Reactor Pressure Transients

2.45. PP 7401, Fuel Reliability Program

2.46. Safety Analysis Report for Vermont Yankee Nuclear Power Station Constant Pressure Power Uprate NEDC-33090P, dated September 2003.

2.47. STP 2002-004, Pressure Regulator Dynamic Testing.

2.48. STP 2003-004 Power Ascension Test Procedure

2.49. STP-22, Original Plant Startup Testing for the Pressure Regulator.

2.50. STP-23, Original Plant Startup Testing for the Feedwater Flow Control System

2.51. Technical Evaluation 2004-037, Benchmarking Feedwater FCV Performance for EPU.

2.52. VY EPU License Amendment Request, PC 263

2.53. VYDC 2000-027, Main Turbine EPR replacement.

2.54. VYDC 2001-002, Feedwater Level Controls Upgrade.

2.55. VYDC 2002-007, Feedwater Control System Replacement - Phase 2.

2.56. VYDC 2003-003 "New Main Generator TC's and RTD's and the ERFIS Software Modification"

2.57. VYDC 2003-004 Feedwater Heater Level Control System

2.58. VYNPS Startup Test

3. Apparatus/Test Equipment

   3.1. Dryer Data Collection per TA 2005-0015, Additional Strain Gauge Installation

   3.2. Feedwater Heater Performance per TM 2003-035 Feedwater Heater Performance

   3.3. Flow Induced Vibration Equipment per TM 2003-022, FIV Instrumentation

   3.4. Hand held vibration equipment

   3.5. Any other monitoring equipment required based on System Engineering System Monitoring Requirements

   3.6. Calibrated Pressurized Ion Chamber (PIC)

   3.7. Other instrumentation and equipment as required

4. Precautions and Limitations

4.1. Reactor power levels given in percent are a percentage of the Extended Power Uprate of 1912 MWth = 100.00% LPU.

4.2. System and equipment performance shall be closely monitored to assure that operating limits and test criteria are not exceeded. Condition reports shall be submitted as required. Any discrepancies noted are reported to the Test Engineer and the PIPTEC with an evaluation to determine plant impact (discrepancy resolved or power ascension terminated and/or power reduction commenced). Attach evaluations within Attachment 9 as discussed in Section 9.

4.3. If during power operation any of the following occurs, it may be indication of vessel internals damage and debris carry over. Notify the Shift Manager, the General Manager, Plant Operations, the Test Engineer and the PIPTEC immediately. (OE14300)

- Unbalance of Main Steam Line steam flow indication ~ 5% greater than baseline values
- Unbalance RPV water level ~3 inches between level instruments from different reference legs.
- Sudden drop in steam dome pressure 2-3 psig.
- Unexpected or unexplained step increase of moisture carryover.

4.4. Any pressure or level step changes at a power plateau shall be made first in the downward direction, then in the upward direction. This includes testing the EPR, the MPR, and the feedwater level control system.

4.5. IF during any pressure or level step changes, the system shows signs of becoming unstable or the acceptance limits are approached, THEN stabilize the condition, OTHERWISE exit the condition. The next larger step change shall not be performed until an acceptable response is achieved from the previous smaller steps. This may require repeating a previous step.

4.6. Reactor Engineering shall ensure the testing will avoid operation in the buffer and exclusion regions of the power to flow map.

4.7. IF the EPR is inoperable (the MPR in control) for a time period greater than two hours per occurrence, THEN initiate a CR per ENN-LI-102. Ensure an operability determination, per ENN-OP-104, is completed within 24 hours.

4.8. The Test Engineer with the assistance of the Test Team shall coordinate the review and evaluation of the data package for each step of this procedure for acceptance criteria compliance.

4.9. ALARA principles should be balanced with observing plant systems during power ascension system inspections.

4.10. Power levels tolerances are -19 MWth, + 0 MWth.

4.11. Intentional operation greater than the current plateau (1593 MWth, 1673 MWth, 1752 MWth, 1832 MWth and 1912 MWth) is not permitted. The average CTP level over any eight-hour period shall not exceed the current plateau power level. It is permissible to inadvertently exceed current power plateau by as much as 2% (nominal 1912 MWth) for as long as 15 minutes. Lesser power excursions are permitted for longer periods (i.e., 1% excess for 30 minutes, 1/2% for one hour, etc.) as long as the 8 hour average does not exceed the current power plateau. (NRC Letter SSINS-0200, dated 8/22/80).

4.12. After any change in plant power level above 1593 MWth by the steps in this procedure, an approximate 60-minute stabilization period shall occur prior to recording system and equipment performance data with the exception of dryer and FIV data. Following the stabilization period and during the data collection period the plant shall be maintained in as stable a condition as is possible (i.e., no backwashing and pre-coating condensate demineralizers, pump swap-over, etc) until data collection has been completed.

4.13. Record dryer data collection every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1(A-Y).

5. Termination Criteria

5.1. If an unexpected action results during performance of this procedure:

STOP, PLACE SYSTEM OR COMPONENT IN A SAFE CONDITION, AND NOTIFY THE SHIFT MANAGER, THE TEST ENGINEER AND THE PIPTEC.

5.2. Terminate the IPTE upon the occurrence of:

5.2.1. Exceeding any Level 1 Criteria

5.2.2. Any specific termination/abort criterion defined in applicable procedures or attachments.

5.2.3. Any related event that causes an unexpected reactivity transient, such as that associated with reactor water level, pressure, core flow, temperature, or control rod position.

5.2.4. Any event which requires entering a Technical Specification Limiting Condition for Operation (LCO).

5.2.5. Any IPTE related event that is reportable or potentially reportable to the NRC, such as reactor scram, ECCS actuation, an uncontrolled radiation release or other Condition Report of noteworthy concern.

5.2.6. Any other condition which, in the determination of the PIPTEC, Management Designee, upper management or SM, requires the IPTE to be terminated.

5.3. IF this test is TERMINATED, THEN record and document the exception on test deficiency log in accordance with ENN-DC-117, and generate a CR. Any CRs effecting operability must be reviewed by SM and the Management designee. Notify the GMPO and 91-01 Coordinator (or equivalent).

5.4. If the decision is made to restart or continue an IPTE which was terminated/aborted, the Management Designee and/or PIPTEC shall perform the following prior to proceeding with the test:

5.4.1. Obtain GMPO approval and review by OSRC (if required).

5.4.2. Obtain SM permission.

5.4.3. Ensure resumption will not have unacceptable impact on plant status, operating equipment, or the remainder of the evolution.

5.4.4. Verify prerequisites are met and conditions have not changed since entering the terminated/aborted condition. If conditions have changed, complete applicable steps on the original prerequisites page or on additional pages and attach to the procedure.

5.4.5. Document the re-verification of prerequisites and continuation in the Control Room Log.

5.4.6. Ensure the Operating crew has been re-briefed and has taken a Take Two to refocus on the task.

5.5. IF during the performance of this procedure, testing is stopped for whatever reason, THEN refer to Termination Criteria for actions to be taken PRIOR to resuming testing.

5.6. If an unexpected event occurs at any time during system testing, the system shall be placed in a safe and stable mode using existing operating procedures. Testing activities shall be suspended and placed on HOLD until the event is understood and the SM and the PIPTEC has granted permission to resume testing. The test engineer shall document the decision making on test deficiency log, recording the resolution and approvals granted in accordance with ENN-DC-117. Submit a Condition Report per EN-LI-102. Some examples are;

- If inadequate manpower is available on site or via telephone to ensure successful completion of the evolution.
- To resolve concerns with the evolution or with personnel assigned to the evolution.
- Upon loss of required communications.
- If plant impacts or conflicts with other procedures are identified that are not addressed by the procedures governing the special evolution.

6. Prerequisites

Verify the following items identified in this section have been implemented and are complete and/or are operable, as appropriate:

> NOTE
>
> Prerequisites do not have to be completed in sequence up to step 6.17, Shift Manager's permission to commence license implementation for EPU. Steps prior to 6.17 can be signed off prior to the receipt of the license amendment.
>
> - The following modifications have been completed in accordance with design engineering requirements.
> - Applicable post modification testing has been scheduled or completed, based on plant conditions, and procedures revised as required.
> - Operations has accepted the modified system and there are NO exceptions which preclude power operation up to 1912 MWth.
> - Confirmation of the completion of a modification is initialed by the Test Engineer, another member of the Test Team, or the Responsible Engineer for the modification.

6.1. Minor Modifications: Responsible Engineer

6.1.1. MM 2003-017, Modify RHRSW A Motor Cooling Piping

______ / ______ / ______
Initial Date Time

6.1.2. MM 2003-018, Modify RHRSW B Motor Cooling Piping

______ / ______ / ______
Initial Date Time

6.2. Temporary Modifications/Alterations: Responsible Engineer

6.2.1. TM 2003-022, FIV Instrumentation (Vibration sensors)

_____/_____/_____
Initial Date Time

6.2.2. TM 2003-035 Feedwater Heater Performance Monitoring.

_____/_____/_____
Initial Date Time

6.2.3. TA 2005-0015, Additional Strain Gauge Installation

_____/_____/_____
Initial Date Time

6.3. Technical Specification Changes

6.3.1. PC-263, EPU

_____/_____/_____
Initial Date Time

6.3.2. PC-262, AST

_____/_____/_____
Initial Date Time

6.4. VYDC completed and implemented: Responsible Engineer

6.4.1. VYDC 2003-020, Replacement 381 Breaker

_____/_____/_____
Initial Date Time

6.4.2. VYDC 2003-016, Alternate Source Term

_____/_____/_____
Initial Date Time

6.5. Nuclear Changes

6.5.1. ER 2004-0705, Cooling Tower Fans/Motors

_____/_____/_____
Initial Date Time

6.5.2. ER 2004-1298, LP Turbine 8th Stage Diaphragms

_____/_____/_____
Initial Date Time

6.5.3. ER 2004-1267, MS Low Point Sockolet Reinforcement

_____/_____/_____
Initial Date Time

6.5.4. ER 2004-0971, Main Transformer (GSU) Differential Protection

_____/_____/_____
Initial Date Time

6.5.5. ER 2005-0731, Isokinetic Sample Probes

_____/_____/_____
Initial Date Time

6.5.6. ER 2005-0776, Feedwater Pump Trip

_____/_____/_____
Initial Date Time

6.5.7. ER 2004-0975, Generator CT Upgrade

_____/_____/_____
Initial Date Time

6.5.8. ER 2004-1409, EPU

_____/_____/_____
Initial Date Time

Power Ascension Testing for Extended Power Uprate Conditions

6.5.9. ER 2004-0529, Setpoints and Scaling Changes Required by EPU (approval of document only, implementation is controlled by this procedure.)

_____ / _____ / _____
Initial Date Time

6.5.10. ER 2006-1099, Reactor Recirculation Runback Termination Point Change

_____ / _____ / _____
Initial Date Time

6.5.11. ER 2005-1002 Modification to Feedwater Level Control System to Support EPU

_____ / _____ / _____
Initial Date Time

6.6. OPERATIONS EPU TRAINING (Training)

6.6.1. The required training to operate the plant under EPU conditions has been conducted. Classroom training includes plant design changes in support of EPU including setpoint changes, changes to parameters, procedures and system operation, all related Technical Specification changes, and this Power Ascension Special Test. Simulator training has provided Operators with a demonstration of transients that show the greatest change in plant response at EPU power levels compared to the original maximum power level.

______ / ______ / ______
Initial Date Time

NOTE

This prerequisite does not pertain to any particular Just-in-Time training Operations Management chooses to conduct for Operations personnel performance of power ascension testing.

6.6.2. Evaluation Comments:

____
____
____
____
____
____
____

______ / ______ / ______
Initial Date Time

6.7. EPU Project Action Items

6.7.1. Throughout the EPU Project, action items have been tracked on an internal Action Item List and via PCRS assignments. These tracking mechanisms have been reviewed for items requiring completion prior to or during power ascension testing. The items requiring completion prior to exceeding 1593 MWth have been completed or will be completed as controlled by this procedure. (EPU)

Comments:

____

____

____

____

____

________ / _____ / _____

Initial Date Time

6.7.2. Steam Dryer Action Items (EPU)

The commitments and planned actions specified in the EPU license amendment pertaining to the steam dryer required prior to power ascension have been completed. This step shall be completed prior to increasing power above 1593 MWth.

Comments:

____

____

____

____

____

Verified By: ______________________________

Licensing Manager/Date

Verified By: ______________________________

EPU Project Manager/Date

6.7.3. Technical Specifications and TRM (OPS)

LCO Tracking Database has been reviewed and evaluated for any impact on the ability of the plant to support power ascension testing and has been found acceptable for power increase. Exceptions requiring action shall be listed below by exception number and shall be annotated in Test Deficiency Log.

Comments:

____
____
____
____
____

______ / ______ / ______
Initial Date Time

6.8. LOG REVIEWS

6.8.1. TEMPORARY ALTERATION (MODIFICATIONS) LOG REVIEW (System Engineering)

6.8.1.1. The Temporary Alteration (Modifications) Log has been reviewed and all installed Temp Alts have been evaluated for their impact on this Power Ascension Test and have been found acceptable. Exceptions requiring action shall be listed in Test Deficiency Log.

Comments:

____
____
____
____

______ / ______ / ______
Initial Date Time

6.8.2. Operability Evaluation/ODMI Log Review: (OPS)

6.8.2.1. All Operability Evaluations/ODMIs that have EPU constraints been evaluated for their impact on Power Ascension and have been found acceptable. Exceptions requiring action shall be listed in Test Deficiency Log.

Comments:

____
____
____
____

_____/_____/_____
Initial Date Time

6.9. PROCEDURE REVIEW AND ISSUANCE

6.9.1. The EPU Project has resulted in the completion of many modifications, Technical Specification revisions and system operating parameter changes. These changes affect many Site procedures. This prerequisite requires the responsible Department Head review the procedures under their control and verify that:

- They have reviewed the procedures under their control for minor modifications, design changes, temp modifications, and license amendments.
- Have evaluated the impact of the differences between the Final License amendment and the proposed License amendment on various procedure changes.
- Training of personnel within their department has been completed as required by the revised procedures.
- Procedures required for power ascension have been issued and distributed for plant usage.
- By signing for their respective department procedures, the responsible department head verifies that plant procedures assigned to the department required for power ascension have been revised accordingly.

Functional Group	Dept Head/ Signature Date/Time	Exceptions [1]
Maintenance		
Operations		
Chemistry		
Radiation Protection		
Engineering		
Training		
Emergency Preparedness		
Reactor Engineering		
General Manager		
Licensing		
Safety		
Quality Assurance		
CA&A		

[1] Record exceptions on the Test Deficiency Log and enter the log number on this page.

6.10. SER Review

6.10.1. The NRC Final Safety Evaluation Report and License Amendment have been reviewed against the License Amendment Request and any differences have been evaluated for their affect on;

- Plant Operating Procedures
- Plant Processes and Programs
- This Power Ascension Test Procedure

This evaluation has been completed and there are no additional changes to the documents listed above prior to the start of Power Ascension Testing as performed by this procedure.

Evaluation Comments

Comments:

____
____
____
____
____

Verified By: ________________________________
Licensing Manager/Date

Verified By: ________________________________
EPU Project Manager/Date

6.11. EQUIPMENT CLEARANCE ORDERS AND EQUIPMENT STATUS TAGS (OPS)

6.11.1. The equipment that is Out-of-Service that can affect the ability of the plant to support power ascension testing has had its plant impact reviewed and evaluated and found acceptable for power increase. Exceptions requiring action shall be listed below by exception number and shall be annotated in Test Deficiency Log in accordance with ENN-DC-117.

6.11.2. Review Comments:

____

____

____

____

____

____

____

______ / ______ / ______

Initial Date Time

6.12. Verify the following Instrumentation Prerequisites completed:

6.12.1. ERFIS is available for monitoring test parameters (RE) including:

6.12.1.1. VYOPF 0452.01 2005-037 ERFIS Condensate and Feedwater Pump and Motor Bearing Temperature Setpoint Increase for EPU.

_____/_____/_____
Initial Date Time

6.12.1.2. VYOPF 0452.01 2005-021; ERFIS F005, C008 Condensate Flow Re-range for EPU

_____/_____/_____
Initial Date Time

6.12.1.3. VYOPF 0452.01 2005-025, ERFIS Miscellaneous EPU Change

_____/_____/_____
Initial Date Time

6.12.2. TA 2005-0015 Strain Gauges (DE)

_____/_____/_____
Initial Date Time

6.12.3. TM 2003-0035, Feedwater Heater Performance Monitoring (DE)

_____/_____/_____
Initial Date Time

6.12.4. TM 2003-022, FIV Monitoring (DE)

_____/_____/_____
Initial Date Time

6.12.5. ER 04-529, EPU Instrument Changes: (I&C)

6.12.5.1. 2005E-060 Condensate Pump Motor Amp Control Room Indication Amber Band (Optional)

____ / ____ / ____
Initial Date Time

6.12.5.2. 2005C-005 Condensate Pump Discharge Pressure Control Room Pressure Indication Green Band (Optional)

____ / ____ / ____
Initial Date Time

6.12.5.3. 2004C-023 PT-6-56 Main Turbine Bowl Pressure Transmitter

____ / ____ / ____
Initial Date Time

6.12.5.4. Calibration of FS-6-95 Steam Leak Detection

____ / ____ / ____
Initial Date Time

6.12.5.5. Calibration Data Sheet for FT-102-4-1 and FI-102-9 Condensate flow input to Oxygen Injection System

____ / ____ / ____
Initial Date Time

Power Ascension Testing for Extended Power Uprate Conditions

6.13. Administrative Controls:

The signature below signifies that power ascension above 1593 MWth may commence with all issues resolved or otherwise addressed.

6.13.1. Licensing Manager

____________ / ____________ / ____________
Signature / Date / Time

6.13.2. EPU Manager

____________ / ____________ / ____________
Signature / Date / Time

6.13.3. Engineering Director

____________ / ____________ / ____________
Signature / Date / Time

6.13.4. Operations Manager

____________ / ____________ / ____________
Signature / Date / Time

6.13.5. Reactor Engineering Superintendent

____________ / ____________ / ____________
Signature / Date / Time

6.13.6. CA&A Manager

____________ / ____________ / ____________
Signature / Date / Time

6.13.7. Quality Assurance Manager

____________ / ____________ / ____________
Signature / Date / Time

6.13.8. Maintenance Manager

____________ / ____________ / ____________
Signature / Date / Time

6.13.9. Chemistry Manager

__________ / __________ / __________
Signature / Date / Time

6.13.10. RP Manager

__________ / __________ / __________
Signature / Date / Time

6.14. All test team members have read and understood:

6.14.1. ERSTI-04-VY1-1409-000, Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth

6.14.2. EN-DC-117 Post Modification Testing and Special Testing Instructions.

6.14.3. AP 6100 Infrequently Performed Tests or Evolutions

_____ / _____ / _____
Days Initial Date Time

_____ / _____ / _____
Nights Initial Date Time

6.15. PRE-JOB BRIEFS:

6.15.1. A pre-job brief has been performed per AP 6100 for PACC personnel involved on day shift.

_____ / _____ / _____
Initial Date Time

6.15.2. A pre-job brief has been performed per AP 6100 for PACC personnel involved on night shift.

_____ / _____ / _____
Initial Date Time

6.15.3. A pre-job brief has been performed per AP 6100 for day shift test team members.

_____ / _____ / _____
Initial Date Time

6.15.4. A pre-job brief has been performed per AP 6100 for night shift test team members.

_____ / _____ / _____
Initial Date Time

6.15.5. A pre-job brief has been conducted per AP 6100 for Operating Crews

_____ / _____ / _____
Initial Date Time

6.16. Shift Manager's Permission to start:

6.16.1. THE SM'S PERMISSION HAS BEEN GRANTED TO COMMENCE LICENSE IMPLEMENTATION FOR EXTENDED POWER UPRATE.

____
Shift Manager/Date /Time

6.17. OSRC recommends license implementation for Extended Power Uprate to the GMPO.

OSRC Review Meeting #: ____________

____/____/____
Initial Date Time

6.18. The GMPO authorizes implementation of the:

6.18.1. The license change per PC 263

____/____/____
Initial Date Time

6.18.2. The remaining prerequisites (Step 6.21) listed in this procedure which will effectively raised authorized reactor power limit to 1912 MWth

____/____/____
Initial Date Time

6.19. Verify that new license has been implemented in the control room.

____/____/____
Initial Date Time

6.20. Implement the following changes:

6.20.1. ERFIS Changes

6.20.1.1. VYOPF 0452.01 2004-070, ERFIS 3D Monicore Extended Power Uprate

_____/_____/_____
Initial Date Time

6.20.1.2. VYOPF 0452.01 2004-073, ERFS EPU Operating Map Display Update

_____/_____/_____
Initial Date Time

6.20.1.3. VYOPF 0452.01 2005-020, ERFIS EPU Related SPDS Display

_____/_____/_____
Initial Date Time

6.21.2 Setpoint Changes:

6.21.2.1 Setpoint Change for Main Steam Line Radiation Monitors RM-17-251 A/B/C/D at EPU Conditions

_____/_____/_____
Initial Date Time

6.21.3 Work orders that implement ER 2004-0529, Setpoints and Scaling Changes Required by EPU:

6.21.3.1 2005C-001APRM Flow Bias Scram (A/M)

_____ / _____ / _____
Initial Date Time

6.21.3.2 2005C-002 APRM Flow Bias Rod Block (A/M)

_____ / _____ / _____
Initial Date Time

6.21.3.3 2005C-003 MSL High Flow M/S in RUN

_____ / _____ / _____
Initial Date Time

6.21.3.4 2005C-004 MSL High Flow M/S Not in Run

_____ / _____ / _____
Initial Date Time

6.21. Confirm the following documents are approved after the receipt of the NRC License Amendment.

6.21.1. Nuclear Change 04-1493

_____ / _____ / _____
Initial Date Time

6.21.2. TRM

_____ / _____ / _____
Initial Date Time

6.21.3. Input Assumption Source Document

_____ / _____ / _____
Initial Date Time

6.21.4. Calculation VYC-808

_____ / _____ / _____
Initial Date Time

6.21.5. Calculation VYC-2374

_____/_____/_____
Initial Date Time

6.21.6. Calculation VYC-2398

_____/_____/_____
Initial Date Time

6.21.7. Calculations VYC-2405

_____/_____/_____
Initial Date Time

6.22. All prerequisites are complete and any exceptions are authorized and approved.

Verified By: ______________________________
Test Engineer/Date/Time

7. Procedure

NOTES

- Power levels tolerances are -19 MWth, + 0 MWth.

- Intentional operation greater than the current plateau (1593 MWth, 1673 MWth, 1752 MWth, 1832 MWth and 1912 MWth) is not permitted. The average CTP level over any eight-hour period shall not exceed the current plateau power level. It is permissible to inadvertently exceed current power plateau by as much as 2% (nominal 1912 MWth) for as long as 15 minutes. Lesser power excursions are permitted for longer periods (i.e., 1% excess for 30 minutes, 1/2% for one hour, etc.) as long as the 8 hour average does not exceed the current power plateau. (NRC Letter SSINS-0200, dated 8/22/80).

- Data collection and evaluation at each power level may be performed in any order at that power level unless the section provides different direction.

- IF during the performance of this procedure, testing is stopped for whatever reason, THEN refer to Termination/Hold Criteria, for actions to be taken PRIOR to resuming testing.

- After any change in plant power level above 1593 MWth by the steps in this procedure, an approximate 60-minute stabilization period shall occur prior to recording system and equipment performance data with the exception of dryer data and FIV data. Following the stabilization period and during the data collection period the plant shall be maintained in as stable a condition as is possible (i.e., no backwashing and pre-coating condensate demineralizers, pump swap-over, etc.) until data collection has been completed.

- The Test Engineer with the assistance of the Test Team shall coordinate the review and evaluation of the data package for each step of this procedure for acceptance criteria compliance.

Power Ascension Testing for Extended Power Uprate Conditions

7.1. 1593 MWth

With reactor power at 1574 MWth to 1593 MWth, and with three (3) Feedwater pumps running, perform the following:

7.1.1. Verify performed or perform dryer data collection per Attachment 1A.

______/______/______
Initial Date Time

7.1.2. Verify performed or perform flow induced vibration measurement per Attachment 2A.

______/______/______
Initial Date Time

7.1.3. Verify performed or request RP to perform Radiation Surveys per Attachment 3.

______/______/______
Initial Date Time

7.1.4. Verify or request Operations to verify or place the "B" recombiner in service and the "A" recombiner in standby per OP 2150.

______/______/______
Initial Date Time

7.1.5. Verify performed or request RE to predict anticipated thermal limits for 1673 MWth per Attachment 4.

______/______/______
Initial Date Time

7.1.6. Verify performed or request Chemistry to obtain baseline offgas samples per OP 2613, Sampling and Analysis of the Off Gas System. Attach per Section 9.0.

______/______/______
Initial Date Time

7.1.7. Verify performed or request System Engineering to perform the System Engineering System Monitoring Plan baseline data at 1593 MWth and has been included within Attachment 9A.

_____/_____/_____
Initial Date Time

NOTES:

- EPU power ascension testing above 1593 MWth will be conducted in approximately 40 MWth steps and 80 MWth plateaus.
- The maximum power increase will not exceed a 80 MWth in a 24-hour period.
- Steam Dryer Moisture Carryover Analysis needs to be performed at least once daily when reactor power is greater than 1593 MWth per Attachment 5.

7.1.8. If needed, raise reactor power and maintain 1593 MWth (1574 MWth to 1593 MWth).

____/____/____
Initial Date Time

7.1.9. Authorization for Power Ascension:

7.1.9.1. General Manager, Plant Operations permission has been granted to exceed 1593 MWth.

____/____/____
Initial Date Time

7.1.9.2. Shift Manager's permission has been granted to implement power ascension testing.

____/____/____
Initial Date Time

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.2. Increasing to 1633 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1633 MWth (1614 MWth to 1633 MWth) in accordance with OP 0105, Reactor Operations, as follows:

7.2.1. While raising reactor power:

7.2.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1B at 1609 MWth (1590 MWth to 1609 MWth).

______/______/______
Initial Date Time

7.2.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1C at 1625 MWth (1606 MWth to 1625 MWth).

______/______/______
Initial Date Time

7.2.1.3. Perform dryer data collection per Attachment 1D after achieving 1633 MWth (1614 MWth to 1633 MWth).

______/______/______
Initial Date Time

7.2.2. Maintain reactor power (1614 MWth to 1633 MWth) for four hours while performing the following non intrusive activities:

7.2.2.1. Perform flow induced vibration measurement per Attachment 2B. (non intrusive)

____/____/____
Initial Date Time

7.2.2.2. Request RE to :

7.2.2.2.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

____/____/____
Initial Date Time

7.2.2.2.2. Verify all inputs to the heat balance acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

____/____/____
Initial Date Time

7.2.3. One hour after achieving 1633 MWth (1614 MWth to 1633 MWth), perform moisture carryover determination per Attachment 5A. (non intrusive)

____/____/____
Initial Date Time

7.2.4. Four hours after achieving 1633 MWth (1614 MWth to 1633 MWth), perform Extraction Steam Reverse Current (RC) Valve Test in accordance with OP 4160 Section B, Extraction Steam Reverse Current Valve Test using VYOPF 4160.07. Hold each RCV test switch for 30 seconds or until a closed (green light) indication is observed. Record whether the valve indicated intermediate or closed. Attach VYOPF 4160.07 per Section 9.0. (Intrusive)

______ / ______ / ______
Initial Date Time

7.2.5. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

______ / ______ / ______
Initial Date Time

______ / ______ / ______
Initial Date Time

7.2.6. Request Chemistry to verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617, Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented (non intrusive)

______ / ______ / ______
Initial Date Time

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.3. Increasing to 1673 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1673 MWth (1654 MWth to 1673 MWth) accordance with OP-0105, Reactor Operations, as follows:

7.3.1. While raising reactor power:

7.3.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1E at 1649 MWth (1630 MWth to 1649 MWth).

______ / ______ / ______
Initial Date Time

7.3.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1F at 1665 MWth (1646 MWth to 1665 MWth).

______ / ______ / ______
Initial Date Time

7.3.1.3. Perform dryer data collection per Attachment 1G after achieving 1673 MWth (1654 MWth to 1673 MWth).

______ / ______ / ______
Initial Date Time

7.3.1.4. Notify the test team to complete report preparation that evaluates dryer data (strain gauge results, evaluations, acceptance criteria, etc,) and makes a recommendation to OSRC to continue power ascension.

OSRC Review Meeting #: ____________

____/____/____
Initial Date Time

7.3.2. Perform flow induced vibration measurement per Attachment 2C. (Non intrusive).

____/____/____
Initial Date Time

7.3.3. Maintain reactor power 1654 MWth to 1673 MWth for a total of four hours.

____/____/____
Initial Date Time

7.3.4. Once each 24 hours:

7.3.4.1. Verify moisture carryover per Attachment 5B. (non intrusive)

____/____/____
Initial Date Time

7.3.4.2. Verify moisture carryover per Attachment 5C. (non intrusive)

____/____/____
Initial Date Time

7.3.4.3. Verify moisture carryover per Attachment 5D. (non intrusive)

____/____/____
Initial Date Time

7.3.4.4. Verify moisture carryover for per Attachment 5E. (non intrusive)

____/____/____
Initial Date Time

7.3.5. Once the dryer data has been evaluated and approved by OSRC and the General Manager, Plant Operations, perform the following (non-intrusive):

7.3.5.1. For the transmission of small data files (i.e., < 5 MB), email directly to:

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____/_____/_____
Initial Date Time

7.3.5.2. For the transmission of large data files (i.e., 5 MB or larger), upload to web folder at www.ibackup.com

Account name: envydryer
Password: Later

and email the following persons the files have been uploaded on ibackup.com:

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____/_____/_____
Initial Date Time

7.3.5.3. Confirm receipt via telephone to NRC Project Manager Rick Ennis (or acting NRC Project Manager) at one of the following numbers (start at top and proceed down list until a single contact is made. If Rick Ennis (or acting NRC PM) cannot immediately confirm receipt, ask for call back. Date stamp or other positive acknowledgment of NRC receipt.

/ /
Initial Date Time

Contact Order

1. 301-415-1420 (Rick Ennis office)
2. 301-972-8225 (Rick Ennis home)
3. 301-814-5965 (Rick Ennis cellular phone)
4. 301-415-1388 (Jim Shea office)
5. 609-220-0306 (Jim Shea cellular phone)
6. 301-415-0560 (Darrell Roberts office)
7. 301-385-3326 (Darrell Roberts cellular phone)
8. 301-415-1430 (NRC secretary—request contact with Ennis or Shea)
9. 301-415-0550 (NRC Operations Center-request contact Ennis or Shea)
10. 301-816-5100 (NRC Operations Center-request contact Ennis or Shea)

7.3.5.4. Once confirmation has been received, record below the start and end time of the 96 hour clock.

Start of 96 hour clock:

____
Date / Time

/ /
Initial Date Time

End of 96 hour clock:

____
Date / Time

/ /
Initial Date Time

7.3.6. Cognizant Engineers to perform walkdowns per Engineering Monitoring Plans, including inspections where practicable based on ALARA and safety reasons, a review of ERFIS indications, local indications, control room indications, etc., for systems (components) affected by EPU. An evaluation needs to be completed for ANY discrepancy noted. Include this documentation within Attachment 9 to this procedure as discussed in Section 9. (non intrusive)

System Engineering Mechanical

______/______/______
Initial Date Time

System Engineering Electrical

______/______/______
Initial Date Time

Programs and Component Engineering
Plant Programs

______/______/______
Initial Date Time

7.3.7. Perform feedwater runout data per Attachment 6A and complete the analysis. (non intrusive)

______/______/______
Initial Date Time

7.3.8. Perform radiation surveys per Attachment 3. (non intrusive)

______/______/______
Initial Date Time

7.3.9. Contact Chemistry to perform the following and include data within Attachment 10A-10D, as appropriate, to this procedure as discussed in Section 9.0. (non intrusive):

7.3.9.1. Monitor and record site boundary dose rates in accordance with Attachment 10.

_____ / _____ / _____
Initial Date Time

7.3.9.2. Perform Reactor Coolant Iodine Activity in accordance with OP 0631, Radiochemistry.

_____ / _____ / _____
Initial Date Time

7.3.9.3. Perform Reactor Coolant Chloride and Conductivity Analysis in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

_____ / _____ / _____
Initial Date Time

7.3.9.4. Perform Reactor Coolant Filterable Solids Analysis per DP 0643, Filterable Solids, Section C.

_____ / _____ / _____
Initial Date Time

7.3.9.5. Perform Reactor Coolant Isotopic (8 hour decay) in accordance with OP 0631, Radiochemistry, Appendix B.

_____ / _____ / _____
Initial Date Time

7.3.9.6. Perform Reactor Coolant 2 liter Metals Sample per DP 0636, Collection and Digestion of Metal Samples.

_____ / _____ / _____
Initial Date Time

7.3.9.7. Perform Feedwater Chemistry Analysis (O_2 and conductivity) in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

/	/	
Initial	Date	Time

7.3.9.8. Verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617 Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented.

/	/	
Initial	Date	Time

Note:

VY is one of several GE-designed BWRs which experience recirc bi-stable flow patterns on a periodic basis. With no change in pump speed, these fluctuations can produce step-changes in drive flow, typically ranging from 0.1 mlbs/hr to 0.35 mlbs/hr. Corresponding changes will also occur in jet pump flow, core flow, core power and electrical output, ranging from 0.1% (with short-lived flow changes) to 2% or more (with longer-lived flow changes and/or at core flows greater than 100%).

These fluctuations have been observed at VY and at other facilities with a duration lasting a few seconds to about 1 minute, and at frequencies typically ranging from one to ten occurrences per hour, although up to 200 occurrences per hour have been observed. The magnitude, duration, and frequency of each flow pattern is random and is sensitive to small changes in influencing parameters such as recirc flow rate or pump speed. GE has performed plant-specific safety analyses and has concluded that the occurrence of recirc bi-stable flow is neither a safety concern nor an operability issue.

7.3.10. Operations to observe control room indications including ERFIS for bi-stable flow for several minutes. If bi-stable flow is observed, submit a condition report. (non intrusive)

Observed / not observed

______ / ______ / ______
Initial Date Time

7.3.11. Run 3-D Monicore Official Case. Perform Core Thermal Limits Verification in accordance with OP 4401. Attach per Section 9.0. (non intrusive)

______ / ______ / ______
Initial Date Time

7.3.12. Request RE to:

7.3.12.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

______/______/______
Initial Date Time

7.3.12.2. Verify all inputs to the heat balance are acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

______/______/______
Initial Date Time

7.3.12.3. Verify the ERFIS heat balance (C047) is +/- 3% to other alternate power indications by reviewing the APD display. Attach EFRIS APD screen per Section 9.0. (non intrusive)

______/______/______
Initial Date Time

7.3.12.4. Submit a 3-D Monicore case and review thermal limits at 1673 MWth. Record and compare them against the predicted values on Attachment 4. Attach the 3-D Monicore case per Section 9.0. Predict anticipated thermal limits for 1752 MWth and record on Attachment 4. (non intrusive)

______/______/______
Initial Date Time

7.3.12.5. Verify that the Process Computer is using jet pump based core flow and not the core flow based upon the drive flow-core flow relationship. (non intrusive)

_____/_____/_____
Initial Date Time

7.3.12.6. After a minimum of 12 hours at this power plateau, save PCIOMR statepoint and compose the envelope per OP 2457, PCIOMR Implementation. (non intrusive)

_____/_____/_____
Initial Date Time

7.3.13. Allowing no other concurrent intrusive activities, perform feedwater level control testing per Attachment 7A. (intrusive)

______/______/______
Initial Date Time

7.3.14. Allowing no other concurrent intrusive activities, perform MHC demonstration per Attachment 8A. (intrusive)

______/______/______
Initial Date Time

7.3.15. Perform Recombiner Performance Monitoring per Attachment 11A. (non intrusive)

______/______/______
Initial Date Time

7.3.16. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

______/______/______
Initial Date Time

______/______/______
Initial Date Time

7.3.17. Complete a report to be presented at OSRC used as a basis to recommend to the General Manager, Plant Operations, to continue the power ascension. (non intrusive)

OSRC Review Meeting #: ____________

______/______/______
Initial Date Time

7.3.18. Authorization for Power Ascension

The results of testing and data collection performed at the last power level plateau have been analyzed and presented to the General Manager, Plant Operations, and approval to proceed has been obtained. (Non intrusive)

_______/_______/_______
Initial Date Time

7.3.19. After 96 hours from the time NRC NRR received the dryer data and evaluation submittal and with no objections from NRC NRR, then call the NRC Project Manager Rick Ennis (or acting NRC Project Manager) at one of the following numbers (start at top and proceed down list until a single contact is made) and inform the NRC that VY is continuing with the power ascension. (non intrusive)

7.3.19.1. If Rick Ennis (or acting NRC PM) cannot immediately confirm receipt, ask for call back. Date stamp or other positive acknowledgment of NRC receipt.

_____/_____/_____
Initial Date Time

Contact Order

1. 301-415-1420 (Rick Ennis office)
2. 301-972-8225 (Rick Ennis home)
3. 301-814-5965 (Rick Ennis cellular phone)
4. 301-415-1388 (Jim Shea office)
5. 609-220-0306 (Jim Shea cellular phone)
6. 301-415-0560 (Darrell Roberts office)
7. 301-385-3326 (Darrell Roberts cellular phone)
8. 301-415-1430 (NRC secretary—request contact with Ennis or Shea)
9. 301-415-0550 (NRC Operations Center-request contact Ennis or Shea)
10. 301-816-5100 (NRC Operations Center-request contact Ennis or Shea)

7.3.19.2. Email the following individuals to inform them VY is continuing with the power ascension. Attach email per step 9.

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____/_____/_____
Initial Date Time

7.3.19.3. Continue with the power ascension.

________/________/________
Initial Date Time

Licensing:______________________________/__________
(Print/Sign) (Date)

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.4. Increasing to 1712 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1712 MWth (1693 MWth to 1712 MWth) in accordance with OP 0105, Reactor Operations, as follows:

7.4.1. While raising reactor power:

7.4.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1H at 1689 MWth (1670 MWth to 1689 MWth).

_____ / _____ / _____
Initial Date Time

7.4.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1I at 1705 MWth (1686 MWth to 1705 MWth).

_____ / _____ / _____
Initial Date Time

7.4.1.3. Perform dryer data collection per Attachment 1J after achieving 1712 MWth (1693 MWth to 1712 MWth).

_____ / _____ / _____
Initial Date Time

7.4.2. Maintain reactor power 1712 MWth (1693 MWth to 1712 MWth) for four hours while performing the following non intrusive activities:

7.4.2.1. Perform flow induced vibration measurement per Attachment 2D. (non intrusive)

_____/_____/_____
Initial Date Time

7.4.2.2. Request RE to :

7.4.2.2.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

_____/_____/_____
Initial Date Time

7.4.2.2.2. Verify all inputs to the heat balance acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

_____/_____/_____
Initial Date Time

7.4.3. One hour after achieving 1712 MWth (1693 MWth to 1712 MWth), perform moisture carryover determination per Attachment 5F. (non intrusive)

_____/_____/_____
Initial Date Time

7.4.4. Four hours after achieving 1712 MWth (1693 MWth to 1712 MWth), perform Extraction Steam Reverse Current (RC) Valve Test in accordance with OP 4160 Section B, Extraction Steam Reverse Current Valve Test using VYOPF 4160.07. Hold each RCV test switch for 30 seconds or until a closed (green light) indication is observed. Record whether the valve indicated intermediate or closed. Attach VYOPF 4160.07 per Section 9.0. (Intrusive)

______ / ______ / ______
Initial Date Time

7.4.5. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

______ / ______ / ______
Initial Date Time

______ / ______ / ______
Initial Date Time

7.4.6. Request Chemistry to verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617, Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented (non intrusive)

______ / ______ / ______
Initial Date Time

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.5. Increasing to 1752 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1752 MWth (1733 MWth to 1752 MWth) per hour in accordance with OP-0105, Reactor Operations, as follows:

7.5.1. While raising reactor power:

7.5.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1K at 1728 MWth (1709 MWth to 1728 MWth).

_______ / _______ / _______
Initial Date Time

7.5.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1L at 1744 MWth (1725 MWth to 1744 MWth).

_______ / _______ / _______
Initial Date Time

7.5.1.3. Perform dryer data collection per Attachment 1M after achieving 1752 MWth (1733 MWth to 1752 MWth).

_______ / _______ / _______
Initial Date Time

7.5.1.4. Notify the test team to complete report preparation that evaluates dryer data (strain gauge results, evaluations, acceptance criteria, etc,) and makes a recommendation to OSRC to continue power ascension.

OSRC Review Meeting #: ____________

_____/_____/_____
Initial Date Time

7.5.2. Perform flow induced vibration measurement per Attachment 2E. (Non intrusive).

_____/_____/_____
Initial Date Time

7.5.3. Maintain reactor power after achieving 1752 MWth (1733 MWth to 1752 MWth) for a total of four hours.

_____/_____/_____
Initial Date Time

7.5.4. Once each 24 hours:

7.5.4.1. Verify moisture carryover per Attachment 5G. (non intrusive)

_____/_____/_____
Initial Date Time

7.5.4.2. Verify moisture carryover per Attachment 5H. (non intrusive)

_____/_____/_____
Initial Date Time

7.5.4.3. Verify moisture carryover per Attachment 5I. (non intrusive)

_____/_____/_____
Initial Date Time

7.5.4.4. Verify moisture carryover for per Attachment 5J. (non intrusive)

_____/_____/_____
Initial Date Time

7.5.5. Once the dryer data has been evaluated and approved by OSRC and the General Manager, Plant Operations, perform the following (non-intrusive):

7.5.5.1. For the transmission of small data files (i.e., < 5 MB), email directly to:

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____/_____/_____
Initial Date Time

7.5.5.2. For the transmission of large data files (i.e., 5 MB or larger), upload to web folder at www.ibackup.com

Account name: envydryer
Password: Later

and email the following persons the files have been uploaded on ibackup.com:

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____/_____/_____
Initial Date Time

7.5.5.3. Confirm receipt via telephone to NRC Project Manager Rick Ennis (or acting NRC Project Manager) at one of the following numbers (start at top and proceed down list until a single contact is made. If Rick Ennis (or acting NRC PM) cannot immediately confirm receipt, ask for call back. Date stamp or other positive acknowledgment of NRC receipt.

_____/_____/_____
Initial Date Time

Contact Order

1. 301-415-1420 (Rick Ennis office)
2. 301-972-8225 (Rick Ennis home)
3. 301-814-5965 (Rick Ennis cellular phone)
4. 301-415-1388 (Jim Shea office)
5. 609-220-0306 (Jim Shea cellular phone)
6. 301-415-0560 (Darrell Roberts office)
7. 301-385-3326 (Darrell Roberts cellular phone)
8. 301-415-1430 (NRC secretary—request contact with Ennis or Shea)
9. 301-415-0550 (NRC Operations Center-request contact Ennis or Shea)
10. 301-816-5100 (NRC Operations Center-request contact Ennis or Shea)

7.5.5.4. Once confirmation has been received, record below the start and end time of the 96 hour clock.

Start of 96 hour clock:

____
Date / Time

_____/_____/_____
Initial Date Time

End of 96 hour clock:

____
Date / Time

_____/_____/_____
Initial Date Time

7.5.6. Cognizant Engineers to perform walkdowns per the Engineering Monitoring Plans, including inspections where practicable based on ALARA and safety reasons, a review of ERFIS indications, local indications, control room indications, etc., for systems (components) affected by EPU. An evaluation needs to be completed for ANY discrepancy noted. Include this documentation within Attachment 9 to this procedure as discussed in Section 9. (non intrusive)

System Engineering Mechanical

_____ / _____ / _____
Initial Date Time

System Engineering Electrical

_____ / _____ / _____
Initial Date Time

Programs and Component Engineering
Plant Programs

_____ / _____ / _____
Initial Date Time

7.5.7. Perform feedwater runout data per Attachment 6B and complete the analysis. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.5.8. Perform radiation surveys per Attachment 3. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.5.9. Contact Chemistry to perform the following and include data within Attachment 10A-10D, as appropriate, to this procedure as discussed in Section 9.0. (non intrusive):

7.5.9.1. Monitor and record site boundary dose rates in accordance with Attachment 10.

_____ / _____ / _____
Initial Date Time

7.5.9.2. Perform Reactor Coolant Iodine Activity in accordance with OP 0631, Radiochemistry.

_____ / _____ / _____
Initial Date Time

7.5.9.3. Perform Reactor Coolant Chloride and Conductivity Analysis in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

_____ / _____ / _____
Initial Date Time

7.5.9.4. Perform Reactor Coolant Filterable Solids Analysis per DP 0643, Filterable Solids, Section C.

_____ / _____ / _____
Initial Date Time

7.5.9.5. Perform Reactor Coolant Isotopic (8 hour decay) in accordance with OP 0631, Radiochemistry, Appendix B.

_____ / _____ / _____
Initial Date Time

7.5.9.6. Perform Reactor Coolant 2 liter Metals Sample per DP 0636, Collection and Digestion of Metal Samples.

_____ / _____ / _____
Initial Date Time

7.5.9.7. Perform Feedwater Chemistry Analysis (O_2 and conductivity) in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

/ /		
Initial	Date	Time

7.5.9.8. Verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617 Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented.

/ /		
Initial	Date	Time

Note:

VY is one of several GE-designed BWRs which experience recirc bi-stable flow patterns on a periodic basis. With no change in pump speed, these fluctuations can produce step-changes in drive flow, typically ranging from 0.1 mlbs/hr to 0.35 mlbs/hr. Corresponding changes will also occur in jet pump flow, core flow, core power and electrical output, ranging from 0.1% (with short-lived flow changes) to 2% or more (with longer-lived flow changes and/or at core flows greater than 100%).

These fluctuations have been observed at VY and at other facilities with a duration lasting a few seconds to about 1 minute, and at frequencies typically ranging from one to ten occurrences per hour, although up to 200 occurrences per hour have been observed. The magnitude, duration, and frequency of each flow pattern is random and is sensitive to small changes in influencing parameters such as recirc flow rate or pump speed. GE has performed plant-specific safety analyses and has concluded that the occurrence of recirc bi-stable flow is neither a safety concern nor an operability issue.

7.5.10. Operations observe control room indications including ERFIS for bi-stable flow for several minutes. If bi-stable flow is observed, submit a condition report. (non intrusive)

Observed / not observed

______/______/______
Initial Date Time

7.5.11. Run 3-D Monicore Official Case. Perform Core Thermal Limits Verification in accordance with OP 4401. Attach per Section 9.0. (non intrusive)

______/______/______
Initial Date Time

7.5.12. Request RE to:

7.5.12.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

_____ / _____ / _____
Initial Date Time

7.5.12.2. Verify all inputs to the heat balance are acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.5.12.3. Verify the ERFIS heat balance (C047) is +/- 3% to other alternate power indications by reviewing the APD display. Attach EFRIS APD screen per Section 9.0. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.5.12.4. Submit a 3-D Monicore case and review thermal limits at 1752 MWth. Record and compare them against the predicted values on Attachment 4. Attach the 3-D Monicore case per Section 9.0. Predict anticipated thermal limits for 1832 MWth and record on Attachment 4. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.5.12.5. Verify that the Process Computer is using jet pump based core flow and not the core flow based upon the drive flow-core flow relationship. (non intrusive)

______/_____/_____
Initial Date Time

7.5.12.6. After a minimum of 12 hours at this power plateau, save PCIOMR statepoint and compose the envelope per OP 2457, PCIOMR Implementation. (non intrusive)

______/_____/_____
Initial Date Time

7.5.13. Allowing no other concurrent intrusive activities, perform feedwater level control testing per Attachment 7B. (intrusive)

______/_____/_____
Initial Date Time

7.5.14. Allowing no other concurrent intrusive activities, perform MHC demonstration per Attachment 8B. (intrusive)

______/_____/_____
Initial Date Time

Power Ascension Testing for Extended Power Uprate Conditions

7.5.15. Perform Recombiner Performance Monitoring per Attachment 11B. (non intrusive)

____ / ____ / ____
Initial Date Time

7.5.16. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

____ / ____ / ____
Initial Date Time

____ / ____ / ____
Initial Date Time

7.5.17. Complete a report to be presented at OSRC used as a basis to recommend to the General Manager, Plant Operations, to continue the power ascension. (non intrusive)

OSRC Review Meeting #: __________

____ / ____ / ____
Initial Date Time

7.5.18. Authorization for Power Ascension

The results of testing and data collection performed at the last power level plateau have been analyzed and presented to the General Manager, Plant Operations, and approval to proceed has been obtained. (Non intrusive)

____ / ____ / ____
Initial Date Time

7.5.19. After 96 hours from the time NRC NRR received the dryer data and evaluation submittal and with no objections from NRC NRR, then call the NRC Project Manager Rick Ennis (or acting NRC Project Manager) at one of the following numbers (start at top and proceed down list until a single contact is made) and inform the NRC that VY is continuing with the power ascension. (non intrusive)

7.5.19.1. If Rick Ennis (or acting NRC PM) cannot immediately confirm receipt, ask for call back. Date stamp or other positive acknowledgment of NRC receipt.

_____ / _____ / _____
Initial Date Time

Contact Order

1. 301-415-1420 (Rick Ennis office)
2. 301-972-8225 (Rick Ennis home)
3. 301-814-5965 (Rick Ennis cellular phone)
4. 301-415-1388 (Jim Shea office)
5. 609-220-0306 (Jim Shea cellular phone)
6. 301-415-0560 (Darrell Roberts office)
7. 301-385-3326 (Darrell Roberts cellular phone)
8. 301-415-1430 (NRC secretary—request contact with Ennis or Shea)
9. 301-415-0550 (NRC Operations Center-request contact Ennis or Shea)
10. 301-816-5100 (NRC Operations Center-request contact Ennis or Shea)

7.5.19.2. Email the following individuals to inform them VY is continuing with the power ascension. Attach email per step 9.

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at cjw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____ / _____ / _____
Initial Date Time

7.5.19.3. Continue with the power ascension.

______ / ______ / ______
Initial Date Time

Licensing: ________________________ / ________
(Print/Sign) (Date)

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.6. Increasing to 1792 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1792 MWth (1773 MWth to 1792 MWth) in accordance with OP 0105, Reactor Operations, as follows:

7.6.1. While raising reactor power:

7.6.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1N at 1768 MWth (1749 MWth to 1768 MWth).

_____/_____/_____
Initial Date Time

7.6.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1O at 1784 MWth (1765 MWth to 1784 MWth).

_____/_____/_____
Initial Date Time

7.6.1.3. Perform dryer data collection per Attachment 1P after achieving 1792 MWth (1773 MWth to 1792 MWth).

_____/_____/_____
Initial Date Time

7.6.2. Maintain reactor power 1792 MWth (1773 MWth to 1792 MWth) for four hours while performing the following non intrusive activities:

7.6.2.1. Perform flow induced vibration measurement per Attachment 2F. (non intrusive)

_____/_____/_____
Initial Date Time

7.6.2.2. Request RE to :

7.6.2.2.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

_____/_____/_____
Initial Date Time

7.6.2.2.2. Verify all inputs to the heat balance acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

_____/_____/_____
Initial Date Time

7.6.3. One hour after achieving 1792 MWth (1773 MWth to 1792 MWth), perform moisture carryover determination per Attachment 5K. (non intrusive)

_____/_____/_____
Initial Date Time

7.6.4. Four hours after achieving 1792 MWth (1773 MWth to 1792 MWth), perform Extraction Steam Reverse Current (RC) Valve Test in accordance with OP 4160 Section B, Extraction Steam Reverse Current Valve Test using VYOPF 4160.07. Hold each RCV test switch for 30 seconds, or until a closed (green light) indication is observed. Record whether the valve indicated intermediate or closed. Attach VYOPF 4160.07 per Section 9.0. (Intrusive)

_____ / _____ / _____
Initial Date Time

7.6.5. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

_____ / _____ / _____
Initial Date Time

_____ / _____ / _____
Initial Date Time

7.6.6. Request Chemistry to verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617, Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented (non intrusive)

_____ / _____ / _____
Initial Date Time

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.7. Increasing to 1832 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1832 MWth (1813 MWth to 1832 MWth) in accordance with OP-0105, Reactor Operations, as follows:

7.7.1. While raising reactor power:

7.7.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1Q at 1808 MWth (1789 MWth to 1808 MWth).

______ / ______ / ______
Initial Date Time

7.7.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1R at 1824 MWth (1805 MWth to 1824 MWth).

______ / ______ / ______
Initial Date Time

7.7.1.3. Perform dryer data collection per Attachment 1S after achieving 1832 MWth (1813 MWth to 1832 MWth).

______ / ______ / ______
Initial Date Time

7.7.1.4. Notify the test team to complete report preparation that evaluates dryer data (strain gauge results, evaluations, acceptance criteria, etc.) and makes a recommendation to OSRC to continue power ascension.

OSRC Review Meeting #: ____________ ______/______/______
Initial Date Time

7.7.2. Perform flow induced vibration measurement per Attachment 2G. (Non intrusive).

______/______/______
Initial Date Time

7.7.3. Maintain reactor power 1832 MWth (1813 MWth to 1832 MWth) for a total of four hours.

______/______/______
Initial Date Time

7.7.4. Once each 24 hours:

7.7.4.1. Verify moisture carryover per Attachment 5L. (non intrusive)

______/______/______
Initial Date Time

7.7.4.2. Verify moisture carryover per Attachment 5M. (non intrusive)

______/______/______
Initial Date Time

7.7.4.3. Verify moisture carryover per Attachment 5N. (non intrusive)

______/______/______
Initial Date Time

7.7.4.4. Verify moisture carryover for per Attachment 5O. (non intrusive)

______/______/______
Initial Date Time

7.7.5. Once the dryer data has been evaluated and approved by OSRC and the General Manager, Plant Operations, perform the following (non-intrusive):

7.7.5.1. For the transmission of small data files (i.e., < 5 MB), email directly to:

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

____ / ____ / ____
Initial Date Time

7.7.5.2. For the transmission of large data files (i.e., 5 MB or larger), upload to web folder at www.ibackup.com

Account name: envydryer
Password: Later

and email the following persons the files have been uploaded on ibackup.com:

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at ciw@nrc.gov
Kamal Manoly at kam@nrc.gov

____ / ____ / ____
Initial Date Time

7.7.5.3. Confirm receipt via telephone to NRC Project Manager Rick Ennis (or acting NRC Project Manager) at one of the following numbers (start at top and proceed down list until a single contact is made. If Rick Ennis (or acting NRC PM) cannot immediately confirm receipt, ask for call back. Date stamp or other positive acknowledgment of NRC receipt.

______ / ______ / ______
Initial Date Time

Contact Order

1. 301-415-1420 (Rick Ennis office)
2. 301-972-8225 (Rick Ennis home)
3. 301-814-5965 (Rick Ennis cellular phone)
4. 301-415-1388 (Jim Shea office)
5. 609-220-0306 (Jim Shea cellular phone)
6. 301-415-0560 (Darrell Roberts office)
7. 301-385-3326 (Darrell Roberts cellular phone)
8. 301-415-1430 (NRC secretary—request contact with Ennis or Shea)
9. 301-415-0550 (NRC Operations Center-request contact Ennis or Shea)
10. 301-816-5100 (NRC Operations Center-request contact Ennis or Shea)

7.7.5.4. Once confirmation has been received, record below the start and end time of the 96 hour clock.

Start of 96 hour clock:

____
Date / Time

______ / ______ / ______
Initial Date Time

End of 96 hour clock:

____
Date / Time

______ / ______ / ______
Initial Date Time

7.7.6. Cognizant Engineers to perform walkdowns per the Engineering Monitoring Plans, including inspections where practicable based on ALARA and safety reasons, a review of ERFIS indications, local indications, control room indications, etc., for systems (components) affected by EPU. An evaluation needs to be completed for ANY discrepancy noted. Include this documentation within Attachment 9 to this procedure as discussed in Section 9. (non intrusive)

System Engineering Mechanical

______/______/______
Initial Date Time

System Engineering Electrical

______/______/______
Initial Date Time

Programs and Component Engineering
Plant Programs

______/______/______
Initial Date Time

7.7.7. Perform feedwater runout data per Attachment 6C and complete the analysis. (non intrusive)

______/______/______
Initial Date Time

7.7.8. Perform radiation surveys per Attachment 3. (non intrusive)

______/______/______
Initial Date Time

7.7.9. Contact Chemistry to perform the following and include data within Attachment 10A-10D, as appropriate, to this procedure as discussed in Section 9.0. (non intrusive):

7.7.9.1. Monitor and record site boundary dose rates in accordance with Attachment 10.

_____/_____/_____
Initial Date Time

7.7.9.2. Perform Reactor Coolant Iodine Activity in accordance with OP 0631, Radiochemistry.

_____/_____/_____
Initial Date Time

7.7.9.3. Perform Reactor Coolant Chloride and Conductivity Analysis in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

_____/_____/_____
Initial Date Time

7.7.9.4. Perform Reactor Coolant Filterable Solids Analysis per DP 0643, Filterable Solids, Section C.

_____/_____/_____
Initial Date Time

7.7.9.5. Perform Reactor Coolant Isotopic (8 hour decay) in accordance with OP 0631, Radiochemistry, Appendix B.

_____/_____/_____
Initial Date Time

7.7.9.6. Perform Reactor Coolant 2 liter Metals Sample per DP 0636, Collection and Digestion of Metal Samples.

_____/_____/_____
Initial Date Time

7.7.9.7. Perform Feedwater Chemistry Analysis (O_2 and conductivity) in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

Initial	Date	Time

7.7.9.8. Verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617 Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented.

Initial	Date	Time

Note:

VY is one of several GE-designed BWRs which experience recirc bi-stable flow patterns on a periodic basis. With no change in pump speed, these fluctuations can produce step-changes in drive flow, typically ranging from 0.1 mlbs/hr to 0.35 mlbs/hr. Corresponding changes will also occur in jet pump flow, core flow, core power and electrical output, ranging from 0.1% (with short-lived flow changes) to 2% or more (with longer-lived flow changes and/or at core flows greater than 100%).

These fluctuations have been observed at VY and at other facilities with a duration lasting a few seconds to about 1 minute, and at frequencies typically ranging from one to ten occurrences per hour, although up to 200 occurrences per hour have been observed. The magnitude, duration, and frequency of each flow pattern is random and is sensitive to small changes in influencing parameters such as recirc flow rate or pump speed. GE has performed plant-specific safety analyses and has concluded that the occurrence of recirc bi-stable flow is neither a safety concern nor an operability issue.

7.7.10. Operations observe control room indications including ERFIS for bi-stable flow for several minutes. If bi-stable flow is observed, submit a condition report. (non intrusive)

Observed / not observed

_____ / _____ / _____
Initial Date Time

7.7.11. Run 3-D Monicore Official Case. Perform Core Thermal Limits Verification in accordance with OP 4401. Attach per Section 9.0. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.7.12. Request RE to:

7.7.12.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

/ /
Initial Date Time

7.7.12.2. Verify all inputs to the heat balance are acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

/ /
Initial Date Time

7.7.12.3. Verify the ERFIS heat balance (C047) is +/- 3% to other alternate power indications by reviewing the APD display. Attach EFRIS APD screen per Section 9.0. (non intrusive)

/ /
Initial Date Time

7.7.12.4. Submit a 3-D Monicore case and review thermal limits at 1832 MWth. Record and compare them against the predicted values on Attachment 4. Attach the 3-D Monicore case per Section 9.0. Predict anticipated thermal limits for 1912 MWth and record on Attachment 4. (non intrusive)

/ /
Initial Date Time

7.7.12.5. Verify that the Process Computer is using jet pump based core flow and not the core flow based upon the drive flow-core flow relationship. (non intrusive)

_____/_____/_____
Initial Date Time

7.7.12.6. After a minimum of 12 hours at this power plateau, save PCIOMR statepoint and compose the envelope per OP 2457, PCIOMR Implementation. (non intrusive)

_____/_____/_____
Initial Date Time

7.7.13. Allowing no other concurrent intrusive activities, perform feedwater level control testing per Attachment 7C. (intrusive)

____/____/____
Initial Date Time

7.7.14. Allowing no other concurrent intrusive activities, perform MHC demonstration per Attachment 8C. (intrusive)

____/____/____
Initial Date Time

7.7.15. Perform Recombiner Performance Monitoring per Attachment 11C. (non intrusive)

____/____/____
Initial Date Time

7.7.16. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

____/____/____
Initial Date Time

____/____/____
Initial Date Time

7.7.17. Complete a report to be presented at OSRC used as a basis to recommend to the General Manager, Plant Operations, to continue the power ascension. (non intrusive)

OSRC Review Meeting #: __________

____/____/____
Initial Date Time

7.7.18. Authorization for Power Ascension

The results of testing and data collection performed at the last power level plateau have been analyzed and presented to the General Manager, Plant Operations, and approval to proceed has been obtained. (Non intrusive)

______/______/______
Initial Date Time

7.7.19. After 96 hours from the time NRC NRR received the dryer data and evaluation submittal and with no objections from NRC NRR, then call the NRC Project Manager Rick Ennis (or acting NRC Project Manager) at one of the following numbers (start at top and proceed down list until a single contact is made) and inform the NRC that VY is continuing with the power ascension. (non intrusive)

7.7.19.1. If Rick Ennis (or acting NRC PM) cannot immediately confirm receipt, ask for call back. Date stamp or other positive acknowledgment of NRC receipt.

_____ / _____ / _____
Initial Date Time

Contact Order

1. 301-415-1420 (Rick Ennis office)
2. 301-972-8225 (Rick Ennis home)
3. 301-814-5965 (Rick Ennis cellular phone)
4. 301-415-1388 (Jim Shea office)
5. 609-220-0306 (Jim Shea cellular phone)
6. 301-415-0560 (Darrell Roberts office)
7. 301-385-3326 (Darrell Roberts cellular phone)
8. 301-415-1430 (NRC secretary—request contact with Ennis or Shea)
9. 301-415-0550 (NRC Operations Center-request contact Ennis or Shea)
10. 301-816-5100 (NRC Operations Center-request contact Ennis or Shea)

7.7.19.2. Email the following individuals to inform them VY is continuing with the power ascension. Attach email per step 9.

Rick Ennis at rxe@nrc.gov
Jim Shea at jjs@nrc.gov
Jim Devincentis at jdevinc@entergy.com
Enrico Betti at ebetti@entergy.com
Tom Scarbrough at tgs@nrc.gov
John Wu at cjw@nrc.gov
Kamal Manoly at kam@nrc.gov

_____ / _____ / _____
Initial Date Time

7.7.19.3. Continue with the power ascension. ○

_____/_____/_____
Initial Date Time

Licensing:______________________________/_________
(Print/Sign) (Date)

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.8. Increasing to 1872 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1872 MWth (1853 MWth to 1872 MWth) in accordance with OP 0105, Reactor Operations, as follows:

7.8.1. While raising reactor power:

7.8.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1T at 1848 MWth (1829 MWth to 1848 MWth).

______/______/______
Initial Date Time

7.8.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1U at 1864 MWth (1845 MWth to 1864 MWth).

______/______/______
Initial Date Time

7.8.1.3. Perform dryer data collection per Attachment 1V after achieving 1872 MWth (1853 MWth to 1872 MWth).

______/______/______
Initial Date Time

7.8.2. Maintain reactor power 1872 MWth (1853 MWth to 1872 MWth) for four hours while performing the following non intrusive activities:

7.8.2.1. Perform flow induced vibration measurement per Attachment 2H. (non intrusive)

/ /		
Initial	Date	Time

7.8.2.2. Request RE to :

7.8.2.2.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

/ /		
Initial	Date	Time

7.8.2.2.2. Verify all inputs to the heat balance acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

/ /		
Initial	Date	Time

7.8.3. One hour after achieving 1872 MWth (1853 MWth to 1872 MWth), perform moisture carryover determination per Attachment 5P. (non intrusive)

/ /		
Initial	Date	Time

7.8.4. Four hours after achieving 1872 MWth (1853 MWth to 1872 MWth), perform Extraction Steam Reverse Current (RC) Valve Test in accordance with OP 4160 Section B, Extraction Steam Reverse Current Valve Test using VYOPF 4160.07. Hold each RCV test switch for 30 seconds or until a closed (green light) indication is observed. Record whether the valve indicated intermediate or closed. Attach VYOPF 4160.07 per Section 9.0. (Intrusive)

_____ / _____ / _____
Initial Date Time

7.8.5. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

_____ / _____ / _____
Initial Date Time

_____ / _____ / _____
Initial Date Time

7.8.6. Request Chemistry to verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617, Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented (non intrusive)

_____ / _____ / _____
Initial Date Time

NOTE:

- Dryer data collection readings (strain gauge and accelerometer data) are to be taken and evaluated every hour during power ascension (16 MWth change in reactor power) and within one hour of achieving the next power plateau per Attachment 1.
- Reactor Power will need to be held constant, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the dryer data collection per Attachment 1.

7.9. Increasing to 1912 MWth

Allowing no other concurrent intrusive activities, raise reactor power by 40 MWth to 1912 MWth (1893 MWth to 1912 MWth) in accordance with OP-0105, Reactor Operations, as follows:

7.9.1. While raising reactor power:

7.9.1.1. Perform dryer data collection after the first 16 MWth change in reactor power per Attachment 1W at 1888 MWth (1869 MWth to 1888 MWth).

_____/____/____
Initial Date Time

7.9.1.2. Perform dryer data collection after the second 16 MWth change in reactor power per Attachment 1X at 1904 MWth (1885 MWth to 1904 MWth).

_____/____/____
Initial Date Time

7.9.1.3. Perform dryer data collection per Attachment 1Y after achieving 1912 MWth (1893 MWth to 1912 MWth).

_____/____/____
Initial Date Time

7.9.1.4. Notify the test team to complete report preparation that evaluates dryer data (strain gauge results, evaluations, acceptance criteria, etc,) and makes a recommendation to OSRC to continue power ascension.

OSRC Review Meeting #: ____________

____/____/____
Initial Date Time

7.9.2. Perform flow induced vibration measurement per Attachment 2I. (Non intrusive).

____/____/____
Initial Date Time

7.9.3. Maintain reactor power 1912 MWth (1893 MWth to 1912 MWth) for a total of four hours.

____/____/____
Initial Date Time

7.9.4. Once each 24 hours:

7.9.4.1. Verify moisture carryover per Attachment 5Q. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.9.4.2. Verify moisture carryover per Attachment 5R. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.9.4.3. Verify moisture carryover per Attachment 5S. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.9.4.4. Verify moisture carryover for per Attachment 5T. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.9.5. Cognizant Engineers to perform walkdowns per the Engineering Monitoring Plans, including inspections where practicable based on ALARA and safety reasons, a review of ERFIS indications, local indications, control room indications, etc., for systems (components) affected by EPU. An evaluation needs to be completed for ANY discrepancy noted. Include this documentation within Attachment 9 to this procedure as discussed in Section 9. (non intrusive)

System Engineering Mechanical ______ / ______ / ______
Initial Date Time

System Engineering Electrical ______ / ______ / ______
Initial Date Time

Programs and Component Engineering
Plant Programs ______ / ______ / ______
Initial Date Time

7.9.6. Perform feedwater runout data per Attachment 6D and complete the analysis. (non intrusive)

______ / ______ / ______
Initial Date Time

7.9.7. Perform radiation surveys per Attachment 3. (non intrusive)

______ / ______ / ______
Initial Date Time

7.9.8. Contact Chemistry to perform the following and include data within Attachment 10A-10D, as appropriate, to this procedure as discussed in Section 9.0. (non intrusive):

7.9.8.1. Monitor and record site boundary dose rates in accordance with Attachment 10.

______/______/______
Initial Date Time

7.9.8.2. Perform Reactor Coolant Iodine Activity in accordance with OP 0631, Radiochemistry.

______/______/______
Initial Date Time

7.9.8.3. Perform Reactor Coolant Chloride and Conductivity Analysis in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

______/______/______
Initial Date Time

7.9.8.4. Perform Reactor Coolant Filterable Solids Analysis per DP 0643, Filterable Solids, Section C.

______/______/______
Initial Date Time

7.9.8.5. Perform Reactor Coolant Isotopic (8 hour decay) in accordance with OP 0631, Radiochemistry, Appendix B.

______/______/______
Initial Date Time

7.9.8.6. Perform Reactor Coolant 2 liter Metals Sample per DP 0636, Collection and Digestion of Metal Samples.

______/______/______
Initial Date Time

7.9.8.7. Perform Feedwater Chemistry Analysis (O_2 and conductivity) in accordance with OP 4612, Sampling and Treatment of the Reactor Water System.

_____/_____/_____
Initial Date Time

7.9.8.8. Verify the Main Steam Line Radiation Monitor response is within the expected dose range per OP 4617 Calculation of Chemistry Controlling Setpoints or new Setpoint Change has been implemented.

_____/_____/_____
Initial Date Time

Note:

VY is one of several GE-designed BWRs which experience recirc bi-stable flow patterns on a periodic basis. With no change in pump speed, these fluctuations can produce step-changes in drive flow, typically ranging from 0.1 mlbs/hr to 0.35 mlbs/hr. Corresponding changes will also occur in jet pump flow, core flow, core power and electrical output, ranging from 0.1% (with short-lived flow changes) to 2% or more (with longer-lived flow changes and/or at core flows greater than 100%).

These fluctuations have been observed at VY and at other facilities with a duration lasting a few seconds to about 1 minute, and at frequencies typically ranging from one to ten occurrences per hour, although up to 200 occurrences per hour have been observed. The magnitude, duration, and frequency of each flow pattern is random and is sensitive to small changes in influencing parameters such as recirc flow rate or pump speed. GE has performed plant-specific safety analyses and has concluded that the occurrence of recirc bi-stable flow is neither a safety concern nor an operability issue.

7.9.9. Operations observe control room indications including ERFIS for bi-stable flow for several minutes. If bi-stable flow is observed, submit a condition report. (non intrusive)

Observed / not observed

______ / ______ / ______

Initial Date Time

7.9.10. Run 3-D Monicore Official Case. Perform Core Thermal Limits Verification in accordance with OP 4401. Attach per Section 9.0. (non intrusive)

______ / ______ / ______

Initial Date Time

7.9.11. Request RE to:

7.9.11.1. Verify current reactor conditions are within acceptable values of the power-flow map (COLR figure 2.4-1). (non intrusive)

_____/_____/_____
Initial Date Time

7.9.11.2. Verify all inputs to the heat balance are acceptable by reviewing ERFIS display HBI (Heat Balance Inputs). Attach HBI screen per Section 9.0. (non intrusive)

_____/_____/_____
Initial Date Time

7.9.11.3. Verify the ERFIS heat balance (C047) is +/- 3% to other alternate power indications by reviewing the APD display. Attach EFRIS APD screen per Section 9.0. (non intrusive)

_____/_____/_____
Initial Date Time

7.9.11.4. Submit a 3-D Monicore case and review thermal limits at 1912 MWth. Record and compare them against the predicted values on Attachment 4. Attach the 3-D Monicore case per Section 9.0. (non intrusive)

_____/_____/_____
Initial Date Time

7.9.11.5. Verify that the Process Computer is using jet pump based core flow and not the core flow based upon the drive flow-core flow relationship. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.9.11.6. After a minimum of 12 hours at this power plateau, save PCIOMR statepoint and compose the envelope per OP 2457, PCIOMR Implementation. (non intrusive)

_____ / _____ / _____
Initial Date Time

7.9.12. Allowing no other concurrent intrusive activities, perform feedwater level control testing per Attachment 7D. (intrusive)

____/____/____
Initial Date Time

7.9.13. Allowing no other concurrent intrusive activities, perform MHC demonstration per Attachment 8D. (intrusive)

____/____/____
Initial Date Time

7.9.14. Perform Recombiner Performance Monitoring per Attachment 11D. (non intrusive)

____/____/____
Initial Date Time

7.9.15. Request Chemistry and RE to evaluate offgas levels for fuel integrity per PP 7401 Fuel Reliability Program and NF 102, Corporate Fuel Reliability. Both parties to sign when complete. (non intrusive)

____/____/____
Initial Date Time

____/____/____
Initial Date Time

7.9.16. Complete a report to be presented at OSRC used as a basis to recommend to the General Manager, Plant Operations, to remain at 1912 MWth. (non intrusive)

OSRC Review Meeting #: ____________

____/____/____
Initial Date Time

7.10. Remaining at 1912 MWth

7.10.1. Authorization to remain at 1912 MWth.

The results of testing and data collection performed at the last power level plateau have been analyzed and presented to the General Manager, Plant Operations, and approval to remain at 1912 MWth been obtained. (Non intrusive)

______/______/______
Initial Date Time

GMPO:________________________/______
(Print/Sign) (Date)

7.10.2. Prior to exceeding 168 hours of plant operation at the nominal full EPU reactor power level, with feedwater and condensate flow rates stabilized at approximately the EPU full power level, confirm through performance of transient testing that the loss of one condensate pump will not result in a complete loss of reactor feedwater. (intrusive)

______/______/______
Initial Date Time

7.10.3. Test Complete.

______/______/______
Initial Date Time

8. Restoration

   8.1. Perform an "End of Evolution" critique. Capture lessons learned

____ / ____ / ____
Initial Date Time

9. Attachments

Attachment Index Sheet Instructions:

This procedure requires that "data packages" and other performance monitoring data collection be attached to this procedure. Known attachments have been identified. For additional attachments, select the next sequential attachment number and record the attachment number in this index, with the document title, number of pages and associated procedure step and on the attached document. Indicate the consecutive page number and total attachment pages at the bottom of each page.

Verified By: ______________________________
Test Engineer/Date

1A Dryer Data Collection 1593 MWth
1B Dryer Data Collection 1609 MWth
1C Dryer Data Collection 1625 MWth
1D Dryer Data Collection 1633 MWth
1E Dryer Data Collection 1649 MWth
1F Dryer Data Collection 1665 MWth
1G Dryer Data Collection 1673 MWth
1H Dryer Data Collection 1689 MWth
1I Dryer Data Collection 1705 MWth
1J Dryer Data Collection 1712 MWth
1K Dryer Data Collection 1728 MWth
1L Dryer Data Collection 1744 MWth
1M Dryer Data Collection 1752 MWth
1N Dryer Data Collection 1768 MWth
1O Dryer Data Collection 1784 MWth
1P Dryer Data Collection 1792 MWth
1Q Dryer Data Collection 1808 MWth
1R Dryer Data Collection 1824 MWth
1S Dryer Data Collection 1832 MWth

1T Dryer Data Collection 1848 MWth
1U Dryer Data Collection 1864 MWth
1V Dryer Data Collection 1872 MWth
1W Dryer Data Collection 1888 MWth
1X Dryer Data Collection 1904 MWth
1Y Dryer Data Collection 1912 MWth
2A Flow Induced Vibration Data 1593 MWth
2B Flow Induced Vibration Data 1633 MWth
2C Flow Induced Vibration Data 1673 MWth
2D Flow Induced Vibration Data 1712 MWth
2E Flow Induced Vibration Data 1752 MWth
2F Flow Induced Vibration Data 1792 MWth
2G Flow Induced Vibration Data 1832 MWth
2H Flow Induced Vibration Data 1872 MWth
2I Flow Induced Vibration Data 1912 MWth
3 Radiation Surveys
4 Core Performance Data Sheet various MWth
5A Moisture Carryover 1633 MWth
5B Moisture Carryover 1673 MWth
5C Moisture Carryover 1673 MWth
5D Moisture Carryover 1673 MWth
5E Moisture Carryover 1673 MWth
5F Moisture Carryover 1712 MWth
5G Moisture Carryover 1752 MWth
5H Moisture Carryover 1752 MWth
5I Moisture Carryover 1752 MWth
5J Moisture Carryover 1752 MWth
5K Moisture Carryover 1792 MWth
5L Moisture Carryover 1832 MWth
5M Moisture Carryover 1832 MWth
5N Moisture Carryover 1832 MWth
5O Moisture Carryover 1832 MWth
5P Moisture Carryover 1872 MWth
5Q Moisture Carryover 1912 MWth
5R Moisture Carryover 1912 MWth
5S Moisture Carryover 1912 MWth
5T Moisture Carryover 1912 MWth
6A Feedwater Runout Data Collection 1673 MWth
6B Feedwater Runout Data Collection 1752 MWth
6C Feedwater Runout Data Collection 1832 MWth
6D Feedwater Runout Data Collection 1912 MWth
7A Feedwater Level Changes 1673 MWth
7B Feedwater Level Changes 1752 MWth

7C Feedwater Level Changes 1832 MWth
7D Feedwater Level Changes 1912 MWth
8A MHC Pressure Change 1673 MWth
8B MHC Pressure Change 1752 MWth
8C MHC Pressure Change 1832 MWth
8D MHC Pressure Change 1912 MWth
9A System Data 1593 MWth
9B System Data 1673 MWth
9C System Data 1572 MWth
9D System Data 1832 MWth
9E System Data 1912 MWth
10 Site Boundary Dose Measurements Various MWth
10A Chemistry Data 1673 MWth
10B Chemistry Data 1572 MWth
10C Chemistry Data 1832 MWth
10D Chemistry Data 1912 MWth
11A Recombiner Performance Data 1673 MWth
11B Recombiner Performance Data 1752 MWth
11C Recombiner Performance Data 1832 MWth
11D Recombiner Perfomrance Data 1912 MWth
12 Signature Identification Log
13 Test Deficiency Log
14 Performance Summary
15 ENN-LI-100 Process Applicability Determination
16 ENN-LI-101, 10.59 Screen
17 Risk Management Worksheet VYAPF 0172.02

NOTES:

- Additional data collection may be performed at other power levels as directed by the Test Coordinator.

- Strain gauges and accelerometers are assumed to be installed and tested via the work order process. The NI Data Acquisition Computer (NIDAC) and NI Hardware in the Reactor Building is on and operational. It is preferred that this system is controlled and monitored via a PC work station from outside the RCA.

- Reactor Power, steam flow, and recirc flow needs to be held steady, (within -19 MWth, +0 MWth) for approximately 2 minutes before and 15 minutes during the data collection at each test step. The data shall be recorded and evaluated within one hour of reaching each power step.

- The strain gauge and accelerometer surveillance shall be performed hourly when increasing power above a level at which data was previously obtained. Operations shall identify windows during power ascension when steam flow is approximately steady state for the hourly data collection.

- The process of increasing power from one step to the next level should be (but is not required) accomplished within one hour, including time to collect and evaluate data. If the step increase (including collection and evaluation of data) cannot be accomplished in one hour, then the collection and evaluation process should be repeated hourly until such time as the step increase is achieved.

- For each data collection Strain Gauges are calibrated and nulled. Then there are two sets of data collected; each set approximately 40 seconds in length. The first set will include bridge excitation to produce/measure signal and noise. This will be followed by a second set with zero bridge excitation. This second set of data is used to identify recirc power electrical noise and AC power electrical noise from the strain signal.

- The data is then processed and plotted by Steam Dryer Engineer within the hour. Engineering shall provide plots, a written summary of data changes. Engineering shall assess the margin to the limit curve, assess the rate of change in sequential data, and provide a recommendation whether power ascension should continue. The MSL accelerometer data shall also be compared with strain gauge data. Engineering shall assess whether accelerometer data provides evidence that there are acoustic frequencies not identified by the SG data.

1.0 Test team to monitor the following ERFIS points:

- B064 Main Steam Line Flow A
- B065 Main Steam Line Flow B
- B066 Main Steam Line Flow C
- B067 Main Steam Line Flow D
- B022 Total Steam Line Flow
- C047 Core Thermal Power
- M134 Recirc Pump A Speed
- M135 Recirc Pump B Speed
- 3DMA015 Recirc Pump A Flow
- 3DMA018 Recirc Pump B Flow

____/____/____
Initial Date Time

2.0 Confirm that NI Data Acquisition Computer (NIDAC) and NI Hardware on 252' elevation of the Reactor Building are on and operational.

____/____/____
Initial Date Time

3.0 Confirm that the Steam Dryer Engineer is prepared to acquire and process data

____/____/____
Initial Date Time

4.0 When the plant is at steady state power, confirm with the Steam Dryer Engineer to collect and evaluate strain gauge and accelerometer data.

____/____/____
Initial Date Time

5.0 Confirm the with the reactor building data recorder station, and the Main Steam line strain gauge data collection, was successful. Record time and date below:

Time and date: ______________________________

___/___/___
Initial Date Time

6.0 Confirm with the Steam Dryer Engineer the data evaluation has been completed within one hour of collecting the strain gauge and accelerometer data. Record date and time of data evaluation completion.

Date and time evaluation complete: _______________

Determine time for evaluation: __________________

___/___/___
Initial Date Time

7.0 IF valid strain gauge and accelerometer data cannot be recorded and evaluated hourly or within one hour of initially reaching a 80 MWth power step from at least three of the four main steam lines,

THEN 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.

___/___/___
Initial Date Time

8.0 Evaluation:

8.1 IF the conditions of Table 1 can not be met,

8.1.1 THEN 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.

_____/_____/_____
Initial Date Time

_____/_____/_____
Verified Date Time

8.2 If the Level 2 performance criteria is exceeded based on Table 2, THEN

8.2.1 Promptly suspend reactor power ascension until an engineering evaluation concludes that further power ascension is justified.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.2.2 Initiate a condition report.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.2.3 Evaluate the cause of any exceedance of the performance criteria.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.2.4 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.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.2.5 Obtain GMPO permission to continue the power ascension.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.3 If the Level 1 performance criteria is exceeded based on Table 2, THEN:

8.3.1 Promptly initiate a reactor power reduction to 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.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.3.2 Initiate a condition report.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.3.3 Evaluate the cause of any exceedance of the performance criteria.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.3.4 If the results of the engineering evaluation support continued power operation, reduce further power ascension step and plateau levels to nominal increases of 20 MWth and 40 MWth respectively, for any additional power ascension.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.3.5 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.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.3.6 Obtain GMPO permission to continue the power ascension.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.4 IF any frequency peak from the MSL strain gage data exceeds the limit curve established by Entergy Nuclear Operations, Inc. and submitted to the NRC staff prior to operation above OLTP,

8.4.1 THEN reduce reactor power to where the limit curve was not exceeded. Engineering shall resolve the uncertainties in the steam dryer analysis, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.5 IF resonance frequencies are identified as increasing above nominal levels in proportion to strain gage instrumentation data,

8.5.1 THEN hold reactor power, and document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.6 IF the acoustic signals are identified that challenge the limit curve during power ascension above OLTP,

8.6.1 THEN Engineering to evaluate dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.7 IF an engineering evaluation is required in accordance with the Steam Dryer Monitoring Plan,

8.7.1 THEN Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to +/- 10% and assure that peak responses that fall within this uncertainty band are addressed.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

8.8 If the Level 1 or Level 2 performance criteria are NOT exceeded based on Table 2,

8.8.1 THEN recommend to OSRC that power ascension testing should continue.

____/____/____
Initial Date Time

____/____/____
Verified Date Time

Attachment 1A
Dryer Data Collection
1593 MWth (1574 MWth to 1593 MWth)

Table 1

Parameter	Surveillance Frequency
1. Main steam line pressure data from strain gauges	Hourly when initially increasing power above a previously attained power level. -AND- At least once at every 40 MWth power step above 1593 MWth (Note 1)
2. Main steam piping accelerometer data from accelerometers in drywell	At least once at every 40 MWth LPU power step above 1593 MWth (Note 1) -AND- Within one hour after achieving every 40 MWth power step above 1593 MWth.

Notes to Table 1:

1. The strain gauge and accelerometer surveillance shall be performed hourly when increasing power above a level at which data was previously obtained. The surveillance of both the strain gauge data and accelerometer data is also required to be performed once at each 40 MWth power step above 1593 MWth and within one hour of achieving each 40 MWth step in power. 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 gauge data cannot be recorded hourly or within one hour of initially reaching a 40 MWth 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

Performance Criteria Not to be Exceeded	**Required Actions if Performance Criteria Exceeded and Required Completion Times**
Level 2: • Pressure data exceed Level 2 Spectra[1] per VYC-3001.	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.
Level 1: • Pressure data exceed Level 1 Spectra[1] per VYC-3001.	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. If the results of the engineering evaluation support continued power operation, reduce further power ascension step and plateau levels to nominal increases of 20 MWth and 40 MWth respectively, for any additional power ascension. 3. 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 ≤ 80% of the ASME allowable alternating stress (S_a) value at $\leq 10^{11}$ cycles (i.e., ≤ 10.88 ksi). Acceptable Level 1 Spectra shall be based on maintaining the ASME S_a at $\leq 10^{11}$ cycles (i.e., ≤13.6 ksi).

Reactor power operation that results in Steam pressures that are less than the Level 2 performance criteria in Table 2 is representative of fully acceptable steam dryer performance.

Attachment 2A
Flow Induced Vibration Data Collection
At 1593 MWth (1574 MWth to 1593 MWth)

DRYWELL AREA			
Accel No./Dir.	Measured Acceleration (g)	Acceptance Criteria (g)	Sat / Unsat
MSA1 N-S		≤0.545	
MSA2 Vert		≤0.230	
MSA3 E-W		≤0.326	
MSB1 N-S		≤0.274	
MSB2 E-W		≤0.160	
MSB3 N-S		≤0.269	
MSB4 Vert		≤0.133	
MSB5 E-W		≤0.248	
MSB6 N-S		≤0.259	
MSB7 E-W		≤0.202	
MSB8 N-S		≤0.271	
MSB9 Vert		≤0.286	
MSB10 E-W		≤0.263	
MSC1 N-S		≤0.264	
MSC2 Vert		≤0.193	
MSC3 E-W		≤0.170	
MSD1 N-S		≤0.271	
MSD2 Vert		≤0.254	
MSD3 E-W		≤0.193	
MSD4 N-S		≤0.271	
MSD5 E-W		≤0.293	
FDWA1 N-S		≤0.123	
FDWA2 Vert		≤0.184	
FDWA3 E-W		≤0.068	
FDWB1 N-S		≤0.172	
FDWB2 Vert		≤0.198	
FDWB3 E-W		≤0.084	
FDWB4 N-S		≤0.184	
FDWB5 E-W		≤0.185	
FDWB6 N-S		≤0.162	
FDWB7 E-W		≤0.144	

Attachment 2A
Flow Induced Vibration Data Collection
At 1593 MWth (1574 MWth to 1593 MWth)

HEATER BAY AREA			
Accel No./Dir.	Measured Acceleration (g)	Acceptance Criteria (g)	Sat / Unsat
MSHB1 N-S		≤0.057	
MSHB2 E-W		≤0.047	
MSHB3 N-S		≤0.048	
MSHB4 E-W		≤0.058	
FDWHB1 N-S		≤0.103	
FDWHB2 Vert		≤0.162	
FDWHB3 E-W		≤0.076	

Performed by: ____________________________________
Sign/Date (Design Engineering)

Verified by: ____________________________________
Sign/Date (Design Engineering)

Note: Any UNSAT indication requires a Condition Report and an Engineering Evaluation. Request Operations to lower reactor power to the last tested power level.

Attachment 2A
Flow Induced Vibration Data Collection
At 1593 MWth (1574 MWth to 1593 MWth)

Turbine Building Branch Piping Vibration Acceptance Criteria						
Valve(s) ID#	Measured Displacement mils (g) N-S	Measured Displacement mils (g) E-W	Measured displacement mils (g) Vertical	SRSS (g)	Acceptance Criteria mils	Sat Unsat
V64-63B & V64-124					≤34	
V64-63A & V64-120					≤28	
V66-12E					≤44	
V64-127					≤6	
V63-812A & B					≤27	
V63-814A & B					≤26	
V63-808C, D					≤15	
V64-16A					≤4	
V64-16B					≤4	
V64-16C					≤4	

SRSS = SQRT $[(\text{N-S mils})^2 + (\text{E-W})^2 + (\text{vertical}^2)]$

Note: Any UNSAT indication requires a Condition Report and an Engineering Evaluation. Request Operations to lower reactor power to the last tested power level.

Performed by: ______________________________
Sign/Date (Design Engineering)

Verified by: ______________________________
Sign/Date (Design Engineering)

Turbine Building FW Piping (FW Pump Room)
Vibration Acceptance Criteria

Peak to Peak Displacements (mils)

Location	N-S		Vertical		E-W		Sat/ Unsat
	Meas.	Accep. Crit.	Meas.	Accep. Crit.	Meas.	Accep. Crit.	
Pipe Support H-35		≤27.5		≤25.6		≤59.4	
FCV-6-12A		≤31.6		≤170.7		≤104.7	
FCV-6-12B		≤20.5		≤11.3		≤32.6	

Performed by: ______________________________
Sign/Date (Design Engineering)

Verified by: ______________________________
Sign/Date (Design Engineering)

Acceptance Criteria Met: ______________________________
Sign/Date (Design Engineering)

Note: Any UNSAT condition requires a Condition Report and an Engineering Evaluation. Request Operations to lower reactor power level to the last tested power level.

FIV Walkdowns
Heater Bay, Condensate and Feedwater Pump Rooms

Plant Location	Vibration Level Observation		
	Sat/Unsat	Sign/Date	Comments*
Condensate Pump Room Piping	____	________/____	____________
Feedwater Pump Room Piping	____	________/____	____________
Heater Bay Piping Systems:			
Condensate Piping	____	________/____	____________
Feedwater Piping	____	________/____	____________
Main Steam Piping	____	________/____	____________
MS Low Point Drains	____	________/____	____________
Extraction Steam	____	________/____	____________
Heater Drains	____	________/____	____________
Feedwater Heater Level Control	____	________/____	____________
Miscellaneous Remaining Systems	____	________/____	____________

Acceptance Criteria:

Piping: For main piping, if the level of vibration is too small to be perceived, and the possibility of fatigue issues is judged to be minimal, the piping system is acceptable. Any observed vibration levels piping judged by walkdown personnel to be a potential concern will be monitored utilizing hand-held vibration meters and evaluated.

System/Components: Baseline inspections of systems and components were performed at OLTP (documented in Calculation VYC-2330). Results of EPU power ascension testing inspections/walkdowns will be compared to baseline inspection results to determine if acceptability is maintained.

Any UNSAT condition requires a Condition Report and an Engineering Evaluation. Request Operations to lower reactor power level to the last tested power level.

Performed by: ______________________________
Sign/Date (Design Engineering)

Verified by: ______________________________
Sign/Date (Design Engineering)

Acceptance Criteria Met ______________________________
Sign/Date (Design Engineering)

Record instruments used and calibration due dates:

____
____
____
____

*Add additional pages as needed.

CAUTIONS

- Any of the following may be indications of vessel internals damage and potential debris generation (loose parts). (SIL 644 Revision 1)
  - Main Steam Line steam flow indication imbalance of 5% or more. (B064, B065, B066, B067)
  - RPV water level difference >3 inches step change between level instruments from different reference legs. (B040, B041, B047 versus B021, B042, B043)
  - Sudden drop (≤1 minute) in steam dome pressure of >2 psig. (B048, B049)
  - Statistically significant step increase of moisture carryover >50% of previous value (per OP 0631, Radiochemistry, Appendix F)
  - Unexpected trends in parameter values that may be indicative of loss of steam dryer integrity, particularly unexplained changes in trends.

1.0 Monitor the following ERFIS points;

- B021 REACTOR WATER LEVEL 72A
- B040 REACTOR WATER LEVEL 72B
- B048 REACTOR PRESSURE 56B
- B049 REACTOR PRESSURE 56A
- B022 MAIN STEAM FLOW
- B064 MAIN STEAM LINE A FLOW
- B065 MAIN STEAM LINE B FLOW
- B066 MAIN STEAM LINE C FLOW

- B067 MAIN STEAM LINE D FLOW
- M084 RX A UPPER REF LEG TEMP
- M085 RX A LOWER REF LEG TEMP
- M086 RX B UPPER REF LEG TEMP
- M087 RX B LOWER REF LEG TEMP

_____/_____/_____
Initial Date Time

1.0 Hold Criteria:

1.1 Moisture carryover exceeds 0.10%.

2.0 Request Chemistry to perform moisture carryover testing per OP 0631, Appendix F. Attach results per Step 9.0 of the main body of the procedure.

_____/_____/_____
Initial Date Time

3.0 Record: reactor power: _________%

Recirc flow: _________%

Moisture carryover: _________%

_____/_____/_____
Initial Date Time

4.0 Evaluate results as follows:

4.1 IF moisture carryover is equal to less than 0.10%, THEN no further actions are required.

_____/_____/_____
Initial Date Time

_____/_____/_____
Verified Date Time

4.2 IF moisture carryover is greater than 0.10%, THEN:

4.2.1 Notify Shift Manager and Test Engineer.

_____/_____/_____
Initial Date Time

4.2.2 Enter ON 3178, Increased Moisture Carryover

_____/_____/_____
Initial Date Time

_____/_____/_____
Verified Date Time

4.2.3 Take actions per the Attachment, Table 2. Consult Technical Specifications.

_____/_____/_____
Initial Date Time

_____/_____/_____
Verified Date Time

4.2.4 Request Reactor Engineering to store data for individual bundle powers and flows for the approximate time Chemistry obtained the moisture carryover samples per OP 0631. Attach results per Section 9 of the main body of the procedure.

_____/_____/_____
Initial Date Time

_____/_____/_____
Verified Date Time

5.0 Acceptance Criteria:

5.1 Level 1: Moisture Carryover less than or equal to 0.35%

5.2 Level 2:

5.2.1 MSL moisture content ratio as determined by Chemistry shall be less than or equal to 0.10 %. (Reference 21A3317, Revision 0 Standard Requirements for Steam Dryer Units).

5.2.2 MSL moisture content ratio as determined by Chemistry shall be less than or equal to 0.35% WITH an approved engineering evaluation that supports continued plant operation.

Table 1

Parameter	Surveillance Frequency
1. Moisture Carryover	Every 24 hours (Notes 1 and 2)

Notes to Table 1:

1. If a determination of moisture carryover cannot be made within 24 hours of achieving an 80 MWth power plateau, an orderly power reduction shall made within the subsequent 12 hours to a power level at which moisture carryover was previously determined to be acceptable.
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.

Table 2

Performance Criteria Not to be Exceeded	Required Actions if Performance Criteria Exceeded and Required Completion Times
Level 2: • Moisture carryover exceeds 0.1% -OR- • Moisture carryover exceeds 0.1% and increases by > 50% over the average of the three previous measurements taken at > 1593 MWt	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.
Level 1: • Moisture carryover exceeds 0.35%	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 step 3 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 20 MWth and 40 MWth , respectively, for any additional power ascension.

TABLE 2 NOTES:

IF the Level 1 or Level 2 performance criteria are exceeded, THEN either suspend reactor power ascension (Level 2 Performance Criteria) or reduce reactor power (Level 1 Performance Criteria), initiate a Condition Report, and evaluate the cause of any exceedance of the performance criteria.

Reactor power operation that results in moisture carryover that are less than the Level 2 performance criteria in Table 2 is representative of fully acceptable steam dryer performance.

BVY 06-019
Docket No. 50-271

VYNPS EPU

Portions of Test Procedure ERSTI-04-VY1-1409-000

Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth

(February 24, 2006)

Attachment 9 to PATP

Supplemental System Monitoring Plans for EPU
Plan

Total number of pages in this Attachment (excluding this cover sheet) is 85.

VYNPS EPU Power Ascension Testing

345 KV System Monitoring Plan

(3 pages)

EPU Power Ascention Testing - 345K System Monitoring Plan

System Number: 345KV **System Engineer:** Ken Sweet

Equipment Name	Para ID	Alert and Action Levels Basis	Level	Alert and Action Levels	Actions Required	Reason or other Info	1593 MwTh	1673 MwTh	1752 MwTh	1835 MwTh	1912 MwTh
340 Line	ERFIS Pt. E037 (MVAR)	Normal VELCO System Monitoring	2	Line Limits for Ambient and Reliable Grid	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. VELCO may resolve by dispatching system load.	Monitored By SE by Contacting Velco					
340 Line	ERFIS Pt. E036 (MW)	Normal VELCO System Monitoring	2	Line Limits for Ambient and Reliable Grid	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. VELCO may resolve by dispatching system load.	Monitored By SE by Contacting Velco					
379 Line	ERFIS Pt. E016 (MVAR)	Normal VELCO System Monitoring	2	Line Limits for Ambient and Reliable Grid	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. VELCO may resolve by dispatching system load.	Monitored By SE by Contacting Velco					
379 Line	ERFIS Pt. E002 (MW)	Velco System Monitoring System	2	Line Limits for Ambient and Reliable Grid	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. VELCO may resolve by dispatching system load.	Monitored By SE by Contacting Velco					

Equipment Name	Para ID	Alert and Action Levels Basis	Level	Alert and Action Levels	Actions Required	Reason or other Info	1593 MwTh	1673 MwTh	1752 MwTh	1835 MwTh	1912 MwTh
	Circle A or B										
381 Line	ERFIS Pt. E017 (MVAR)	Normal VELCO System Monitoring	2	Line Limits for Ambient and Reliable Grid	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. VELCO may resolve by dispatching system load.	Monitored By SE by Contacting Velco					
381 Line	ERFIS Pt. E003 (MW)	Normal VELCO System Monitoring	2	Line Limits for Ambient and Reliable Grid	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. VELCO may resolve by dispatching system load.	Monitored By SE by Contacting Velco					
345 KV Voltage (South Bus)	VY Generator (Relay House)	VELCO Voltage Schedule	2	VELCO Voltage Schedule (123V light load, 125V peak load)	Increased Monitoring, VELCO to notify VY Operations of possible PA hold. ~~VELCO~~ may resolve by dispatching system load.	Monitored By SE by Contacting Velco					

1593 MWth Data Recorded By: ______________________ Date: __________

1593 MWth Data Recorded By: ______________________ Date: __________

1673 MWth Data Recorded By: ______________________ Date: __________

1673 MWth Data Reviewed By: ______________________ Date: __________

1752 MWth Data Recorded By: ______________________ Date: __________

1752 MWth Data Reviewed By: ______________________ Date: __________

1853 MWth Data Recorded By: ______________________ Date: __________

1853 MWth Data Recorded By: ______________________ Date: __________

1912 MWth Data Recorded By: ______________________ Date: __________

1912 MWth Data Reviewed By: ______________________ Date: __________

VYNPS EPU Power Ascension Testing

AOG / AOGCCW System Monitoring Plan

(9 pages)

EPU Power Ascention Testing - AOG / AOGCCW System Monitoring Plan

System Number: AOG: N/A AOGCCW: V70-xx **System Engineer:** Brian Naeck

Equipment Name	Para ID	Alert and Action Levels Basis	Alert and Action Levels	Actions Required	Reason or other info	1593 MwTh	1673 MwTh	1752 MwTh	1832 MwTh	1912 MwTh
	Circle A or B									
Recombiner H_2 Detector	H2AN-2921A/B	OP 0150 ARS: 50-C-5 & 50-P-5	Both Units: 1. >25% 2. >50% 3. >10% Disagreement	1. Per ARS 50-C-5, Notify Engineering 2. Per ARS 50-C-6, Notify Engineering 3. Declare Inop & Swap Recombiners	Monitored by Ops Level 4	< 5%				
Recombiner H_2 Detector	H2AN-2922A/B					< 5%				
Rad Monitors	RAN-OG-3127 RAN-OG-3128	OP 0150 ODCM 4.3.4 & T.4.1.2. ARS 50-M-4 & 50-M-6	1. 5,000 cpm 2. 10,000 cpm 3. 200,000 cpm	1. Notify RP & Engineering 2. Per ARS 50-M-4 3. Per ARS 50-M-6	Monitored by Ops Level 4	3127: ~ 600 cpm 3128: ~300 cpm w/i 10%				
Steam Temp to HE-100-1A/B	TE-OG-2301A/B	OP 0150	< 300 °F > 400 °F	1. Veryify valve line-up 2. Thermography on MS-114-1A	Monitored by Ops Level 4	~350 °F				

Equipment Name	Para ID	Alert and Action Levels Basis	Alert and Action Levels	Actions Required	Reason or other Info	1593 MwTh	1673 MwTh	1752 MwTh	1832 MwTh	1912 MwTh
	Circle A or B									
Recombiner Inlet Temperature	TE-OG-2302A/B	OP 0150 ARS 50-N-2 & 50-N-6	< 295 °F > 315 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	~313 °F				
Recombiner Top Temperature	TE-OG-2303A/B	OP 0150 ARS 50-A-3, A-4, N-3, & N-4	< 300 °F > 650 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	~ 535 °F				
Recombiner Bottom Temperature	TE-OG-2304A/B	OP 0150 ARS 50-A-3, A-4, B-6, N-3, N-4, O-6	< 450 °F > 650 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	~ 490 - 540 °F				
Recombiner Center Temperature	TE-OG-2305A/B	OP 0150 ARS 50-A-3, A-4, B-6, N-3, N-4, O-6	< 300 °F > 650 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	~ 530 - 550 °F				
MS-101-1A/B Outlet Temperature	TE-OG-2307A/B	OP 0150 ARS 50-A-3, A-4, A-5, B-6, N-3, N-4, N-5, O-6	< 75 °F > 145 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	80 - 95 °F				
Evaporator Glycol Inlet Temperature	TE-OG-5251A/B	OP 0150	< 35 °F > 50 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	35 - 45 °F				

Equipment Name	Para ID	Alert and Action Levels Basis	Alert and Action Levels	Actions Required	Reason or other info	1593 MwTh	1673 MwTh	1752 MwTh	1832 MwTh	1912 MwTh
	Circle A or B									
Evaporator Glycol Outlet Temperature	TE-OG-5252A/B	OP 0150	< 35 °F > 50 °F	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	35 - 45 °F				
System Inlet Pressure	PI-1301	OP 0150	< 0 psig	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	-0.75 psig				
Adsorber "G" Outlet Pressure	PI-1306	OP 0150	< -1 psig	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	-1.25 psig				
System Outlet Pressure	PI-1307	OP 0150	-1 to 1 psig	Verify valve line-up, notify Engineering	Monitored by Ops Level 4	0 psig				

Equipment Name	Para ID	Alert and Action Levels Basis	Alert and Action Levels	Actions Required	Reason or other info	1593 MwTh	1673 MwTh	1752 MwTh	1832 MwTh	1912 MwTh
Delay Pipe / System Flow	FI-2002	OP 2150 OP 0150 ODCM Table 3.1.2	1. 25 scfm 2. 30 scfm 3. <100 scfm	1. notify engineering, verify valve line-up 2. initate corrective actions to prevent exceeding 100 scfm 3. reduce power to maintain <100 scfm 4. Agree within 10 scfm of FI-2004	Monitored by Ops Level 4	18 scfm				
Delay Pipe / System Flow	FI-2004	OP 2150 OP 0150 ODCM Table 3.1.2	1. 25 scfm 2. 30 scfm 3. <100 scfm 4. Agree within 10 scfm of FI-2002	1. notify engineering, verify valve line-up 2. initate corrective actions to prevent exceeding 100 scfm 3. reduce power to maintain <100 scfm	Monitored by Ops Level 4	18 scfm				
AOGCCW Temperature	TI-104-7153	OP 0150 OP 2150 RP 2188	50 °F - 90 °F, & (≤15 °F above ambient when >70 °F air temp)	Adjust temperature per OP 2150 & RP 2188 Notify Engineering	Monitored by Ops Level 4	50 - 90 °F				

1673 MWth Data Recorded By:	____________	Date:	________
1673 MWth Data Reviewed By:	____________	Date:	________
1752 MWth Data Recorded By:	____________	Date:	________
1752 MWth Data Reviewed By:	____________	Date:	________
1832 MWth Data Recorded By:	____________	Date:	________
1832 MWth Data Reviewed By:	____________	Date:	________
1912 MWth Data Recorded By:	____________	Date:	________
1912 MWth Data Reviewed By:	____________	Date:	________

System Monitoring Plan

System Name: AOG / AOGCCW							Date Issued: 10/12/2004	Rev. 1	

System Number: AOG: N/A AOGCCW: V70-xx System Engineer: Brian Naeck

Equipment Name	Equipment No./ ID	Parameter	Para ID	Source	M / T	Freq	Alert and Action Levels	Actions Required	Reason or other info
System Reliability	N / A	MRFFs	N / A	N / A	M	N / A	Per M-Rule Program	Per M-Rule Program	Scopping Basis
SJAE Flow	N / A	Flow Rate	ERFIS Pt. T032	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Recombiner H2 Detector	H2AN-2921A/B	% LEL H2	H2AN-2921A/B	Logs	M	OP 0150	OP 0150 ARS: 50-C-5 & 50-P-5	OP 0150 TS 3.8.J ARS: 50-C-6 & 50-P-6	Monitored by Ops
Recombiner H2 Detector	H2AN-2922A/B	% LEL H2	H2AN-2921A/B	Logs	M	OP 0150 TS 3.8.J	OP 0150 TS 3.8.J	OP 0150 TS 3.8.J ARS: 50-C-6 & 50-P-6	Monitored by Ops
Rad Monitors	RAN-OG-3127 RAN-OG-3128	CPS In Discharge Stream	RAN-OG-3127 RAN-OG-3128	Logs	M	OP 0150 ODCM 4.3.4 & T.4.1.2.	OP 0150 ODCM 4.3.4 & T.4.1.2.	OP 0150 ODCM 4.3.4 & T.4.1.2.	Monitored by Ops

Flow to Recombiner	FI-2001A / B	Flow Rate to Recombiner	FI-2001A / B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Off Gas Inlet Temp	TE-OG-2340A/B	Temperature	TE-OG-2340A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Steam Temp to HE-100-1A/B	TE-OG-2301A/B	Temperature	TE-OG-2301A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Recombiner Inlet Temperature	TE-OG-2302A/B	Temperature	TE-OG-2302A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Recombiner Top Temperature	TE-OG-2303A/B	Temperature	TE-OG-2303A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Recombiner Bottom Temperature	TE-OG-2304A/B	Temperature	TE-OG-2304A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Recombiner Center Temperature	TE-OG-2305A/B	Temperature	TE-OG-2305A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops

MS-101-1A/B Outlet Temperature	TE-OG-2307A/B	Temperature	TE-OG-2307A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Evaporator Glycol Inlet Temperature	TE-OG-5251A/B	Temperature	TE-OG-5251A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Evaporator Glycol Outlet Temperature	TE-OG-5252A/B	Temperature	TE-OG-5252A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
System Inlet Pressure	PI-1301	Pressure	PI-1301	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Adsorber "G" Outlet Pressure	PI-1306	Pressure	PI-1306	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
System Outlet Pressure	PI-1307	Pressure	PI-1307	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops
Delay Pipe / System Flow	FI-2002	Flow Rate	FI-2002	Logs	M	OP 0150 ODCM	OP 0150 ODCM	OP 0150 ODCM	Monitored by Ops

Delay Pipe / System Flow	FI-2004	Flow Rate	FI-2002	Logs	M	OP 0150 ODCM	OP 0150 ODCM	OP 0150 ODCM	Monitored by Ops
AOGCCW System Chemistry	N / A	pH Iron Copper Chloride Corrosion Inhibitors Specific Gravity (i.e. Glycol Concentration)	N/A	Surv. (grab sample analysis)	T	Q	OP 4623	OP 4623	EPRI Guidelines are changing, more to follow. Monitoring by Chemistry
AOG 'Glycol' Chilled Water System Chemistry	N / A	Conductivity Chlorides Filterable Solids	N/A	Surv. (grab sample analysis)	T	Q	OP 4623	OP 4623	Monitoring by Chemistry
Chiller Pump A/B Discharge Pressure	PI-OGG-5151A/B	Pressure	PI-OGG-5151A/B	Logs	M	OP 0150	OP 0150	OP 0150	Monitored by Ops

VYNPS EPU Power Ascension Testing

Condensate Demineralizer System Monitoring Plan

(2 pages)

EPU Performance Monitoring for Condensate Demineralizer System

Equipment No.	Parameter	Alarm Values/Limits	Level	Increased Power Level Evaluation Points 1593 MWth (83.32%)	1673 MWth (87.48%)	1752 MWth (91.65%)	1832 MWth (95.81%)	1912 MWth (100%)	Action
DM-1-1A	dP	25psid	2	25	20	18	17	15	Evaluate margin to 55psid limit for system dP; Fluff resin; Backwash
			Data						
	Flow	3250gpm	2	~2600gpm	~2760gpm	~2925gpm	~3095gpm	~3250gpm	Investigate why flows are not ballanced
			Data						
DM-1-1B	dP	25psid	2	25	20	18	17	15	Evaluate margin to 55psid limit for system dP; Fluff resin; Backwash
			Data						
	Flow	3250gpm	2	~2600gpm	~2760gpm	~2925gpm	~3095gpm	~3250gpm	Investigate why flows are not ballanced
			Data						
DM-1-1C	dP	25psid	2	25	20	18	17	15	Evaluate margin to 55psid limit for system dP; Fluff resin; Backwash
			Data						
	Flow	3250gpm	2	~2600gpm	~2760gpm	~2925gpm	~3095gpm	~3250gpm	Investigate why flows are not ballanced
			Data						
DM-1-1D	dP	25psid	2	25	20	18	17	15	Evaluate margin to 55psid limit for system dP; Fluff resin; Backwash
			Data						
	Flow	3250gpm	2	~2600gpm	~2760gpm	~2925gpm	~3095gpm	~3250gpm	Investigate why flows are not ballanced
			Data						
DM-1-1E	dP	25psid	2	25	20	18	17	15	Evaluate margin to 55psid limit for system dP; Fluff resin; Backwash
			Data						
	Flow	3250gpm	2	~2600gpm	~2760gpm	~2925gpm	~3095gpm	~3250gpm	Investigate why flows are not ballanced
			Data						
System	dP	55psid	2	55psid	55psid	55psid	55psid	55psid	Evaluate prior data for which vessel put system into Flow Balance Override
			Data						
S-14-1A	dP	20psid	2	15	16	17	19	20	Backwash Filter; Evaluate replacement
			Data						
S-14-1B	dP	20psid	2	15	16	17	19	20	Backwash Filter; Evaluate replacement
			Data						
S-14-1C	dP	20psid	2	15	16	17	19	20	Backwash Filter; Evaluate replacement
			Data						
S-14-1D	dP	20psid	2	15	16	17	19	20	Backwash Filter; Evaluate replacement
			Data						
S-14-1E	dP	20psid	2	15	16	17	19	20	Backwash Filter; Evaluate replacement
			Data						
Conductivity	Monitored by Chemistry								

Comments:

1593 Mwth Reviewed By: ______________________
Print/Sign/Date
Approved By: ______________________
Print/Sign/Date

1673 Mwth Reviewed By: ______________________
Print/Sign/Date
Approved By: ______________________
Print/Sign/Date

1752 Mwth Reviewed By: ______________________
Print/Sign/Date
Approved By: ______________________
Print/Sign/Date

1832 Mwth Reviewed By: ______________________
Print/Sign/Date
Approved By: ______________________
Print/Sign/Date

1912 Mwth Reviewed By: ______________________
Print/Sign/Date
Approved By: ______________________
Print/Sign/Date

General Guidance

*Data can be collected at the Condemin control panel on the 232 level of the Turbine building. System dP and vessel flows are available on the recorder located at the panel. Vessel dP is visible along the upper right corner of the panel.

*Data can be obtained shiftly via OP 0150.05 data sheets

*Chemistry is performing additional daily trending of Condemin performance for the scheduling of vessel backwashes

*It is the intent of this monitoring plan that any parameter approaching an evaluation limit be monitored on a more frequent basis to preclude the system from entering flow ballance override at 55psid system dP before action is taken to reduce overall system dP.

SUMMARY OF CONDEMIN FILTERED BYPASS FLOW CASES

CASE	DESCRIPTION	MODELED TRAP dP (@ current flow)	TRAP Dp ACTUAL	DEMIN Dp PSID	HEADER Dp	TOTAL FLOW GPM	MASS FLOW E6 #/HR	OUTLET E VALVE %OPEN	AVE DEMIN FLOW GPM	BYPASS FLOW	BYPASS % OPEN
1	CURRENT POWER	7	8.7	5	27.5	13000	6.435	90	2600	0	
2	CURRENT POWER	7	8.7	20	41	13000	6.435	70	2600	0	
3	CURRENT POWER	12	13.4	5	32.5	13000	6.435	90	2600	0	
4	CURRENT POWER	12	13.7	20	46.5	13000	6.435	70	2600	0	
5	105% 5 demins online	7	9.8	5	29.5	13810	6.836	70	2760	0	
6	105% 5 demins online	7	10	17	40.7	13810	6.836	90	2760	0	
7	105% 5 demins online	12	15.6	5	37	13810	6.836	70	2760	0	
8	105% 5 demins online	12	15.5	17	46.5	13810	6.836	90	2760	0	
9	105% 4 demins online	12	NR	17	NR	13810	6.836	NR	NR	NR	
10	110% 5 demins online	7	9.8	5	29.7	14625	7.239	70	2925	0	
11	110% 5 demins online	7	10.1	17	41.7	14625	7.239	70	2925	0	
12	110% 5 demins online	12	17.2	5	39	14625	7.239	70	2925	0	
13	110% 5 demins online	12	17.1	17	51.7	14625	7.239	90	2925	0	
14	110% 4 demins online	12	15.5	17	45	14625	7.239	70	2755	3600	
15	115% 5 demins online	7	10.5	5	32.3	15465	7.655	70	3095	0	
16	115% 5 demins online	7	8.5	17	34	15465	7.655	70	3095	0	
17	115% 5 demins online	12	18.7	5	42.1	15465	7.655	70	3095	0	
18	115% 5 demins online	12	18.7	17	54	15465	7.655	90	3095	0	
19	115% 4 demins online	12	16.7	17	51.2	15465	7.655	90	2930	3845	50
19A	115% 5 demins online	7	11.5	5	35	15465	7.655	70	3095	0	
19B	115% 4 demins online	7	13	5	38.5	15465	7.655	70	3075	3170	50
20	120% 5 demins online	7	11.5	5	35.8	16250	8.044	70	3250	0	
21	120% 5 demins online	7	12	17	46.2	16250	8.044	90	3250	0	
22	120% 5 demins online	12	19.8	5	45.8	16250	8.044	70	3250	0	
23	120% 5 demins online	12	20.5	17	57.5	16250	8.044	90	3250	0	
23A	120% 5 demins online	10	17	15	51.5	16250	8.044	3250	3250	90	
23B	120% 5 demins online	10	17	17	53	16250	8.044	3250	3250	90	
23C	120% 5 demins online	10	17	20	57.5	16250	8.044	3250	3250	90	
23D	120% 5 demins online	12	20	15	54.5	16250	8.044	3250	3250	90	
23E	120% 5 demins online	12	20	17	56.8	16250	8.044	3250	3250	90	
23F	120% 5 demins online	13	23	15	57.5	16250	8.044	3250	3250	90	
24	120% 4 demins online	12	18.8	17	52.5	16250	8.044	90	3095	3875	50
24A	120% 5 demins online	7	13	5	40	16250	8.044	70	3250	0	
24B	120% 4 demins online	7	13	5	38.5	16250	8.044	70	3235	3310	50

VYNPS EPU Power Ascension Testing

Nuclear Boiler Vessel Instrumentation System Monitoring Plan

(2 pages)

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Source	Level	Actions Required	1593 MWth	1673 MWth	1752 MWth	1835 MWth	1912 MWth
						Date					
						Time					
Calculated Reference Leg A	Temp °F	C220		OP4390	4	Evaluate					
Calculated Reference Leg B	Temp °F	C221		OP4390	4	Evaluate					
RX A Upper Reference Leg	Temp °F	M084		OP4390	4	Evaluate					
RX A Lower Reference Leg	Temp °F	M085		OP4390	4	Evaluate					
RX B Upper Reference Leg	Temp °F	M086		OP4390	4	Evaluate					
RX B Lower Reference Leg	Temp °F	M087		OP4390	4	Evaluate					
Vessel Stud	Temp °F	S023			4	Evaluate					
Vessel Head Flange	Temp °F	S024			4	Evaluate					
Vessel Head Adjacent to Flange	Temp °F	S025			4	Evaluate					
Vessel Bottom Drain Temp	Temp °F	S026			4	Evaluate					
Vessel Skirt at MTG Flange	Temp °F	S027			4	Evaluate					
Vessel Bottom Head	Temp °F	S028			4	Evaluate					
Vessel Skirt Near Joint	Temp °F	S029			4	Evaluate					
Vessel Above Skirt Joint	Temp °F	S030			4	Evaluate					
Vessel Downcomer	Temp °F	S031			4	Evaluate					
Vessel Core	Temp °F	S032			4	Evaluate					
Nozzle N4C In Board	Temp °F	S033			4	Evaluate					
Vessel Below Water Level	Temp °F	S034			4	Evaluate					
Total Jet Pump Flow Loop A	M#/HR	B051			4	Evaluate					
Total Jet Pump Flow Loop B	M#/HR	B052			4	Evaluate					
Total RX Jet Pump Flow	M#/HR	B012	51.05 M#/HR?		4	Evaluate					
Flow to Ref Leg FIT-400-A	GPM	N/A	0.001-0.005 GPM	OP0150	4	Evaluate					
Flow to Ref Leg FIT-400-B	GPM	N/A	0.001-0.005 GPM	OP0150	4	Evaluate					

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels		Level	Actions Required	1593 MWth	1673 MWth	1752 MWth	1835 MWth	1912 MWth
						Date					
						Time					
Flow to Ref Leg FIT-400-C	GPM	N/A	0.001-0.005 GPM	OP0150	4	Evaluate					
Flow to Ref Leg FIT-400-D	GPM	N/A	0.001-0.005 GPM	OP0150	4	Evaluate					

1593 MWth Data Recorded By: ______________________ Date: ____________

1593 MWth Data Reviewed By: ______________________ Date: ____________

1673 MWth Data Recorded By: ______________________ Date: ____________

1673 MWth Data Reviewed By: ______________________ Date: ____________

1752 MWth Data Recorded By: ______________________ Date: ____________

1752 MWth Data Reviewed By: ______________________ Date: ____________

1835 MWth Data Recorded By: ______________________ Date: ____________

1835MWth Data Reviewed By: ______________________ Date: ____________

1912 MWth Data Recorded By: ______________________ Date: ____________

1912 MWth Data Reviewed By: ______________________ Date: ____________

VYNPS EPU Power Ascension Testing

Core Spray System Monitoring Plan

(1 page)

EPU Supplemental Performance Monitoring Plan for the Core Spray System

System Engineer: Stephen Jonasch

Previously Monitored	Equip ID	Parameter	Pre EPU Range	5% 1673 MWth	10% 1752 MWth	15% 1832 Mwth	20% 1912 Mwth	Source	Remarks
Yes	DPIS – 14-43A	CS A Sparger DP	-3.2					OP 0150 pg 10	Note 1 Note 2 Note 3
Yes	DPIS – 14-43B	CS B Sparger DP	-2.9					OP 0150 pg 10	Note 1 Note 2

Note 1: A minus reading is normal. Gauge range is -5.0 to +5.0. Alarm setpoint is +0.6.

Note 2: GE SIL 300, Supplement 001 was provided to VY with GE's discussion on what will be the response of this gauge during power uprate. GE has stated that there should essentially be NO CHANGE in readings. Data collected during various down powers and post refuel indicate that this is probably correct.

Note 3: CR 2005-4023 reported that the 43A DP gauge was fluctuating. While not certain, there may be a small weep in the restricting orifice flange located in the drywell that is giving these fluctuating readings. Because it is located in the drywell, this cannot be confirmed. On/About Jan 4, the fluctuating stopped and was reading -4.5. Since that time, the reading has again changed and, as of 2/13/06, is reading -3.2. CR 2006-0460 was generated reporting this issue.

1673 Mwth Data Recorded BY: ______________________ Date: ________

1673 Mwth Data Reviewed BY: ______________________ Date: ________

1752 Mwth Data Recorded BY: ______________________ Date: ________

1752 Mwth Data Reviewed BY: ______________________ Date: ________

1832 Mwth Data Recorded BY: ______________________ Date: ________

1832 Mwth Data Reviewed BY: ______________________ Date: ________

1912 Mwth Data Recorded BY: ______________________ Date: ________

1912 Mwth Data Reviewed BY: ______________________ Date: ________

VYNPS EPU Power Ascension Testing

22 KV System Monitoring Plan

(2 pages)

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Level	Actions Required	1593 MWth (83.32%)	1593 MWth (83.32%)	1593 MWth (83.32%)	1673 MWth (87.48%)	1673 MWth (87.48%)	1673 MWth (87.48%)	1752 MWth (91.65%)	1752 MWth (91.65%)	1752 MWth (91.65%)
					Date									
					Time									
Phase A Bus	Amps	(G006)	Expected: 17.95 KA Design / Operating Limit: 19 KA		Evaluate									
Phase B Bus	Amps	(G007)	Expected: 17.95 KA Design / Operating Limit: 19 KA		Evaluate									
Phase C Bus	Amps	(G008)	Expected: 17.95 KA Design / Operating Limit: 19 KA		Evaluate									
Phase A Bus	Return Air Temp °F	Local Indication TI-22KV-1A	Alarm @ 176°F Alert @ > 160°F		Evaluate									
Phase B Bus	Supply Air Temp °F	Local Indication TI-22KV-1B or TI-22KV-1D	Alarm @ 176°F Alert @ > 120°F		Evaluate									
Phase C Bus	Return Air Temp °F	Local Indication TI-22KV-1C	Alarm @ 176°F Alert @ > 160°F		Evaluate									
Isophase Bus Cooler A (TBCCW)	Outlet Temp °F	Local Indication TI-104-31A	Alert @ > 110°F		Evaluate									
Isophase Bus Cooler B (TBCCW)	Outlet Temp °F	Local Indication TI-104-31B	Alert @ > 110°F		Evaluate									
Isophase Bus Cooler A (TBCCW)	Flow (GPM)	Local Indication FI 104-2A	Alert @ < 90 GPM		Evaluate									
Isophase Bus Cooler B (TBCCW)	Flow (GPM)	Local Indication FI 104-2B	Alert @ < 90 GPM		Evaluate									
Isophase Bus Fan (GLF-1A) or (GLF-1B)	Air Flow (CFM)	Local Indication FI 22KV-3A or FI-22KV-3B	Alert @ < 16000 CFM		Evaluate									
Thermography performed by Component Engineering														

1593 MWth Data Recorded by:____________________ Date:__________

1593 MWth Data Reviewed by:____________________ Date:__________

1673 MWth Data Recorded by:____________________ Date:__________

1673 MWth Data Reviewed by:____________________ Date:__________

1752 MWth Data Recorded by:____________________ Date:__________

1752 MWth Data Reviewed by:____________________ Date:__________

Nick Lisai
22KV System Engineer

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Level	Actions Required		1832 MWth (95.81%)	1832 MWth (95.81%)	1832 MWth (95.81%)	1912 MWth (100%)	1912 MWth (100%)	1912 MWth (100%)			
					Date										
					Time										
Phase A Bus	Amps	(G006)	Expected: 17.95 KA Design / Operating Limit: 19 KA		Evaluate										
Phase B Bus	Amps	(G007)	Expected: 17.95 KA Design / Operating Limit: 19 KA		Evaluate										
Phase C Bus	Amps	(G008)	Expected: 17.95 KA Design / Operating Limit: 19 KA		Evaluate										
Phase A Bus	Return Air Temp °F	Local Indication TI-22KV-1A	Alarm @ 176°F Alert @ > 160°F		Evaluate										
Phase B Bus	Supply Air Temp °F	Local Indication TI-22KV-1B or TI-22KV-1D	Alarm @ 176°F Alert @ > 120°F		Evaluate										
Phase C Bus	Return Air Temp °F	Local Indication TI-22KV-1C	Alarm @ 176°F Alert @ > 160°F		Evaluate										
Isophase Bus Cooler A (TBCCW)	Outlet Temp °F	Local Indication TI-104-31A	Alert @ > 110°F		Evaluate										
Isophase Bus Cooler B (TBCCW)	Outlet Temp °F	Local Indication TI-104-31B	Alert @ > 110°F		Evaluate										
Isophase Bus Cooler A (TBCCW)	Flow (GPM)	Local Indication FI 104-2A	Alert @ < 90 GPM		Evaluate										
Isophase Bus Cooler B (TBCCW)	Flow (GPM)	Local Indication FI 104-2B	Alert @ < 90 GPM		Evaluate										
Isophase Bus Fan (GLF-1A) or (GLF-1B)	Air Flow (CFM)	Local Indication FI 22KV-3A or FI-22KV-3B	Alert @ < 16000 CFM		Evaluate										
Thermography performed by Component Engineering															

1832 MWth Data Recorded by:________________ Date:__________

1832 MWth Data Reviewed by:________________ Date:__________

1912 MWth Data Recorded by:________________ Date:__________

1912 MWth Data Reviewed by:________________ Date:__________

VYNPS EPU Power Ascension Testing

AE / RWCU System Monitoring Plan

(12 pages)

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Level	Actions Required	1593 MWth (83.32%)	1593 MWth (83.32%)	1593 MWth (83.32%)	1673 MWth (87.48%)	1673 MWth (87.48%)	1673 MWth (87.48%)	1752 MWth (91.65%)	1752 MWth (91.65%)	1752 MWth (91.65%)
					Date									
					Time									
SJAE	SJAE Off Gas Radiation	**(BOPM002)**	n/a		n/a									
SJAE	SJAE Off Gas Lin Rad (Ci/sec)	**RM-17-151** CRP 9-10 OP 0150.03 [pg. 16]	Alert - > 1E-6 Action - > 2E-5 ODCM = 1.6E-1Ci/sec	2	> 2E-5 - restore to < 1E-6; CR [TS 4.8.K.1 = ODCM]									
SJAE	SJAESteam Flow (lbm/hr)	**(T032)** OP 0150.03 [pg.25]	n/a		n/a									
SJAE	SJAE Press	**PI 101-23** CRP 9-6 OP 0150.03 [pg. 4]	Alert <111, >119 Action <110, >120 psig		<110, >120 adjust PCV-1									
(RWCU) DI Inlet	Conductivity	**CR 12-132** CRP 9-4 OP 0150.03 [pg. 8]	Alert/Action - > 0.3		Notify Chemistry									
(RWCU) DI Outlet	Conductivity A	**CR 12-135** CRP 9-4 OP 0150.03 (pg. 8)	Alert - > 0.1		Notify Chemistry									
	Conductivity B	**CR 12-135** CRP 9-4 OP 0150.03 (pg. 8)	Alert - > 0.1		Notify Chemistry									
(RWCU) Pt 1	Temperature	**TI 12-137** CRP 9-4 OP 0150.03 (pg. 8)	per TS Fig. 3.6.1	1	CR [TS 3.6.A.1]									
(RWCU) Pt 3		**TI 12-137** CRP 9-4 OP 0150.03 (pg. 8)	Alert/Action - > 140 F		Isolate Demineralizer WR/CR									
(RWCU) P-49-1A	Amps	**12-A-M1/M2** CRP 9-4 OP 0150.03 (pg. 8)	Alert/Action > 52 Amps		WR, CR									
(RWCU) P-49-1B	Amps	**12-A-M1/M2** CRP 9-4 OP 0150.03 (pg. 8)	Alert/Action > 52 Amps		WR, CR									
(RWCU) Avg of Demin Flows	GPM	**(3DMA009)**	n/a		n/a									
RWCU Flow	M# / HR	**(C009)**	Alert/Action > 0.060 mlb/hr		CR									
RWCU System Inlet Temp	F	**(B023)**	Alert/Action > 550 F		CR									
RWCU System Outlet Temp	F	**(B024)**	Alert/Action > 450 F		CR									
(RWCU) Demin Flow A	M# / HR	**(B017)**	n/a		n/a									
(RWCU) Demin Flow B	M# / HR	**(B018)**	n/a		n/a									
(RWCU) ROC	F / HR	**(C039)**	n/a		n/a									
(RWCU) Flow	GPM	**(B054)**	n/a		n/a									
Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Level	Actions Required	1593 MWth (83.32%)	1593 MWth (83.32%)	1593 MWth (83.32%)	1673 MWth (87.48%)	1673 MWth (87.48%)	1673 MWth (87.48%)	1752 MWth (91.65%)	1752 MWth (91.65%)	1752 MWth (91.65%)

					Date									
					Time									
RHX Outlet Temp to NRHX	F	**(B055)**	n/a		n/a									
NRHX Outlet Temp	F	**(B056)**	n/a		n/a									
(RWCU) Thermal Power	%	**(BOP014)**	n/a		n/a									
(RWCU) A Flow	F	**FT-75A** Local [280']	n/a		n/a									
(RWCU) B Flow	F	**FT-75B** Local [280']	n/a		n/a									
(RWCU) Demin A D/P	F	**dPIS-94A** Local [280']	n/a		n/a									
(RWCU) Demin B D/P	F	**dPIS-94B** Local [280']	n/a		n/a									
(RWCU) Resin Trap A D/P	F	**dPIS-72A** Local [280']	n/a		n/a									
(RWCU) Resin Trap B D/P	F	**dPIS-72B** Local [280']	n/a		n/a									
Reactor Pressure	PSIG	**PI-2-3-60B** S of Rk 25-6	n/a		n/a									
RWCU Pump Suct	PSIG	**PI-12-114** Rk 25-2	n/a		n/a									
(RWCU) 'A' Pump Brg Clr Out	F	**TIS-12-89A** Rk 25-2	n/a		n/a									
(RWCU) 'B' Pump Brg Clr Out	F	**TIS-12-89B** Rk 25-2	n/a		n/a									
RWCU Pump Disch	PSIG	**PI-12-87** Rk 25-2	n/a		n/a									
Regen HX Out	PSIG	**PI-12-95** Rk 25-2	n/a		n/a									
Non-Regen HX Out	PSIG	**PI-12-96** Rk 25-2	n/a		n/a									
Non-Regen HX Out	F	**TIS-12-99** Rk 25-2	n/a		n/a									
NRHX (RBCCW) Out	F	**TC-104-5** Rk 25-2	n/a		n/a									
RWCU Demin Inlet	F	**TIS-12-115** Rk 25-2	n/a		n/a									
(RWCU) Demin Effluent	PSIG	**PI-12-113** Rk 25-2	n/a		n/a									

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Level	Actions Required	1832 MWth (95.81%)	1832 MWth (95.81%)	1832 MWth (95.81%)	1912 MWth (100%)	1912 MWth (100%)	1912 MWth (100%)
					Date						
					Time						
SJAE	SJAE Off Gas Radiation	**(BOPM002)**	n/a		n/a						
SJAE	SJAE Off Gas Lin Rad (Ci/sec)	**RM-17-151** CRP 9-10 OP 0150.03 [pg. 16]	Alert - < 1E-6 Action - < 2E-5 ODCM = 1.6E-1Ci/sec	2	< 2E-5 - restore to > 3E-2; CR [TS 4.8.K.1 = ODCM]						
SJAE	SJAESteam Flow (lbm/hr)	**(T032)** OP 0150.03 [pg.25]	n/a		n/a						
SJAE	SJAE Press	**PI 101-23** CRP 9-6 OP 0150.03 [pg. 4]	Alert <111, >119 Action <110, >120 psig		<110, >120 adjust PCV-1						
(RWCU) DI Inlet	Conductivity	**CR 12-132** CRP 9-4 OP 0150.03 [pg. 8]	Alert/Action - > 0.3		Notify Chemistry [TS 4.6.B.3.b]						
(RWCU) DI Outlet	Conductivity A	**CR 12-135** CRP 9-4 OP 0150.03 (pg. 8)	Alert - > 0.1		Notify Chemistry						
	Conductivity B	**CR 12-135** CRP 9-4 OP 0150.03 (pg. 8)	Alert - > 0.1		Notify Chemistry						
(RWCU) Pt 1	Temperature	**TI 12-137** CRP 9-4 OP 0150.03 (pg. 8)	per TS Fig. 3.6.1	1	CR [TS 3.6.A.1]						
(RWCU) Pt 3		**TI 12-137** CRP 9-4 OP 0150.03 (pg. 8)	Alert/Action - > 140 F		Isolate Demineralizer WR/CR						
(RWCU) P-49-1A	Amps	**12-A-M1/M2** CRP 9-4 OP 0150.03 (pg. 8)	Alert/Action > 52 Amps		WR, CR						
(RWCU) P-49-1B	Amps	**12-A-M1/M2** CRP 9-4 OP 0150.03 (pg. 8)	Alert/Action > 52 Amps		WR, CR						
(RWCU) Avg of Demin Flows	GPM	**(3DMA009)**	n/a		n/a						
RWCU Flow	M# / HR	**(C009)**	Alert/Action > 0.060 mlb/hr		CR						
RWCU System Inlet Temp	F	**(B023)**	Alert/Action > 550 F		CR						
RWCU System Outlet Temp	F	**(B024)**	Alert/Action > 450 F		CR						
(RWCU) Demin Flow A	M# / HR	**(B017)**	n/a		n/a						
(RWCU) Demin Flow B	M# / HR	**(B018)**	n/a		n/a						
(RWCU) ROC	F / HR	**(C039)**	n/a		n/a						

Asset ID	Parameter	Parameter ID (ERFIS)	Alert/ Action Levels	Level	Actions Required	1832 MWth (95.81%)	1832 MWth (95.81%)	1832 MWth (95.81%)	1912 MWth (100%)	1912 MWth (100%)	1912 MWth (100%)
					Date						
					Time						
(RWCU) Flow	GPM	**(B054)**	n/a		n/a						
RHX Outlet Temp to NRHX	F	**(B055)**	n/a		n/a						
NRHX Outlet Temp	F	**(B056)**	n/a		n/a						
(RWCU) Thermal Power	%	**(BOP014)**	n/a		n/a						
(RWCU) A Flow	F	**FT-75A** Local [280']	n/a		n/a						
(RWCU) B Flow	F	**FT-75B** Local [280']	n/a		n/a						
(RWCU) Demin A D/P	F	**dPIS-94A** Local [280']	n/a		n/a						
(RWCU) Demin B D/P	F	**dPIS-94B** Local [280']	n/a		n/a						
(RWCU) Resin Trap A D/P	F	**dPIS-72A** Local [280']	n/a		n/a						
(RWCU) Resin Trap B D/P	F	**dPIS-72B** Local [280']	n/a		n/a						
Reactor Pressure	PSIG	**PI-2-3-60B** S of Rk 25-6	n/a		n/a						
RWCU Pump Suct	PSIG	**PI-12-114** Rk 25-2	n/a		n/a						
(RWCU) 'A' Pump Brg Clr Out	F	**TIS-12-89A** Rk 25-2	n/a		n/a						
(RWCU) 'B' Pump Brg Clr Out	F	**TIS-12-89B** Rk 25-2	n/a		n/a						
RWCU Pump Disch	PSIG	**PI-12-87** Rk 25-2	n/a		n/a						
Regen HX Out	PSIG	**PI-12-95** Rk 25-2	n/a		n/a						
Non-Regen HX Out	PSIG	**PI-12-96** Rk 25-2	n/a		n/a						
Non-Regen HX Out	F	**TIS-12-99** Rk 25-2	n/a		n/a						
NRHX (RBCCW) Out	F	**TC-104-5** Rk 25-2	n/a		n/a						
RWCU Demin Inlet	F	**TIS-12-115** Rk 25-2	n/a		n/a						
(RWCU) Demin Effluent	PSIG	**PI-12-113** Rk 25-2	n/a		n/a						

1593 MWth Data Recorded by: ______________ / ______ Reviewed by: ______________ / ______
1673 MWth Data Recorded by: ______________ / ______ Reviewed by: ______________ / ______
1752 MWth Data Recorded by: ______________ / ______ Reviewed by: ______________ / ______
1832 MWth Data Recorded by: ______________ / ______ Reviewed by: ______________ / ______
1912 MWth Data Recorded by: ______________ / ______ Reviewed by: ______________ / ______

R*TIME (DO NOT EDIT!)	erfis:0:BOPM002	erfis:0:T032	erfis:0:3DMA009	erfis:0:C009	erfis:0:B023	erfis:0:B024	erfis:0:B017	erfis:0:B018	erfis:0:C039	erfis:0:B054	erfis:0:B055	erfis:0:BOP014
Point ID	BOPM002	T032	3DMA009	C009	B023	B024	B017	B018	C039	B054	B055	BOP014
Point Description	SJAE OFF GAS ACT 1AV	SJAE STEAM FLOW	RWCU SYSTEM FLOW	RWCU FLOW	RWCU SYSTEM INLET TEMP	RWCU SYSTEM OUTLET TEMP	RWCU DEMIN FLOW A	RWCU DEMIN FLOW B	RWCU INLET TEMP RATE OF CHANGE	RWCU RECIRC PUMP FLOW	RWCU REGEN HX OUTLET	RWCU LOOP THERMAL POWER
Engineering Units		LB/HR	GPM	MLB/HR	DEG F	DEG F	M#/HR	M#/HR	F/HR	GPM	DEG F	
2/01/06 11:21:00	4.81	10657.03	64.74	0.06	510.82	445.27	0.03	0.03	0.01	154.49	184.35	1.43
2/01/06 11:22:00	4.89	10667.19	64.80	0.06	510.74	445.27	0.03	0.03	-0.19	154.49	184.16	1.43
2/01/06 11:23:00	4.85	10659.38	64.92	0.07	510.63	445.15	0.03	0.03	-0.12	154.49	184.21	1.44
2/01/06 11:24:00	4.87	10647.65	64.96	0.06	510.71	445.23	0.03	0.03	-0.99	154.49	184.45	1.43
2/01/06 11:25:00	4.85	10661.72	64.83	0.06	510.98	445.19	0.03	0.03	-0.94	154.49	184.12	1.43
2/01/06 11:26:00	4.94	10688.28	64.99	0.07	510.90	445.27	0.03	0.03	-0.77	154.49	184.64	1.44
2/01/06 11:27:00	4.88	10648.44	64.76	0.06	510.78	445.23	0.03	0.03	-0.38	154.49	184.16	1.43
2/01/06 11:28:00	4.89	10633.59	64.83	0.07	510.90	445.19	0.03	0.03	-0.18	154.49	184.16	1.44
2/01/06 11:29:00	4.85	10644.53	64.79	0.06	510.82	445.19	0.03	0.03	0.40	154.49	184.16	1.43
2/01/06 11:30:00	4.84	10619.53	64.89	0.06	510.86	445.23	0.03	0.03	0.73	154.49	184.21	1.43
2/01/06 11:31:00	4.85	10654.68	64.94	0.07	510.94	445.47	0.03	0.03	0.62	154.49	184.45	1.44
2/01/06 11:32:00	4.93	10631.25	64.78	0.06	510.75	445.27	0.03	0.03	0.68	154.49	184.26	1.43
2/01/06 11:33:00	4.88	10674.21	65.02	0.06	510.78	445.31	0.03	0.03	0.44	154.49	184.16	1.43
2/01/06 11:34:00	4.80	10640.62	65.03	0.07	510.86	445.23	0.03	0.03	0.00	154.49	184.49	1.43
2/01/06 11:35:00	4.95	10658.59	64.94	0.06	510.63	444.99	0.03	0.03	-0.58	154.49	184.16	1.43
2/01/06 11:36:00	4.87	10647.65	64.77	0.07	510.82	445.11	0.03	0.03	-0.58	154.49	184.26	1.44
2/01/06 11:37:00	4.83	10664.06	64.95	0.06	510.90	445.11	0.03	0.03	-0.65	154.49	184.16	1.43
2/01/06 11:38:00	4.82	10677.34	64.91	0.06	510.78	445.15	0.03	0.03	-0.53	154.49	184.07	1.43
2/01/06 11:39:00	4.87	10628.90	64.70	0.06	510.86	445.15	0.03	0.03	-0.25	154.49	184.21	1.43
2/01/06 11:40:00	4.87	10685.15	64.88	0.06	510.94	445.23	0.03	0.03	-0.08	154.49	184.17	1.43
2/01/06 11:41:00	4.85	10629.69	64.84	0.07	510.82	445.19	0.03	0.03	0.16	154.49	184.26	1.44
2/01/06 11:42:00	4.87	10678.91	64.74	0.06	510.86	445.23	0.03	0.03	0.51	154.49	184.21	1.43
2/01/06 11:43:00	4.80	10653.91	64.83	0.06	510.82	445.11	0.03	0.03	0.07	154.49	184.16	1.43
2/01/06 11:44:00	4.90	10667.97	64.81	0.06	510.86	445.31	0.03	0.03	0.07	154.49	184.54	1.43
2/01/06 11:45:00	4.84	10670.31	64.88	0.06	510.98	445.27	0.03	0.03	0.00	154.49	184.12	1.44
2/01/06 11:46:00	4.88	10654.68	64.94	0.06	510.98	445.19	0.03	0.03	-0.02	154.49	184.21	1.43
2/01/06 11:47:00	4.91	10655.47	64.88	0.06	511.17	445.15	0.03	0.03	0.16	154.49	184.40	1.44
2/01/06 11:48:00	4.85	10657.03	64.87	0.06	510.90	445.27	0.03	0.03	0.31	154.49	184.36	1.43
2/01/06 11:49:00	4.85	10652.34	64.92	0.07	511.05	445.27	0.03	0.03	0.46	154.49	184.21	1.43

2/01/06 11:50:00	4.86	10636.72	64.87	0.06	511.06	445.35	0.03	0.03	0.55	154.49	184.07	1.44
2/01/06 11:51:00	4.89	10643.75	64.86	0.07	510.75	445.27	0.03	0.03	0.80	154.49	184.26	1.43
2/01/06 11:52:00	4.76	10660.94	64.76	0.06	510.86	445.23	0.03	0.03	0.74	154.49	184.26	1.44
2/01/06 11:53:00	4.91	10653.91	64.80	0.07	510.82	445.27	0.03	0.03	0.28	154.49	184.26	1.44
2/01/06 11:54:00	4.95	10667.97	64.98	0.06	510.94	445.15	0.03	0.03	0.10	154.49	184.16	1.43
2/01/06 11:55:00	4.77	10671.09	64.87	0.06	510.78	445.23	0.03	0.03	-0.22	154.49	183.98	1.43
2/01/06 11:56:00	4.89	10690.63	64.96	0.06	510.78	445.23	0.03	0.03	-0.22	154.49	184.40	1.43
2/01/06 11:57:00	4.88	10649.22	64.85	0.06	510.59	445.11	0.03	0.03	0.16	154.49	184.21	1.43
2/01/06 11:58:00	4.79	10644.53	64.93	0.06	510.90	445.27	0.03	0.03	0.09	154.49	184.12	1.43
2/01/06 11:59:00	4.89	10642.97	64.64	0.06	510.94	445.23	0.03	0.03	0.00	154.49	184.21	1.43
2/01/06 12:00:00	4.79	10657.81	64.82	0.06	510.71	445.31	0.03	0.03	0.03	154.49	184.17	1.43
2/01/06 12:01:00	4.88	10645.31	64.91	0.06	511.09	445.23	0.03	0.03	0.24	154.49	184.16	1.43
2/01/06 12:02:00	4.88	10668.75	64.88	0.06	510.82	445.11	0.03	0.03	0.10	154.49	184.17	1.43
2/01/06 12:03:00	4.77	10663.28	64.76	0.06	511.01	445.23	0.03	0.03	-0.29	154.49	184.21	1.43
2/01/06 12:04:00	4.75	10649.22	64.79	0.06	510.90	445.27	0.03	0.03	-0.17	154.49	184.07	1.43
2/01/06 12:05:00	4.90	10628.90	64.90	0.06	510.86	445.31	0.03	0.03	-0.07	154.49	184.17	1.44
2/01/06 12:06:00	4.86	10642.97	64.84	0.07	510.94	445.39	0.03	0.03	-0.07	154.49	184.21	1.44
2/01/06 12:07:00	4.85	10665.62	64.93	0.06	510.67	445.19	0.03	0.03	0.30	154.49	184.12	1.44
2/01/06 12:08:00	4.83	10670.31	64.74	0.06	510.97	445.27	0.03	0.03	0.23	154.49	184.21	1.43
2/01/06 12:09:00	4.79	10650.78	64.87	0.06	511.09	445.31	0.03	0.03	0.33	154.49	184.02	1.43
2/01/06 12:10:00	4.86	10633.59	64.94	0.06	510.82	445.43	0.03	0.03	0.27	154.49	183.98	1.44
2/01/06 12:11:00	4.79	10642.97	64.94	0.06	510.90	445.19	0.03	0.03	0.18	154.49	184.07	1.43
2/01/06 12:12:00	4.87	10696.87	64.79	0.06	510.94	445.23	0.03	0.03	0.06	154.49	184.12	1.43
2/01/06 12:13:00	4.81	10671.09	64.87	0.06	510.78	445.15	0.03	0.03	-0.25	154.49	183.98	1.43
2/01/06 12:14:00	4.81	10658.59	64.80	0.06	510.98	445.35	0.03	0.03	-0.20	154.49	183.98	1.44
2/01/06 12:15:00	4.82	10642.19	64.87	0.07	510.94	445.31	0.03	0.03	0.04	154.49	184.26	1.44
2/01/06 12:16:00	4.80	10667.97	64.88	0.06	510.67	445.19	0.03	0.03	0.07	154.49	184.45	1.43
2/01/06 12:17:00	4.87	10636.72	64.87	0.06	511.13	445.27	0.03	0.03	0.09	154.49	184.16	1.43
2/01/06 12:18:00	4.80	10667.97	64.91	0.06	510.82	445.27	0.03	0.03	-0.18	154.49	184.26	1.43
2/01/06 12:19:00	4.80	10643.75	65.06	0.06	510.82	445.19	0.03	0.03	-0.09	154.49	184.16	1.43
2/01/06 12:20:00	4.82	10650.00	64.93	0.06	510.94	445.31	0.03	0.03	0.07	154.49	184.03	1.44
2/01/06 12:21:00	4.91	10666.41	64.84	0.06	510.86	445.23	0.03	0.03	0.07	154.49	184.17	1.43

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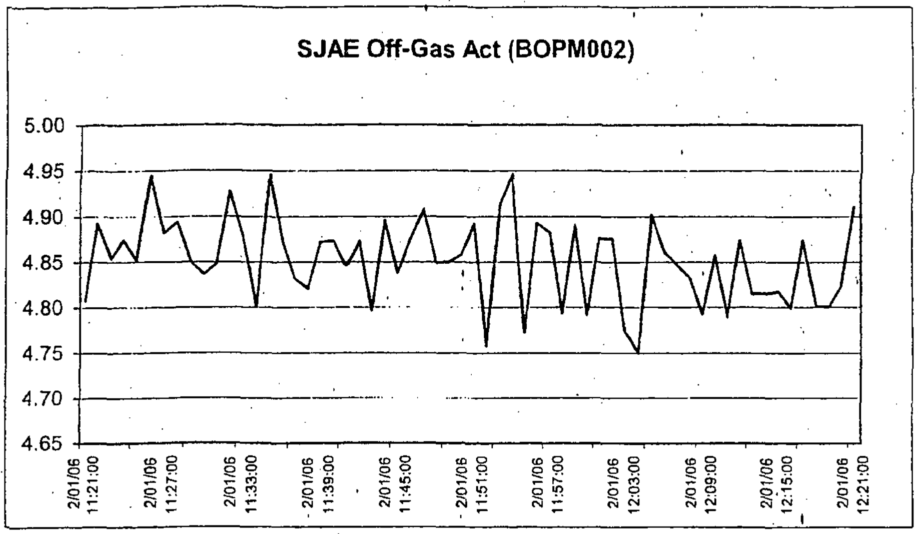
Highlight Cell A1
R*Time
Archive Date
Parameters
(4037 for 14 days @ 1200)



SJAE Off-Gas Act (BOPM002)
5.00
4.95
4.90
4.85
4.80
4.75
4.70
4.65
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
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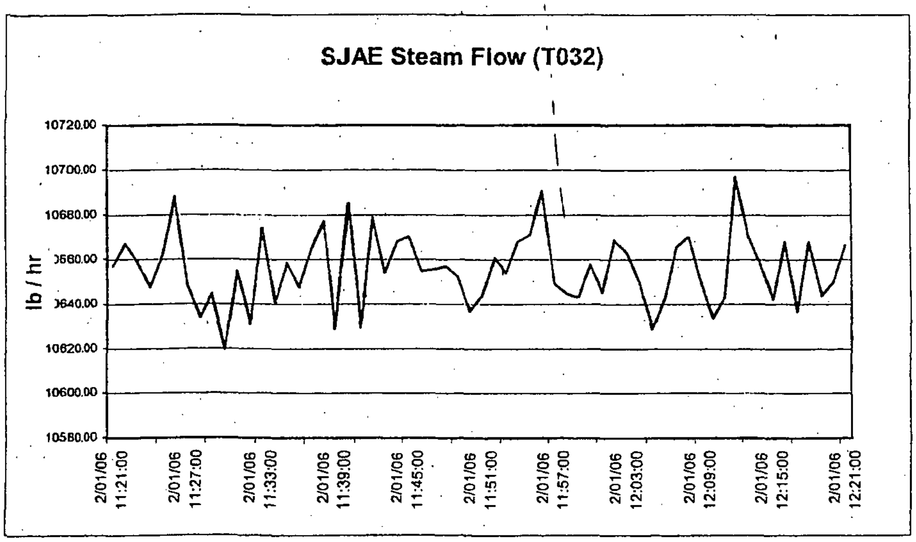
2/01/06 12:21:00



SJAE Steam Flow (T032)
10720.00
10700.00
10680.00
10620.00
10600.00
10580.00
lb / hr
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
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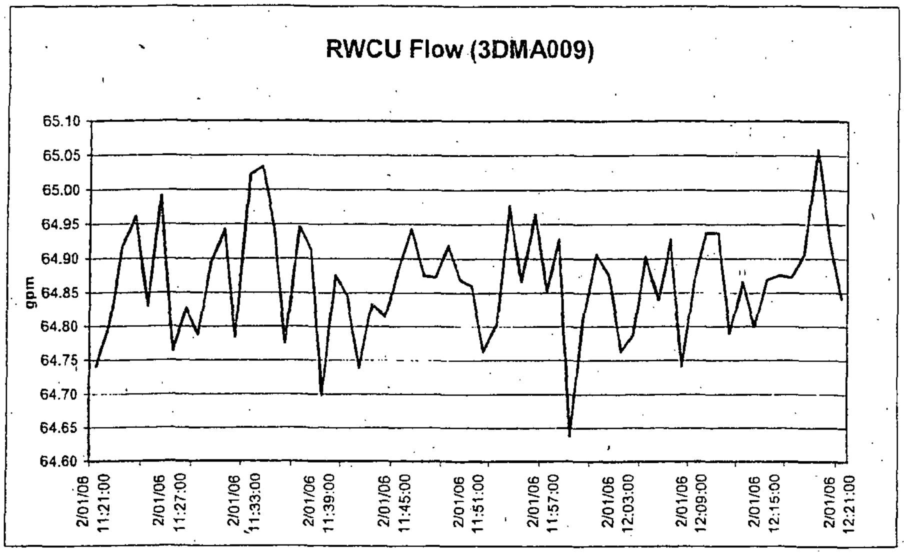
2/01/06 12:21:00


RWCU Flow (3DMA009)
gpm
65.10
65.05
65.00
64.95
64.90
64.85
64.80
64.75
64.70
64.65
64.60
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
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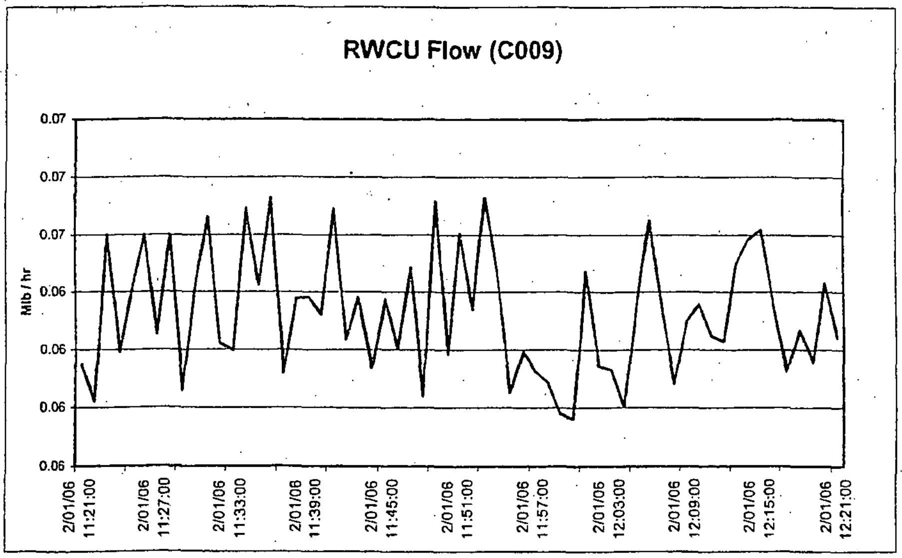
2/01/06 12:21:00


RWCU Flow (C009)
Mlb / hr
0.07
0.07
0.07
0.06
0.06
0.06
0.06
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
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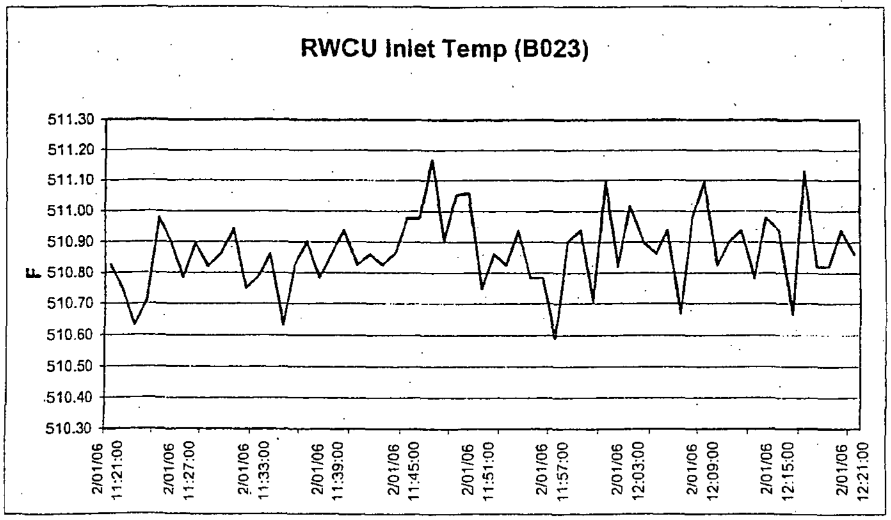
2/01/06 12:21:00


RWCU Inlet Temp (B023)
F
511.30
511.20
511.10
511.00
510.90
510.80
510.70
510.60
510.50
510.40
510.30
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
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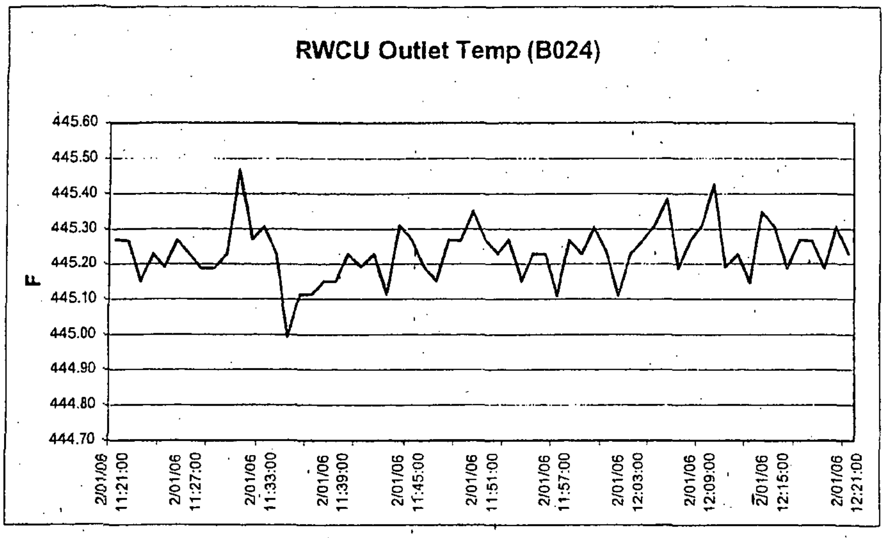
2/01/06 12:15:00
2/01/06 12:21:00


RWCU Outlet Temp (B024)
F
445.60
445.50
445.40
445.30
445.20
445.10
445.00
444.90
444.80
444.70
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
2/01/06 11:57:00
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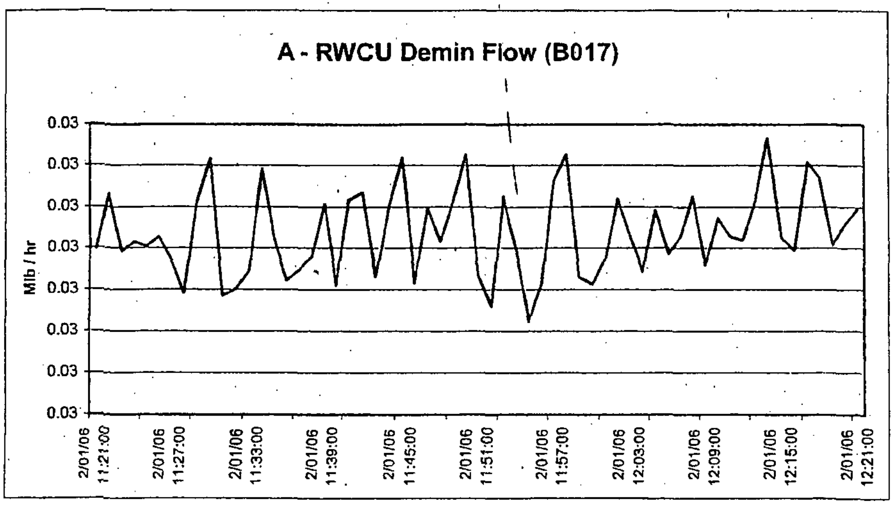
2/01/06 12:15:00
2/01/06 12:21:00


A - RWCU Demin Flow (B017)
Mlb / hr
0.03
0.03
0.03
0.03
0.03
0.03
0.03
0.03
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
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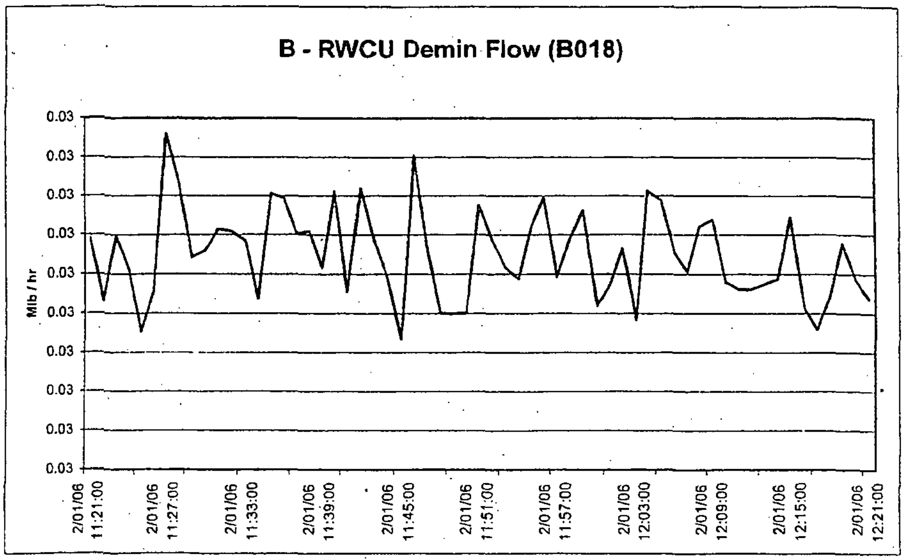
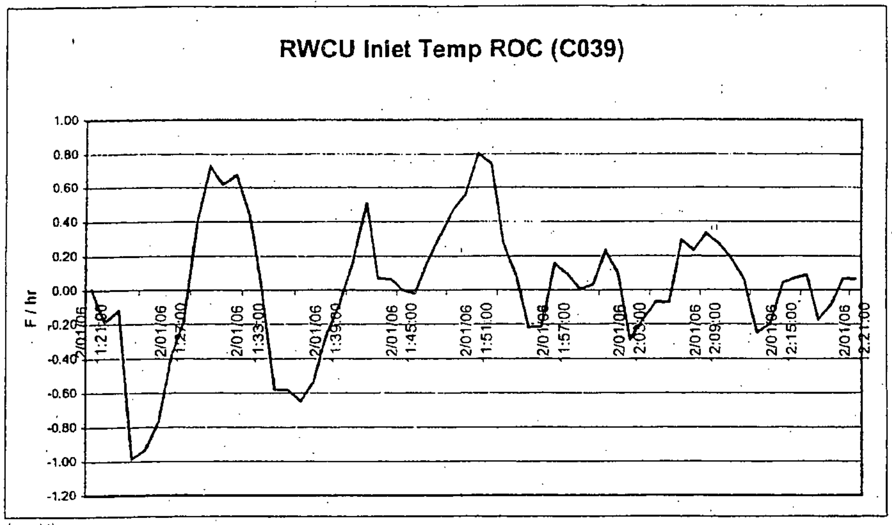
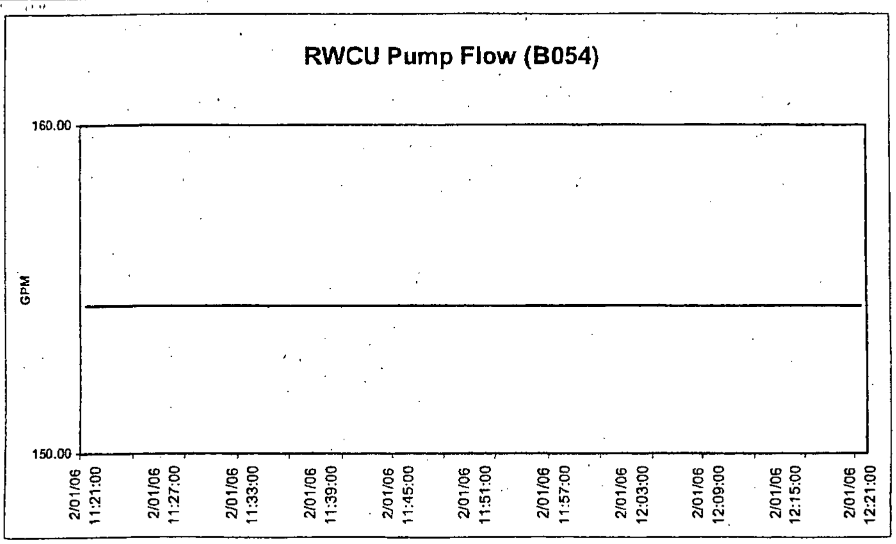
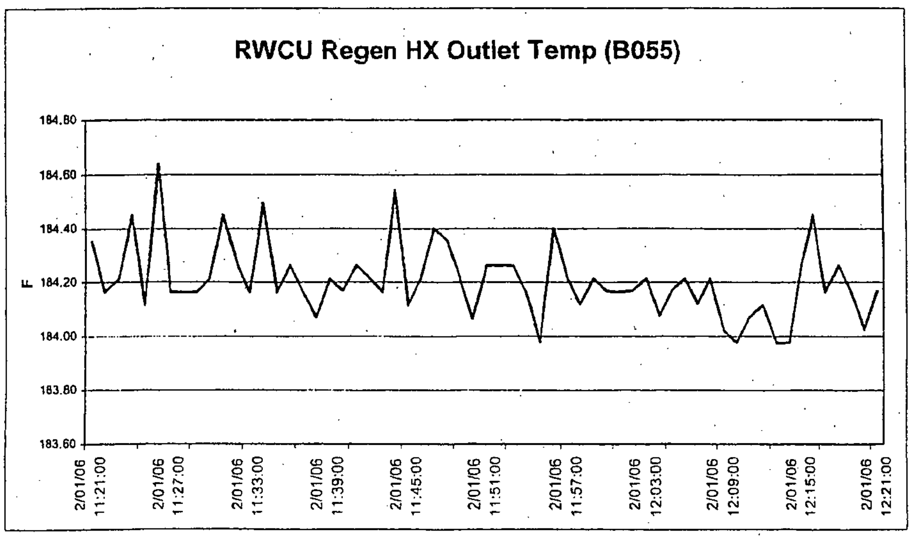
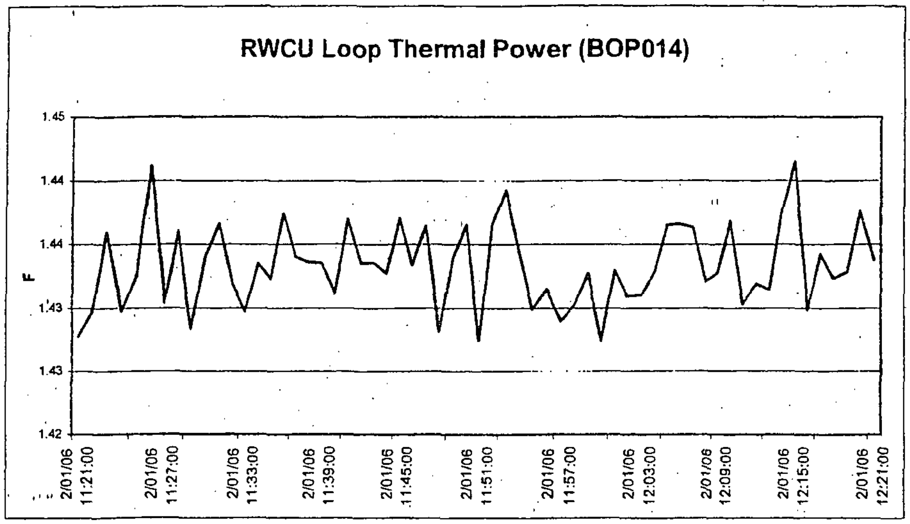
2/01/06 12:21:00


B - RWCU Demin Flow (B018)
Mlb / hr
0.03
0.03
0.03
0.03
0.03
0.03
0.03
0.03
0.03
0.03
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
2/01/06 11:57:00
2/01/06 12:03:00
2/01/06 12:09:00
2/01/06 12:15:00
2/01/06 12:21:00


RWCU Inlet Temp ROC (C039)
F / hr
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-1.20
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
2/01/06 11:57:00
2/01/06 12:03:00
2/01/06 12:09:00
2/01/06 12:15:00
2/01/06 12:21:00


RWCU Pump Flow (B054)
GPM
160.00
150.00
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
2/01/06 11:57:00
2/01/06 12:03:00
2/01/06 12:09:00
2/01/06 12:15:00
2/01/06 12:21:00


RWCU Regen HX Outlet Temp (B055)
F
184.80
184.60
184.40
184.20
184.00
183.80
183.60
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
2/01/06 11:57:00
2/01/06 12:03:00
2/01/06 12:09:00
2/01/06 12:15:00
2/01/06 12:21:00



RWCU Loop Thermal Power (BOP014)
1.45
1.44
1.44
1.43
1.43
1.42
F
2/01/06 11:21:00
2/01/06 11:27:00
2/01/06 11:33:00
2/01/06 11:39:00
2/01/06 11:45:00
2/01/06 11:51:00
2/01/06 11:57:00
2/01/06 12:03:00
2/01/06 12:09:00
2/01/06 12:15:00
2/01/06 12:21:00

VYNPS EPU Power Ascension Testing

Feedwater Control System Monitoring Plan

(2 pages)

John Stasolla, Sr. Engineer
System Engineering

EPU Steady-State Nominal Operating Conditions

ERFIS PTID	Plant Parameter [Units]	Steady-State Nominal	CLTP [%] 100.0 / EPU [%] 83.3	CLTP [%] 100.0 / EPU [%] 83.3	CLTP [%] 102.5 / EPU [%] 85.4	CLTP [%] 105.0 / EPU [%] 87.5	CLTP [%] 107.5 / EPU [%] 89.6	CLTP [%] 110.0 / EPU [%] 91.6	CLTP [%] 112.5 / EPU [%] 93.7	CLTP [%] 115.0 / EPU [%] 95.8	CLTP [%] 117.5 / EPU [%] 97.9	CLTP [%] 120.0 / EPU [%] 100.0
[illegible]	Core Power Level (MWth)	Predicted	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Actual	[illegible]	[illegible]	[illegible]	>> ALERT <<	>> ALERT <<	[illegible]	[illegible]	>> ALERT <<	>> ALERT <<	>> ALERT <<
[illegible]	APRM Power Level (%)	Predicted	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Actual	[illegible]	[illegible]	>> ALERT <<	>> ALERT <<	>> ALERT <<	[illegible]	[illegible]	>> ALERT <<	>> ALERT <<	[illegible]
C000	Total Steam Flow [Mlbs/hr] *(baseline)*	Predicted	6.458	6.458	6.639	6.820	7.001	7.182	7.363	7.544	7.725	7.906
		Actual	6.475	6.475	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B065 B066	Loop B/C Steam Flow [Mlbs/hr] *(baseline / 4)*	Predicted	1.615	1.615	1.660	1.705	1.750	1.796	1.841	1.886	1.931	1.977
		Actual	1.615	1.615	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B064 B067	Loop A/D Steam Flow [Mlbs/hr] *(baseline / 4) * 1.047*	Predicted	1.690	1.690	1.738	1.785	1.833	1.880	1.927	1.975	2.022	2.069
		Actual	1.699	1.699	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
C001	Total Feed Flow [Mlbs/hr] *(baseline)*	Predicted	6.430	6.430	6.611	6.792	6.973	7.154	7.335	7.516	7.697	7.878
		Actual	6.448	6.448	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B015	Loop A Feed Flow [Mlbs/hr] *(baseline / 2) * 1.0152*	Predicted	3.264	3.264	3.356	3.448	3.539	3.631	3.723	3.815	3.907	3.999
		Actual	3.264	3.264	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B016	Loop B Feed Flow [Mlbs/hr] *(baseline / 2) * 0.991*	Predicted	3.186	3.186	3.276	3.365	3.455	3.545	3.634	3.724	3.814	3.904
		Actual	3.185	3.185	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B050	"A" Feed (Valve) Demand [%] *(3 feed pump baseline)*	Predicted	48.50	42.00	45.25	48.50	51.75	~~55.00~~	58.25	61.50	64.75	68.00
		Actual	48.48	>> ALERT <<	>> ALERT <<	48.48	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B061	"B" Feed (Valve) Demand [%] *(3 feed pump baseline)*	Predicted	48.50	42.00	45.25	48.50	51.75	55.00	58.25	61.50	64.75	68.00
		Actual	48.51	>> ALERT <<	>> ALERT <<	48.51	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B062	FRV "A" Stem Position [%] *(3 feed pump baseline)*	Predicted	48.50	42.00	45.25	48.50	51.75	55.00	58.25	61.50	64.75	68.00
		Actual	47.83	>> ALERT <<	>> ALERT <<	47.83	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<
B063	FRV "B" Stem Position [%] *(3 feed pump baseline)*	Predicted	48.50	42.00	45.25	48.50	51.75	55.00	58.25	61.50	64.75	68.00
		Actual	47.50	>> ALERT <<	>> ALERT <<	47.50	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<	>> ALERT <<

*** ALL PREDICTED DATA ASSUMES LINEAR EXTRAPOLATION BETWEEN 1593 AND 1912 ***

1673 MWth (87.5% EPU)
_______________ Data Recorded By / Date
_______________ Data Reviewed By / Date

1752 MWth (91.6% EPU)
_______________ Data Recorded By / Date
_______________ Data Reviewed By / Date

1832 MWth (95.8% EPU)
_______________ Data Recorded By / Date
_______________ Data Reviewed By / Date

1912 MWth (100.0% EPU)
_______________ Data Recorded By / Date
_______________ Data Reviewed By / Date

ENN-DC-159	ENN System Monitoring Procedure	Performance Goals/Indicator:	Drawings and Procedures
System Name:	Feedwater Flow Control System	as per System Health Reporting	5920-204
System Code:	FWC		OP 2172
System Engineer:	Stasolla		OT 3113
This Revision Is:	1.0 dtd 01/27/06		OT 3114
Date Approved:	Rev 1 PENDING (Rev O.1 was June 2004)		OP 4172
System is:	NNS, CDF-risk significant, single-failure vulnerable, RTG		OP 5353

System Functions:		
	MR-1	Provide the necessary instrumentation and controls to maintain a pre-established water level in the reactor vessel dueng planned operation
	MR-2	Provide for both automatic and manual control of the system
	MR-3	Provide the necessary instrumentation inputs for Thermal Power calculations
	MR-4	Provide an essentially leak free reactor coolant pressure boundary for directly interfacing instrumentation
	MR-5	Provide the necessary controls to interlock with recirculation flow control (RR) system

Equipment Name	Equipment No./ID	Critical	Parameter	Instrument	M/T	Freq	Acceptance Bands (Note 1)	Source	Reason or other Info (Note 2)
SYSTEM	System	No	MRule Unavailability	N/A	T	M	0.84% / 3-year period	MRule	Scoping Basis
SYSTEM	System	No	MRule Reliability	N/A	T	M	3 MRFFs / 3-year period	MRule	Scoping Basis
STEAM FLOW ?P TRANSMITTERS; LOOPS A THROUGH D	FT-6-51A thru 51D	Yes	Steam Flow Detector ?P; Loops A thru D	ERFIS B022, B064-B067	M/T	D/W	[CLTP: ~ 1.620 Mlbs/hr @ 100%] [EPU: ~ 1.980 Mlbs/hr @ 100%]	ERFIS	Can be Trended via PSS; proportional to CTP
STEAM FLOW AMPLIFIERS / SQUARE ROOT EXTRACTORS; LOOPS A THROUGH D	FTA-6-73A thru 73D	Yes	Steam Flow; Loops A thru D	ERFIS B022 B064-B067	M/T	D/W	[CLTP: ~ 1.620 Mlbs/hr @ 100%] [EPU: ~ 1.980 Mlbs/hr @ 100%]	ERFIS	Can be Trended via PSS; proportional to CTP
TOTAL STEAM FLOW SUMMER	FSUM-6-75	Yes	Total Steam Flow	ERFIS B022; C000	M/T	D/W	[CLTP: ~ 6.460 Mlbs/hr @ 100%] [EPU: ~ 7.910 Mlbs/hr @ 100%]	ERFIS	Can be Trended via PSS; proportional to CTP
FEED FLOW ?P TRANSMITTERS; LOOPS A AND B	FT-6-50A / 50B	Yes	Feed Flow Detector ?P; Loops A and B	ERFIS B015, B016	M/T	D/W	[CLTP: ~ 3.210 Mlbs/hr @ 100%] [EPU: ~ 3.940 Mlbs/hr @ 100%]	ERFIS	Can be Trended via PSS; proportional to CTP
FEEDWATER FLOW AMPLIFIERS / SQUARE ROOT EXTRACTORS; LOOPS A AND B	FTA-6-110A / 110B	Yes	Feed Flow; Loops A and B	ERFIS B015, B016	M/T	D/W	[CLTP: ~ 3.210 Mlbs/hr @ 100%] [EPU: ~ 3.940 Mlbs/hr @ 100%]	ERFIS	Can be Trended via PSS; proportional to CTP. Also via Crossflow.
TOTAL FEEDWATER FLOW SUMMER	FPAM-6-103	Yes	Total Feed Flow	ERFIS C001	M/T	D/W	[CLTP: ~ 6.430 Mlbs/hr @ 100%] [EPU: ~ 7.880 Mlbs/hr @ 100%]	ERFIS	Can be Trended via PSS; proportional to CTP
STEAM FLOW – FEED FLOW ERROR AMPLIFIER	FPAM-6-74	Yes	Steam Flow / Feed Flow Mismatch	ERFIS B022, C001; C127	M/T	D/W	internal	ERFIS	Can be Trended via PSS
VESSEL WATER LEVEL ?P TRANSMITTERS; CHANNELS A AND B	LT-6-52A / 52B	Yes	Level Detector ?P; Channels A and B	ERFIS B041, B042	M/T	D/W	155 - 165 inches	ERFIS	Can be Trended via PSS; dependent upon plant mode
3-ELEMENT ERROR AMPLIFIER	FPAM-6-104	Yes	Level Dominant – Flow Sensitive Control Signal Input	ERFIS B060, B061	M/T	D/W	Internal	ERFIS	Can be Trended via PSS
MASTER WATER LEVEL CONTROLLER	LC-6-83	Yes	Master Feed Flow Demand	ERFIS B060, B061	M/T	D/W	Internal	ERFIS	Can be Trended via PSS
INDIVIDUAL WATER LEVEL CONTROLLERS; LOOPS A AND B	RMC-6-84A / 84B	Yes	Demand to Individual Positioners; Loops A and B	ERFIS B060, B061	M/T	D/W	[CLTP: ~ 47% @ 100% (2 pumps) ~ 42% @ 100% (3 pumps)] [EPU: ~ 68% @ 100% (3 pumps)]	ERFIS	Can be Trended via PSS
FRV POSITIONERS; LOOPS A AND B	I/P-6-12A / 12B	Yes	Actual Valve Stem Position; FRV-A and FRV-B	ERFIS B062, B063	M/T	D/W	[CLTP: ~ 47% @ 100% (2 pumps) ~ 42% @ 100% (3 pumps)] [EPU: ~ 68% @ 100% (3 pumps)]	ERFIS	Can be Trended via PSS

Note 1: Alert Level = Greater than Expected (> ~ 5%) Deviation from nominal @ 100% CTP; Action = Investigate Cause and/or Increase Monitoring
Action Level = Surveillance Requirements; Action = Initiate CR

Note 2: Process trending found in \\vyshared1\departments\System Engineering\System Performance Monitoring\Stasolla

Note 3: Supplemental Monitoring for EPU Power Ascension found in \\vyshared1\departments\System Engineeing\System Performance Monitoring\Stasolla\EPU_Power Ascension.xls

VYNPS EPU Power Ascension Testing

Nuclear Boiler System Monitoring Plan

(2 pages)

Equipment Name	Equipment No./ID	Parameter	Para ID	Source	Freq	Alert and Action Level	Action Level	Actions Required	Reason or other info	1593 MwTh	1673 MwTh	1752 MwTh	1832 MwTh	1912 MwTh
Recirc MG Set	MG-1-1A/B	MG Set Motor and Generator Winding Temperatures	S000,S001 S002,S003 S004,S005 S006,S007	ERFIS	Recorded continuously / incorporate data into xls and graph	Motor Alarms at 220F, Gen alarms at 240F	Level 4	Evaluate	High temp degrades insulation					
Recirc MG Set	MG-1-1A/B	MG Set Motor and Generator Bearing Temperatures	S035-S050	ERFIS	Recorded continuously / incorporate data into xls and graph	Alarms at 160F	Level 4	Evaluate	High temp indicates bearing degradation					
Recirc MG Set	MG-1-1A/B	Vibration	N/A	AP-0211	Recorded continuously / incorporate data into xls and graph	Compare to baseline	Level 4	Evaluate						
Recirc MG Set	MG-1-1A/B	Thermography	N/A	AP-0211	Baselined @ 1593 MWth, Recorded Continuously, Incorporate Data into DB	Compare to baseline	Level 4	Evaluate						
Recirc Pump Motors	P-18-1A/B	Vibration	N/A	AP-0211	Recorded continuously / incorporate data into xls and graph	Per DP-0211	Level 4	Evaluate						
Recirc Pump Motors	P-18-1A/B	Winding Temperature	N/A	ERFIS	Recorded continuously / incorporate data into xls and graph	216F	Level 4	Evaluate						
Recirc Pump Motors	P-18-1A/B	Bearing Temperature	N/A	ERFIS	Baselined @ 1593 MWth, Recorded Continuously, Incorporate Data into DB	160F	Level 4	Evaluate						
Recirc Pumps	P-18-1A/B	Seal Stage Pressures	N/A	TM-2003-023	Recorded continuously / incorporate data into xls and graph	Deviation	Level 4	Evaluate						
Recirc Pumps	P-18-1A/B	Seal Stage Temperatures	N/A	ERFIS	Recorded continuously / incorporate data into xls and graph	160F	Level 4	Evaluate						

Jet Pumps	A-K, L-W	Pump dP	N/A	OP-4110	Daily	Per Procedure	Level 4	Evaluate						
Jet Pumps	A-K, L-W	M-ratio	N/A	This is Proposed add to OP-4110	Daily	Per Procedure	Level 4	Evaluate	OE 17950 - The M-ratio of a jet pump is its suction flow divided by its drive flow.					
SRVs		Tailpipe Temp	Tailpipe Baseline Dt	ERFIS	Continuous	Per OP-2122	Level 4	Evaluate / repair / rebaseline						
Pressure Boundary		Drywell Unidentified Leakage	N/A	OP 4152	Daily (recorded 4 times daily)	Per tech spec	Level 4	Per tech spec						
Steam Dryer		Moisture Carryover	N/A	Sample	Per STP	Attach 4	Level 2							
Steam Dryer		Dryer Failure	Numerous	ERFIS	ON 3178	Change from baseline	Level 4	Investigate	GE SIL 644 Supp 1					
AOG Recomb O2	CP-HWC-5	O2% ≥10% to <15%		OP 0150	OP 2199	Change from baseline	Level 4	Evaluate						

1673 MwTh Data Recorded By:__________ Date: __________
1673 MwTh Data Reviewed By:__________ Date: __________

1752 MwTh Data Recorded By:__________ Date: __________
1752 MwTh Data Reviewed By:__________ Date: __________

1832 MwTh Data Recorded By:__________ Date: __________
1832 MwTh Data Reviewed By:__________ Date: __________

1912 MwTh Data Recorded By:__________ Date: __________
1912 MwTh Data Reviewed By:__________ Date: __________

VYNPS EPU Power Ascension Testing

HVAC System Monitoring Plan

(2 pages)

Previously Monitored	Equipment No.	Parameter	Alarm Values/Limits	Level	1593 MWTh 3-FDW Pmp (83.32%)	Increased Power Level Evaluation Points				Source
						1673 MWth (87.48%)	1752 MWth (91.65%)	1832 MWth (95.8%)	1912 MWth (100%)	
X	2 Computer Points	DW Average Temp elevation 250'	< 135 °F	4						VYOPF 4115.05
X	10 Computer Points	DW Average Temp below elevation 270'	< 150 °F	4						VYOPF 4115.05
X	6 Computer Points	DW Average Temp elevation 270' to 315'	< 185 °F	4						VYOPF 4115.05
X	4 Computer Points	DW Average Temp above elevation 315'	< 270 °F	4						VYOPF 4115.05
X	MN STM TE-2-126A	Steam Tunnel Temp	< 160 °F	4						VM-12-1 CRP 9-21
X	HPCI TE-23-105A	HPCI Steam Tunnel Temp	< 175 °F	4						VM-12-1 CRP 9-21
X	HPCI TE-23-105B	HPCI Steam Tunnel Temp	< 175 °F	4						VM-12-1 CRP 9-21
X	RCIC TE-13-77A	RCIC Steam Tunnel Temp	< 175 °F	4						VM-12-1 CRP 9-21
X	RCIC TE-13-77B	RCIC Steam Tunnel Temp	< 175 °F	4						VM-12-1 CRP 9-21
	TB Rm B-6	Feed Pumps Room average temp	< 105 °F	4						Hand Held Thermometer
	TB Rm B-3	Cond Pumps Room average temp	< 105 °F	4						Hand Held Thermometer

Previously Monitored	**Equipment No.**	**Parameter**	**Alarm Values/Limits**	**Level**	**1593 MWTh 3-FDW Pmp (83.32%)**	**Increased Power Level Evaluation Points**				**Source**
						1673 MWth (87.48%)	**1752 MWth (91.65%)**	**1832 MWth (95.8%)**	**1912 MWth (100%)**	

1593 MWth Data Recorded By: ____________ Date: ____________
1593 MWth Data Reviewed By: ____________ Date: ____________

1673 MWth Data Recorded By: ____________ Date: ____________
1673 MWth Data Reviewed By: ____________ Date: ____________

1752 MWth Data Recorded By: ____________ Date: ____________
1752 MWth Data Reviewed By: ____________ Date: ____________

1832 MWth Data Recorded By: ____________ Date: ____________
1832 MWth Data Reviewed By: ____________ Date: ____________

1912 MWth Data Recorded By: ____________ Date: ____________
1912 MWth Data Reviewed By: ____________ Date: ____________

VYNPS EPU Power Ascension Testing

Motors Monitoring Plan

(25 pages)

Entergy Nuclear - Vermont Yankee
Power Uprate Power Accention Testing Performance Monitoring Plan

Component Engineer: Chris Kowal
Component Engineer: Ron Schermen

Power level

Functional Group: Feedwater Pump Motors (P-1s)							1593	1633	1673	1712	1752	1792	1832	1872	1912
							83.20%	85.40%	87.48%	89.56%	91.65%	93.73%	95.81%	97.90%	100%
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		Initial/Date	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
Visual Inspection (VIS)	Engineer	Each Power level hold point	CE, SE	Evaluate	Evaluate motor material condition, audible noise.										
Vibration Motor (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate motor material condition										
A Motor															
B Motor															
C Motor															
Vibration Pump (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate Pump material condition										
A Pump															
B Pump															
C Pump															
Thermography (Therm)	Thermography cameras	Each Power level hold point	CE	Hot spots <10 Deg c	Investigate cause of high temp										
Pump Bearing Temp, Driven	ERFIS Points	Each Power level hold point	CE	160<deg F [200<deg F EPU] 212 S/D											
A	W027														
A	W028														
B	W033														
B	W034														
C	W039														
C	W040														
Pump Bearing Temp, Opp.	ERFIS Points	Each Power level hold point	CE	160<deg F [200<deg F EPU] 212 S/D											
A	W029														
B	W035														
C	W041														
Motor Thrust Bearing (front) Temp (B-Temp)	ERFIS Points W031, W037, W043	Each Power level hold point	CE	180<deg F [200<deg F EPU] 212 S/D	Investigate cause of high temp										
A	W031														
B	W037														
C	W043														
Motor Guide bearing (Rear) Temp (B-Temp)	ERFIS Points W032, W038, W044	Each Power level hold point	CE	178<deg F [200<deg F EPU] 212 S/D	Investigate cause of high temp										
A	W032														
B	W038														
C	W044														
Winding Temps (W-Temp)	ERFIS Points E026, E027, E028	Each Power level hold point	CE	<83 DEG C norm [100 deg C EPU] 93.4 exp @EPU	Investigate cause of high temp										
A	E026														
B	E027														
C	E028														
Equipment Status (Equip. Status)	Engineering Judgement	Periodic	Motor CE		Evaluate motor material condition										
Comments															

Functional Group Condensate Pump Motors (P2s)

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		1593 83.26% Initial/Date	1633 85.40% Time: Date:	1673 87.48% Time: Date:	1712 89.56% Time: Date:	1752 91.65% Time: Date:	1792 93.73% Time: Date:	1832 95.81% Time: Date:	1872 97.90% Time: Date:	1912 100% Time: Date:
Visual Inspection (VIS)	Craft / Engineer	Each Power level hold point	CE,SE,	Evaluate	Evaluate motor material condition										
Vibration Motor (VIB)	AP 0211 CSI 2116, 2120	Each Power level hold point	CE		Evaluate motor material condition										
A															
B															
C															
Vibration Pump (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate Pump material condition										
A															
B															
C															
Thermography (Therm)	Thermography cameras	Each Power level hold point	CE	Hot spots <10 Deg c	Investigate cause of high temp										
Upper Bearing Temp (B-Temp)	ERFIS Points E067, E069, E071	Each Power level hold point	CE	172 (160) <Deg F [183 (170) EPU] 200 lim	Investigate cause of high temp										
A	E067														
B	E069														
C	E071														
Lower bearing Temp (B-Temp)	ERFIS Points E068,E070,E072	Each Power level hold point	CE	150 (190) Deg F [172 (201) EPU] 200 Lim	Investigate cause of high temp										
A	E068														
B	E070														
C	E072														
Winding Temps (W-Temp)	ERFIS Points E029,E030, E031	Each Power level hold point	CE	106 (100) <deg C [115 (95) EPU] 120 lim	Investigate cause of high temp										
A	E031														
B	E030														
C	E031														
Equipment Status (Equip. Status)	Engineering Judgement	Periodic	Motor CE.		Evaluate motor material condition										
Comments															

							[illegible]	1633	[illegible]	1712	1752	1792	1832	1872	1912	
							[illegible]	85.40%	87.48%	89.58%	91.65%	93.73%	95.81%	97.90%	100%	
							[illegible]	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	
Functional Group: Circ Water Pump Motors (R-58)																
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		[redacted]									
Upper Bearing Temp (B-Temp)	ERFIS Points W045, W047, W049	Last power level	CE		Investigate cause of high temp			[redacted]								
A	W045							[redacted]								
B	W047							[redacted]								
C	W049							[redacted]								
Lower bearing Temp (B-Temp)	ERFIS Points W046, W048, W050	Last power level	CE		Investigate cause of high temp			[redacted]								
A	W046							[redacted]								
B	W048							[redacted]								
C	W050							[redacted]								
Equipment Status (Equip. Status)	Engineering Judgement	Periodic	Motor CE		Evaluate motor material condition			[redacted]								
Comments																

1593	1633	1673	1712	1752	1792	1832	1872	1912
83.28%	85.40%	87.48%	89.56%	91.65%	93.73%	95.81%	97.90%	100%
[illegible]	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:

Functional Group: Circ Water Booster Pump Motors (P-6s) [illegible]

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response	
Visual Inspection (VIS)	Motor Engineer	Last power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition	
Upper Bearing Temp (B-Temp)	ERFIS Points W073, W075, W077	Last power level	CE	Run 176 <deg F Alarm 194 deg F S/D 210 deg F.	Investigate cause of high temp	
A	W073					
B	W075					
C	W077					
Lower bearing Temp (B-Temp)	ERFIS Points W074, W076, W078	Last power level	CE	Run 176 <deg F Alarm 194 deg F S/D 210 deg F.	Investigate cause of high temp	
A	W074					
B	W076					
C	W078					
Equipment Status (Equip. Status)	Engineering Judgement	Last power level	Motor CE		Evaluate motor material condition	
Comments						

[redacted]

							1593	1633	1673	1712	1752	1792	1832	1872	1912
							[illegible]	85.40%	[illegible]	89.56%	91.65%	93.73%	95.81%	97.90%	100%
							[illegible]	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
Functional Group: Service Water Pump Motors (R-7s)															
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response										
Visual Inspection (VIS)	SE,CE	Each Power level hold point	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition										
Vibration (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE	by others	Evaluate motor material condition										
A															
B															
C															
D															
Winding Temps (W-Temp)	ERFIS Points A: F070, F071, F072 B: F064, F065, F066 C: F067, F068, F069 D: F061, F062, F063	Each Power level hold point	CE	220 deg F	Investigate cause of high temp										
A	A: F070														
A	A: F071														
A	A:F072														
B	B: F064														
B	B: F065														
B	B: F066														
C	C: F067														
C	C: F068														
C	C: F069														
D	D: F061														
D	D: F062														
D	D: F063														
Pump Amperage	OP 0150		SE	<32 Amps	Evaluate motor material condition										
	A														
	B														
	C														
	D														
Equipment Status (Equip. Status)	Engineering Judgement	Each Power level hold point	Motor CE		Evaluate motor material condition										
Comments															

							1593	1633	1673	1712	1752	1792	1832	1872	1912
							83.20%	85.40%	[illegible]	89.56%	91.65%	93.73%	95.81%	97.90%	100%
								Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
Functional Group - RHR Service Water Pump Motors (P-8s)															
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		[redacted]								
Visual Inspection (VIS)	SE, CE	Last Power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition			[redacted]							
Equipment Status (Equip. Status)	Engineering Judgement	Last Power level	Motor CE		Evaluate motor material condition			[redacted]							
Comments															
Functional Group - RHR Pump Motors (P-10s)															
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		[redacted]								
Visual Inspection (VIS)	SE, CE	Last Power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition			[redacted]							
Equipment Status (Equip. Status)	Engineering Judgement	Last Power level	Motor CE		Evaluate motor material condition			[redacted]							
Comments															

							1593	1633	1672	1712	1752	1792	1832	1872	1912
							83.28%	85.40%	[illegible]	89.56%	91.65%	93.73%	95.81%	97.90%	100%
							Initial Data	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
Functional Group: Recirc Pump Motors (P-16s)															
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response										
Vibration (VIB)	BENTLY NEVADA	Each Power level hold point	CE	by others	Evaluate motor material condition										
A															
B															
Pump bearing temperatures @ speed	ERFIS Points S069, S071, M134, S072, S074, M135	Each Power level hold point	CE												
A	M134														
A	A: S069														
A	A: S071														
B	M135														
B	B: S072														
B	B:S074														
Motor Upper Bearing Temp	ERFIS Points S051, S052, S053, S054,	Each Power level hold point	CE	140 deg f	Investigate cause of high temp										
A	S051														
A	S052														
B	S053														
B	S054,														
Motor Lower bearing Temp	ERFIS Points S055, S056, S057, S058	Each Power level hold point	CE	140 deg f	Investigate cause of high temp										
A	S055														
A	S056														
B	S057														
B	S058														
Winding Temps (W-Temp)	ERFIS Points S059, S060, S061, S062, S063, S064	Each Power level hold point	CE	220 deg F	Investigate cause of high temp										
A	S059														
A	S060														
A	S061														
B	S062														
B	S063														
B	S064														
Equipment Status (Equip. Status)	Engineering Judgement	Each Power level hold point	Motor CE		Evaluate motor material condition										
Comments															

							[illegible]1593	1633	[illegible]1678	1712	[illegible]1752	1792	1832	1872	1912
							[illegible]	85.40%	[illegible]	89.56%	[illegible]	93.73%	95.81%	97.90%	100%
							[illegible]	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
Functional Group: Core Spray Pump Motors (P-46)															
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response										
Visual Inspection (VIS)	CE, SE	Last power level	Maint, E, CE,SE,ops	Evaluate	Evaluate motor material condition										
Equipment Status (Equip. Status)	Engineering Judgement	Last power level	Motor CE		Evaluate motor material condition										
Comments															
Functional Group: Recirc MG Set Motors (MG-1-1A, MG-1-1B)															
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response										
Visual Inspection (VIS)	CE, SE	Each Power level hold point	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition										
Vibration (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point, and during power level changes	CE		Evaluate motor material condition										
A Motor															
A Generator															
B Motor															
B Generator															
Motor Bearing Temp	ERFI S points A: S043, S044 B: S045, S046	Each Power level hold point	CE	<200 deg F, 212 S/d	Investigate cause of high temp										
A	S043														
A	S044														
B	S045														
B	S046														
Generator Bearing Temp	ERFI S points A: S047, S048 B: S049, S050	Each Power level hold point	CE	<200 deg F, 212 S/d	Investigate cause of high temp										
A	S047														
A	S048														
B	S049														
B	S050														
Motor Winding Temps	ERFI S points S000, S001, S002, S003	Each Power level hold point	CE	220 deg F Lim	Investigate cause of high temp										
A	S000														
A	S001														
B	S002														
B	S003														
Generator Winding Temps (W-Temp)	ERFIS Points S004, S005, S006, S007	Each Power level hold point	CE	220 deg F Lim	Investigate cause of high temp										
A	S004														
A	S005														
B	S006														
B	S007														
Equipment Status (Equip. Status)	Engineering Judgement	Each Power level hold point	Motor CE		Evaluate motor material condition										
Comments															

[illegible]	1633	[illegible]	1712	1752	1792	1832	1872	1912
[illegible]	85.40%	[illegible]	89.56%	91.65%	93.73%	95.81%	97.90%	100%
[illegible]	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:

Functional Group: CRD Pump Motors (P-38a)

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		
Visual Inspection (VIS)	CE, SE	Periodic	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition		[redacted]
Equipment Status (Equip. Status)	Engineering Judgement	Last Power Level	Motor CE		Evaluate motor material condition		

Entergy Nuclear - Vermont Yankee
Performance Parameter Spreadsheet
Component Type: Motors

Component Engineer: Chris Kowal

Functional Group: All Functional Groups											
(Assigned Color)		Deferred PM's	CM Backlog	EM Backlog	Performance Parameters (Color)						
Equipment	Description				VIS	[illegible]	[illegible]	[illegible]	B-Temp	W-Temp	WCIR
P-1-1A	Feed Water Pump 5500HP	0	0	2	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-1-1B	Feed Water Pump 5500HP	0	0	3	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-1-1C	Feed Water Pump 5500HP	0	[illegible]	[illegible]	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-2-1A	Condensate Pump 1500HP	0	0	1	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-2-1B	Condensate Pump 1500HP	0	0	0	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-2-1C	Condensate Pump 1500HP	0	0	1	[illegible]	Y	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-5-1A	Circ Water Pump 1250HP	0	0	[illegible]	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-5-1B	Circ Water Pump 1250HP	0	0	2	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-5-1C	Circ Water Pump 1250HP	[illegible]	0	2	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-6-1A	Circ Water Booster Pump 2500HP	0	0	1	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0	0	1	G	G	[illegible]	[illegible]	G	[illegible]	G
P-6-1C	Circ Water Booster Pump 2500HP	0	0	1	G	W	G	G	G	[illegible]	G
P-7-1A	Service Water Pump 250HP	0	0	0	G	W	G	G	[illegible]	G	G

P-7-1B	Service Water Pump 250HP	0	0	1	G	W	G	G		G	G
P-7-1C	Service Water Pump 250HP	0	0	3	G	W	G	G		G	G
P-7-1D	Service Water Pump 250HP	0	0	[illegible]	W	W	[illegible]	[illegible]		[illegible]	[illegible]
P-8-1A	RHR Service Water Pump 350HP	0	1	2	[illegible]	W	G	[illegible]	[illegible]		G
P-8-1B	RHR Service Water Pump 350HP	0	0	[illegible]	[illegible]	W	[illegible]	[illegible]	[illegible]		[illegible]
P-8-1C	RHR Service Water Pump 350HP	0	0	[illegible]	[illegible]	W	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
P-10-1A	RHR Pump 1000HP	[illegible]	[illegible]	[illegible]	[illegible]	W	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-10-1C	RHR Pump 1000HP	0	0	0	[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P-10-1D	RHR Pump 1000HP	0	0	0	[illegible]	W	[illegible]	[illegible]	G	[illegible]	[illegible]
P-18-1A	Recirc Pump 3000HP	0	0	[illegible]	[illegible]		W		[illegible]	[illegible]	[illegible]
P-18-1B	Recirc Pump 3000HP	0	0	0	[illegible]		W		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0	0	0	[illegible]	[illegible]	G	[illegible]			[illegible]
[illegible]	[illegible]	0	0	0	G	[illegible]	G	G			G
MG-1-1A	Recirc MG Set 3500HP	0	0	3	G	G	Y	G		G	G
MG-1-1B	Recirc MG Set 3500HP	0	0	0	G	W	G	G		G	G
[illegible]	CRD pump 250HP	0	0	0	G	G	G	G			G

P-38-1B	CRD pump 250HP	0	0	1	[illegible]	[illegible]	[illegible]	G		[illegible]
[illegible]	Electric Fire Pump 250HP	0	0	0	G	[illegible]	[illegible]	G		[illegible]
[illegible]	[illegible]	0	0	0	[illegible]		[illegible]	[illegible]		[illegible]

NOTES: UB = upper bearing, LB = Lower bearing, TC = Thermocouple, SG = Sight glass, DP = drain pipe

Report for Quarter: 2005-Q4

MEG	CS	Equip. Status	Reason for Assigned Color	Notes
G	Later		Leak - OB suply line OB Ret SG, OB BRG, IB ret line SG	
	Later	G	Leak at oil supply line to IB and OB	
	Later	W	Wedges showed cracking	MAJOR OP 5235 small leak at B oil supply line T[illegible]
	Later		slight oil leak at bottom of motor	
	Later		New SG piping is leaking	MAJOR OP [illegible]
	Later	W	Oil analasys showed increase particle wear	
	Later		UBTG lower SG DV leaking	
	Later		UBTG - Lower sight gauge, SG DV LB leaking	
	Later		UBTG, UB SG level over full, Lower BRG DV	
	Later		UB SG pipe leaking	
	Later			
	Later	G	UB SG pipe leaking	
G	Later	G	Top cover and base wet - source unknown - possibly ratchet plate	

C	Later	C	Top cover and base wet - source unknown - possibly ratchet plate	
C	Later	C	slight oil leak at ubdp	Top cover wet - source unknown
[illegible]	Later	[illegible]	[illegible] vibs on pump pad - motor OK	no teflon on threads - ubtc vent screens dirty
C	Later	C	Base covered in oil LB DV or TC leak	
[illegible]	Later	[illegible]	LB SG treaded fitting weeping oil	Cooling coil grommet needs replacement
[illegible]	Later	[illegible]	LB SG treaded fittings weeping oil	Cooling coil grommet needs replacement motor leaking oil
[illegible]	Later	[illegible]		Cooling coil grommet needs replacement lower bearing [illegible] leaking oil
[illegible]	Later	[illegible]	LB DV looks wet	
[illegible]	Later	[illegible]		
[illegible]	Later	[illegible]	LB DV looks wet	MOTOR HOTTER THEN OTHERS
[illegible]	Later	[illegible]	LB DV elbow to MTR threads leaking	
[illegible]	Later	[illegible]	vibration probes on Bently indicate bypass on several points	
[illegible]	Later	[illegible]	vibration probes on Bently indicate bypass on several points	
[illegible]	Later	[illegible]		
[illegible]	Later	[illegible]		
[illegible]	Later	W	Equipment on watch list - vibration on coupling	
C	Later	C	SG pipe between Motor and Exctr	
C	Later	C		

G	Later	Y	1.) Oil Leak 2.) Motor windings found degraded in visual inspection during OP 5235	Budget for new motor cut until 2007
G	Later	G		
[illegible]	Later	[illegible]		

Entergy Nuclear - Vermont Yankee

Power Uprate Power Acecntion Testing Performance Monitoring Plan

Component Engineer: Chris Kowal

Component Engineer: Ron Scherman

Functional Group: Feedwater Pump Motors (P-1s) [illegible]

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response		Power level 1593 / 81.20% / Initial Date [illegible]	1633 / 85.40% / Time: Date:	1673 / 87.48% / Time: Date:
Visual Inspection (VIS)	Engineer	Each Power level hold point	CE, SE	Evaluate	Evaluate motor material condition, audible noise.				
Vibration Motor (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate motor material condition				
A Motor									
B Motor									
C Motor									
Vibration Pump (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate Pump material condition				
A Pump									
B Pump									
C Pump									
Thermography (Therm)	Thermography cameras	Each Power level hold point	CE	Hot spots <10 Deg c	Investigate cause of high temp				
Pump Bearing Temp, Driven	ERFIS Points	Each Power level hold point	CE	160<deg F [200<deg F EPU] 212 S/D					
A	W027								
A	W028								
B	W033								
B	W034								
C	W039								
C	W040								
Pump Bearing Temp, Opp.	ERFIS Points	Each Power level hold point	CE	160<deg F [200<deg F EPU] 212 S/D					
A	W029								
B	W035								
C	W041								
Motor Thrust Bearing (front) Temp (B-Temp)	ERFIS Points W031, W037, W043	Each Power level hold point	CE	160<deg F [200<deg F EPU] 212 S/D	Investigate cause of high temp				
A	W031								
B	W037								
C	W043								
Motor Guide bearing (Rear) Temp (B-Temp)	ERFIS Points W032, W038, W044	Each Power level hold point	CE	178<deg f [200<deg f EPU] 212 S/D	Investigate cause of high temp				
A	W032								
B	W038								
C	W044								
Winding Temps (W-Temp)	ERFIS Points E026, E027, E028	Each Power level hold point	CE	<83 DEG C norm [100 deg C EPU] 93.4 exp @EPU	Investigate cause of high temp				
A	E026								
B	E027								
C	E028								
Equipment Status (Equip. Status)	Engineering Judgement	Periodic	Motor CE		Evaluate motor material condition				
Comments							1593	1633	1673

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
							83.20%	85.40%	87.48%
							Initial Date	Time: Date:	Time: Date:
Functional Group: Condensate Pump Motors (P2s)									
Visual Inspection (VIS)	Craft / Engineer	Each Power level hold point	CE,SE,	Evaluate	Evaluate motor material condition				
Vibration Motor (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate motor material condition				
A									
B									
C									
Vibration Pump (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE		Evaluate Pump material condition				
A									
B									
C									
Thermography (Therm)	Thermography cameras	Each Power level hold point	CE	Hot spots <10 Deg c	Investigate cause of high temp				
Upper Bearing Temp (B-Temp)	ERFIS Points E067, E069, E071	Each Power level hold point	CE	172 (160) <Deg F [183 (170) EPU] 200 llm	Investigate cause of high temp				
A	E067								
B	E069								
C	E071								
Lower bearing Temp (B-Temp)	ERFIS Points E068,E070,E072	Each Power level hold point	CE	150 (190) Deg F [172 (201) EPU] 200 Llm	Investigate cause of high temp				
A	E068								
B	E070								
C	E072								
Winding Temps (W-Temp)	ERFIS Points E029,E030, E031	Each Power level hold point	CE	106 (100) <deg C [115 (95) EPU] 120 llm	Investigate cause of high temp				
A	E031								
B	E030								
C	E031								
Equipment Status (Equip. Status)	Engineering Judgement	Periodic	Motor CE		Evaluate motor material condition				
Comments									
							1593	1633	1673

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
							83.20%	85.40%	87.48%
							Initial Date	Time: Date:	Time: Date:
Functional Group: Circ Water Pump Motors (P2s)									
Upper Bearing Temp (B-Temp)	ERFIS Points W045, W047, W049	Last power level	CE		Investigate cause of high temp				
A	W045								
B	W047								
C	W049								
Lower bearing Temp (B-Temp)	ERFIS Points W046, W048, W050	Last power level	CE		Investigate cause of high temp				
A	W046								
B	W048								
C	W050								
Equipment Status (Equip. Status)	Engineering Judgement	Periodic	Motor CE		Evaluate motor material condition				
Comments									
							1593	1633	1673

Functional Group: Circ. Water Booster Pump Motors (B-8a)

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
							83.20%	85.40%	87.48%
							Initial Data	Time: Date:	Time: Date:
							[redacted]	[redacted]	[redacted]
Visual Inspection (VIS)	Motor Engineer	Last power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition			[redacted]	[redacted]
Upper Bearing Temp (B-Temp)	ERFIS Points W073, W075, W077	Last power level	CE	Run 176 <deg F Alarm 194 deg F .S/D 210 deg F.	Investigate cause of high temp			[redacted]	[redacted]
A	W073							[redacted]	[redacted]
B	W075							[redacted]	[redacted]
C	W077							[redacted]	[redacted]
Lower bearing Temp (B-Temp)	ERFIS Points W074, W076, W078	Last power level	CE	Run 176 <deg F Alarm 194 deg F S/D 210 deg F.	Investigate cause of high temp			[redacted]	[redacted]
A	W074							[redacted]	[redacted]
B	W076							[redacted]	[redacted]
C	W078							[redacted]	[redacted]
Equipment Status (Equip. Status)	Engineering Judgement	Last power level	Motor CE		Evaluate motor material condition			[redacted]	[redacted]
Comments									

Functional Group: Service Water Pump Motors (B-7a)

Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
							1593	1633	1673
							83.20%	85.40%	87.48%
							Initial Data	Time: Date:	Time: Date:
							[redacted]	[redacted]	[redacted]
Visual Inspection (VIS)	SE,CE	Each Power level hold point	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition			[redacted]	
Vibration (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point	CE	by others	Evaluate motor material condition		[redacted]	[redacted]	
A							[redacted]	[redacted]	
B							[redacted]	[redacted]	
C							[redacted]	[redacted]	
D							[redacted]	[redacted]	
Winding Temps (W-Temp)	ERFIS Points A: F070, F071, F072 B: F064, F065, F066 C: F067, F068, F069 D: F061, F062, F063	Each Power level hold point	CE	220 deg F	Investigate cause of high temp			[redacted]	
A	A: F070							[redacted]	
A	A: F071							[redacted]	
A	A:F072							[redacted]	
B	B: F064							[redacted]	
B	B: F065							[redacted]	
B	B: F066							[redacted]	
C	C: F067							[redacted]	
C	C: F068							[redacted]	
C	C: F069							[redacted]	
D	D: F061							[redacted]	
D	D: F062							[redacted]	
D	D: F063							[redacted]	
Pump Amperage	OP 0150		SE	<32 Amps	Evaluate motor material condition			[redacted]	
	A							[redacted]	
	B							[redacted]	
	C							[redacted]	
	D							[redacted]	
Equipment Status (Equip. Status)	Engineering Judgement	Each Power level hold point	Motor CE		Evaluate motor material condition				
Comments									

							[illegible] 1593	1633	1673
							[illegible] 83.20%	85.40%	87.48%
							[illegible]	Time: Date:	Time: Date:
Functional Group: RHR Service Water Pump Motors [illegible]									
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
Visual Inspection (VIS)	SE, CE	Last Power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition				
Equipment Status (Equip. Status)	Engineering Judgement	Last Power level	Motor CE		Evaluate motor material condition				
Comments									

Functional Group: RHR Pump Motors (P-405)									
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
Visual Inspection (VIS)	SE, CE	Last Power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition				
Equipment Status (Equip. Status)	Engineering Judgement	Last Power level	Motor CE		Evaluate motor material condition				
Comments									

							[illegible] 1593	1633	1673
							[illegible] 83.20%	85.40%	87.48%
							[illegible]	Time: Date:	Time: Date:
Functional Group: Recirc Pump Motors [illegible]									
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
Vibration (VIB)	BENTLY NEVADA	Each Power level hold point	CE	by others	Evaluate motor material condition				
A									
B									
Pump bearing temperatures @ speed	ERFIS Points S069, S071, M134, S072, S074, M135	Each Power level hold point	CE						
A	M134								
A	A: S069								
A	A: S071								
B	M135								
B	B: S072								
B	B:S074								
Motor Upper Bearing Temp	ERFIS Points S051, S052, S053, S054,	Each Power level hold point	CE	140 deg f	Investigate cause of high temp				
A	S051								
A	S052								
B	S053								
B	S054,								
Motor Lower bearing Temp	ERFIS Points S055, S056, S057, S058	Each Power level hold point	CE	140 deg f	Investigate cause of high temp				
A	S055								
A	S056								
B	S057								
B	S058								
Winding Temps (W-Temp)	ERFIS Points S059, S060, S061, S062, S063, S064	Each Power level hold point	CE	220 deg F	Investigate cause of high temp				
A	S059								
A	S060								
A	S061								
B	S062								
B	S063								
B	S064								
Equipment Status (Equip. Status)	Engineering Judgement	Each Power level hold point	Motor CE		Evaluate motor material condition				
Comments									

							1593	1633	1673
							20%	85.40%	87.48%
							Initial Date	Time: Date:	Time: Date:

Functional Group: Core Spray Pump Motors (P-48s)									
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
Visual Inspection (VIS)	CE, SE	Last power level	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition				
Equipment Status (Equip. Status)	Engineering Judgement	Last power level	Motor CE		Evaluate motor material condition				
Comments									

Functional Group: Recirc MG Set Motors (MG-1-1A, MG-1-1B)									
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
Visual Inspection (VIS)	CE, SE	Each Power level hold point	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition				
Vibration (VIB)	AP 0211 CSI 2115, 2120	Each Power level hold point, and during power level changes	CE		Evaluate motor material condition				
A Motor									
A Generator									
B Motor									
B Generator									
Motor Bearing Temp	ERFI S points A: S043, S044 B: S045, S046	Each Power level hold point	CE	<200 deg F, 212 S/d	Investigate cause of high temp				
A	S043								
A	S044								
B	S045								
B	S046								
Generator Bearing Temp	ERFI S points A: S047, S048 B: S049, S050	Each Power level hold point	CE	<200 deg F, 212 S/d	Investigate cause of high temp				
A	S047								
A	S048								
B	S049								
B	S050								
Motor Winding Temps	ERFI S points S000, S001, S002, S003	Each Power level hold point	CE	220 deg F Lim	Investigate cause of high temp				
A	S000								
A	S001								
B	S002								
B	S003								
Generator Winding Temps (W-Temp)	ERFIS Points S004, S005, S006, S007	Each Power level hold point	CE	220 deg F Lim	Investigate cause of high temp				
A	S004								
A	S005								
B	S006								
B	S007								
Equipment Status (Equip. Status)	Engineering Judgement	Each Power level hold point	Motor CE		Evaluate motor material condition				
Comments									

							1593	1633	1673
							82.20%	85.40%	87.48%
							Initial Date	Time: Date:	Time: Date:

Functional Group: CRD Pump Motors (P-38s)									
Parameter	Source	Frequency	Plant Org	Alert/Action levels (range)	Response				
Visual Inspection (VIS)	CE, SE	Periodic	Maint. E, CE,SE,ops	Evaluate	Evaluate motor material condition				
Equipment Status (Equip. Status)	Engineering Judgement	Last Power Level	Motor CE		Evaluate motor material condition				
Comments									

1712	1752	1792	1832	1872	1912
89.56%	91.65%	93.73%	95.81%	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]		[redacted]		[redacted]	
[redacted]		[redacted]		[redacted]	
1712	1752	1792	1882	1872	1912

89.56%	91.65%	93.73%	[illegible]	97.90%	[illegible]
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]		[redacted]		[redacted]	

1712	1752	1792	[illegible]	1872	[illegible]
89.56%	91.65%	93.73%	[illegible]	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	

1712	1752	1792	1832	1872	[illegible]
89.56%	91.65%	93.73%	[illegible]	97.90%	[illegible]
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	

[redacted]

1712	1752	1792	1832	1872	1912
89.56%	91.65%	93.73%	95.81%	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:

[redacted]

1712	1752	1792	[illegible]	1872	1912
89.56%	91.65%	93.73%	[illegible]	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

1712	1752	1792	[illegible]	1872	1912
89.56%	91.65%	93.73%	[illegible]	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

1712	1752	1792	1832	1872	1912
89.56%	91.65%	93.73%	95.81%	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
[redacted]		[redacted]		[redacted]	
[redacted]		[redacted]		[redacted]	

1712	1752	1792	1832	1872	1912
89.56%	91.65%	93.73%	95.80%	97.90%	100%
Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:	Time: Date:

[redacted]

VYNPS EPU Power Ascension Testing

Service Water System Monitoring Plan

(4 pages)

EPU Supplemental Performance Monitoring Plan for the SW System

Previously Monitored	Equipment No.	Parameter	Alarm Values/Limits	Level	Pre PA Activity	Increased Power Level Evaluation Points 1593 MWth (83.32%)	1673 MWth (87.48%)	1752 MWth (91.65%)	1912 MWth (100%)	Source
	P-7-1A-D	Number of Pumps Running	2 during Feb/Mar (Note1)	2	Record # of Running Pumps	3 Pumps Running	3 Pumps Running	3 Pumps Running	3 Pumps Running	ERFIS - E516, E517, E518, E519
	PI-104-20A/B	SW Header Pressure	97-117 psig	2	Record Header Pressure	Pressure < 97 psig	Pressure < 97 psig	Pressure < 97 psig	Pressure < 97 psig	OP 0150.03 CRP 9-6
X	RD-17-332	SW Rad Monitor Flow	1.0 - 2.0 gpm (Note 2)	3	Record Flow	Flow > 2 gpm	Flow > 2 gpm	Flow > 2 gpm	Flow > 2 gpm	OP 0150.05 FI-104-332
X	P-7-1A	Running Amps	32 (Note 2)	2	Record Amps	Amps 31	Amps 31	Amps 31	Amps > 31	OP 0150.03 CRP 9-6
X	P-7-1B	Running Amps	32 (Note 2)	2	Record Amps	Amps 31	Amps 31	Amps 31	Amps > 31	OP 0150.03 CRP 9-6
X	P-7-1C	Running Amps	32 (Note 2)	2	Record Amps	Amps 31	Amps 31	Amps 31	Amps > 31	OP 0150.03 CRP 9-6
X	P-7-1D	Running Amps	32 (Note 2)	2	Record Amps	Amps 31	Amps 31	Amps 31	Amps > 31	OP 0150.03 CRP 9-6
X	P-7-1A-D	Motor Winding Temp	Monitored by Components							
	E-10-1A-D	H2 Temp	Monitored by Turbine Generator Program							
	E-25-1A&B	TLO Outlet Temp	Monitored by Turbine Generator Program							
	E-26-1A&B	SC Outlet Temp	Monitored by Turbine Generator Program							
	Alterex	Temp	Monitored by Turbine Generator Program							
	TRU-5	Condensate Pump Room	Monitored by HVAC Program							
	TRU-1,2,3,4	Feed Pump Room	Monitored by HVAC Program							
	RRU-17A&B	Steam Tunnel Temp	Monitored by HVAC Program							
	TCV-104-20	H2 Cooler Outlet	N/A	2	Record Valve Stem Position	75% Open	75% Open	75% Open	75% Open	TCV-104-20
	TCV-104-21	TLO Cooler Outlet	N/A	2	Record Valve Stem Position	75% Open	75% Open	75% Open	75% Open	TCV-104-21
X	E-22-1A&B	TBCCW Outlet Temp (TBCCW not SW)	< 100 °F (Note 3)	3	Record Outlet Temp	> 95° F	> 95° F	> 95° F	> 95° F	ERFIS - M042

EPU Supplemental Performance Monitoring Plan for the SW System

Previously Monitored	Equipment No.	Parameter	Alarm Values/Limits	Level	Pre PA Activity	Increased Power Level Evaluation Points 1593 MWth (83.32%)	1673 MWth (87.48%)	1752 MWth (91.65%)	1912 MWth (100%)	Source
	TCV-104-3	"A" TBCCW HX Outlet	N/A	3	Record Valve Stem Position	75% Open	75% Open	75% Open	75% Open	TCV-104-3
	TCV-104-6	"B" TBCCW HX Outlet	N/A	3	Record Valve Stem Position	75% Open	75% Open	75% Open	75% Open	TCV-104-6
X	E-8-1A	RBCCW Outlet Temp (RBCCW not SW)	< 100 °F (Note 3)	3	Record Outlet Temp	> 95° F	> 95° F	> 95° F	> 95° F	ERFIS - M008
X	E-8-1B	RBCCW Outlet Temp (RBCCW not SW)	< 100 °F (Note 3)	3	Record Outlet Temp	> 95° F	> 95° F	> 95° F	> 95° F	ERFIS - M009
X	E40-1A	"A" MGLO Outlet Temp (Oil not SW Temp)	< 140 °F (Note 2)	3	Record Outlet Temp	> 130° F	> 130° F	> 130° F	> 130° F	ERFIS - W082 ODMI CR-VTY-2005-02391
X	E40-1B	"B" MGLO Outlet Temp (Oil not SW Temp	< 140 °F (Note 2)	3	Record Outlet Temp	> 130° F	> 130° F	> 130° F	> 130° F	ERFIS - W085 ODMI CR-VTY-2005-02391

Note 3	- From USFAR/TS
Note 2	- From Procedure or Alarm Set Point
Note 1	- Based on Review of Trending Data
	Manual adjustment of valve positions to control flow/temperature must be recorded

Prepared by: ______________________ Date ______________

Reviewed by: ______________________ Date ______________

SW EPU
Monitoring Logs

Equipment No.	Parameter	Alarm Values/Limits	Level	Increased Power Level Evaluation Points 1593 MWth	1673 MWth	1752 MWth	1832 MWth	1912 MWth	Source
P-7-1A-D	Number of Pumps Running	> 2 during Feb/Mar	2	2 Pumps Running					ERFIS - E516, E517, E518, E519
PI-104-20A/B	SW Header Pressure	97-117 psig	2	Pressure < 97 psig					OP 0150.03 CRP 9-6
RD-17-332	SW Rad Monitor Flow	1.0 - 2.0 gpm	3	Flow < 2 gpm					OP 0150.05 FI-104-332
P-7-1A	Running Amps	32	2	< 31					OP 0150.03 CRP 9-6
P-7-1B	Running Amps	32	2	< 31					OP 0150.03 CRP 9-6
P-7-1C	Running Amps	32	2	< 31					OP 0150.03 CRP 9-6
P-7-1D	Running Amps	32	2	< 31					OP 0150.03 CRP 9-6
TCV-104-20	H2 Cooler Outlet	N/A	2	<75% Open					TCV-104-20
TCV-104-21	TLO Cooler Outlet	N/A	2	<75% Open					TCV-104-21
E-22-1A&B	TBCCW Outlet Temp (TBCCW not SW)	< 100 °F	3	< 95° F					ERFIS - M042
TCV-104-3	"A" TBCCW HX Outlet	N/A	3	< 75% Open					TCV-104-3
TCV-104-6	"B" TBCCW HX Outlet	N/A	3	< 75% Open					TCV-104-6
E-8-1A	RBCCW Outlet Temp (RBCCW not SW)	< 100 °F	3	< 95° F					ERFIS - M008
E-8-1B	RBCCW Outlet Temp (RBCCW not SW)	< 100 °F	3	< 95° F					ERFIS - M009
E40-1A	"A" MGLO Outlet Temp (Oil not SW Temp)	< 140 °F	3	< 130° F					ERFIS - W082 ODMI CR-VTY-2005-02391

SW EPU
Monitoring Logs

Equipment No.	Parameter	Alarm Values/Limits	Level	Increased Power Level Evaluation Points					Source
				1593 MWth	1673 MWth	1752 MWth	1832 MWth	1912 MWth	
E40-1B	"B" MGLO Outlet Temp (Oil not SW Temp	< 140 °F	3	< 130° F					ERFIS - W085 ODMI CR-VTY-2005-02391

1673 MWth Data Recorded By: ____________________ Date: ____________________
1673 MWth Data Reviewed By: ____________________ Date: ____________________

1752 MWth Data Recorded By: ____________________ Date: ____________________
1752 MWth Data Reviewed By: ____________________ Date: ____________________

1832 MWth Data Recorded By: ____________________ Date: ____________________
1832 MWth Data Reviewed By: ____________________ Date: ____________________

1912 MWth Data Recorded By: ____________________ Date: ____________________
1912 MWth Data Reviewed By: ____________________ Date: ____________________

VYNPS EPU Power Ascension Testing

Turbine Generator System Monitoring Plan

(6 pages)

System Name: Stator Cooling
System Code: SC
System Engineer: Bob Swanson

Date Issued:

System Functions: MR-1 Provide cooling for the main generator
MR-2 Provide necessary instrumentation to allow for identification of operational status.
MR-3 Provide necessary signals to initate a timed turbine trip

System Performance Goals/Indicator:

SCW P&ID Click Here

Equipment Name	Equipment No./ID	Critical	Parameter	Instrument	M/T	Freq	Acceptance Bands	Source	Reason or other info
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Generator MWe	ERFIS G002	M/T	D	~550 MWE	ERFIS	Can be Trended via PSS.
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Stator Cooling Deionizer dP	DPI-110-YGA-6	T	D	≤14 psid	OP 0105	
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Stator Cooling Filter dP	DPI-110-YGA-4	T	D	<9 psid	OP 0105	
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Stator Winding Inlet Temperature	ERFIS G021	T	D	~ 40 Deg C	ERFIS	Can be Trended via PSS.
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Stator Winding Inlet Pressure	PI-110-YGA-2	T	D	34-38 psig	OP 0105	
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Stator Winding Coolant Flow	FIS-110-YFL-1	T	D	274-288 gpm	OP 0105	
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Generator Outlet Conductivity	CDR-110-1, pt. 3	T	D	<0.3 μmho/cm	OP 0105	
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Deionizer Outlet Conductivity			D			
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	H2 Purity	ERFIS G001	M	D	> 95%	ERFIS	Can be Trended via PSS.
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Machine Gas Temp	ERFIS	M/T	D	30-50°C	OP 0105	Can be Trended via PSS.
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Machine Gas Pressure	ERFIS G010	M/T	D	~ 45 psig	ERFIS	Can be Trended via PSS. ER950525_02
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	H2 Usage	FIT-110-H-1	T	D	~ .277 scfm	OP 0105	

System Name: Turbine Lube Oil
System Code: TLO
System Engineer: Bob Swanson

Date Issued:

System Functions: MR-1 Provide lube oil for lubrication of the main turbine.
MR-2 Provide sufficient oil pressure for control of MS system turbine control and turbine bypass valves and other MHC equipment.
MR-3 Provide for emergency DC powered lube oil supply

System Performance Goals/Indicator:

TLO P&ID Click Here

Equipment Name	Equipment No./ID	Critical	Parameter	Instrument	M/T	Freq	Acceptance Bands	Source	Reason or other Info
TG-1-1A	Turbine Lube Oil Cooler	Yes	Turbine Oil to Cooler Temperature	T024	T	D	130-140	ERFIS	
TG-1-1A	Turbine Lube Oil Cooler	Yes	Turbine Oil from Cooler Temperature	T025	T	D	110-120	ERFIS	
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Turbine Brng Oil Pressure	W008	T	D	20-30	ERFIS	
TB-1	High Pressure Turbine	Yes	Turbine Brng 1 Oil Outlet	W011	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TB-1	High Pressure Turbine	Yes	Turbine Brng 2 Oil Outlet	W012	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TB-1A	Low Pressure Turbine	Yes	Turbine Brng 3 Oil Outlet	W013	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TB-1A	Low Pressure Turbine	Yes	Turbine Brng 4 Oil Outlet	W014	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TB-1B	Low Pressure Turbine	Yes	Turbine Brng 5 Oil Outlet	W015	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TB-1B	Low Pressure Turbine	Yes	Turbine Brng 6 Oil Outlet	W016	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Generator Brng 7 Oil Outlet	W017	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Generator Brng 8 Oil Outlet	W018	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
Alterrex	Exciter	Yes	Exciter Brng 9 Oil Outlet	W019	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp
Alterrex	Exciter	Yes	Exciter Brng 10 Oil Outlet	W020	T	D	10 / 15 / 35 deg Diff	ERFIS	Difference between Brg Metal and Oil drain temp

System Name: Seal Oil
System Code: SO
System Engineer: Bob Swanson

Date Issued:

System Functions: MR-1 Provide shaft sealing for the main generator.
MR-2 Provide for emergency DC powered seal oil supply.

System Performance Goals/Indicator:

SO P&ID Click Here

Equipment Name	Equipment No./ID	Critical	Parameter	Instrument	M/T	Freq	Acceptance Bands	Source	Reason or other info
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Hydrogen Seal Oil Pressure Bearing	W009	T	D	45-51	ERFIS	Trending Avaialble in System 1
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Hydrogen Seal Oil Pressure Bearing	W010	T	D	45-52	ERFIS	Trending Avaialble in System 1
TG-1-1A	STEAM TURBINE GENERATOR UNIT	Yes	Seal Oil / Gas Pressure Differential	Calculation	T	D	8 PSID	ERFIS	Trending Avaialble In System 1

System Name:	Turbine Generator	**Date Issued:**	**TG System Functions:** MR-1 Convert the thermodynamic energy of steam to provide electrical energy
System Code:	TG		MR-2 Provide automatic and manual controls via both the EPR and the MPR
			MR-3 Control steam flow and pressure to the turbine to protect the turbine from overpressure or excessive speed
System Engineer:	Bob Swanson		MR-4 Provide for automatic turbine generator trip under appropriate conditions
			MR-5 Provide for automatic and manual control of turbine speed, load, and trip
			MR-6 Provide for monitoring and control of generator hydrogen (H2) purity and

System Performance Goals/Indicator: Main Steam Functions Below

MS P&ID Click Here

MS Functions

1) Conduct steam provided from the NB system to the main turbine at a controlled pressure during normal operation.
'2) Provide a supply of steam to the Extraction Steam (ES) system.
3) Provide a supply of steam to the Auxilliary Steam (AS) system.

'4) Provide a supply of steam at a controlled pressure for turbine shaft sealing.

'5) Bypass steam directly to the main condenser to control reactor pressure via automatic and local-manual control.

'6) Control steam flow and pressure to the the main turbine to protect the turbine from overpressure or excessive speed.
'7) Provide signal for MSIV closure on low turbine inlet pressure.
8) Provide signal for Turbine Trip on high exhaust hood temperature.
'9) Provide necessary mechanical support to ensure accomplishment of other safety related functions (i.e., piping integrity to ensure reactor coolant pressure boundary and containment boundry functions).

									Reason or other info
Main Turbine	TB-1	Yes	Turb/Gen Brng 9 Vibration	System 1	T	D	< 6 mils, 1 Mil Delta	ERFIS	
Main Turbine	TB-1	Yes	Turb/Gen Brng 10 Vibration	System 1	T	D	< 6 mils, 1 Mil Delta	ERFIS	
Main Turbine	TB-1	Yes	Turb/Gen Front Thrust Oil Outlet	W021	T	D	< 130,150 deg F	ERFIS	Can be Trended via PSS.
Main Turbine	TB-1	Yes	Turb/Gen Rear Thrust Oil Outlet	W022	T	D	< 130,150 deg F	ERFIS	
Main Turbine	TB-1	Yes	Turb/Gen Front Thrust Bearing Metal	W023	T	D	< 130,150 deg F	ERFIS	
Main Turbine	TB-1	Yes	Turb/Gen Rear Thrust Bearing Metal	W024	T	D	< 130,150 deg F	ERFIS	Can be Trended via PSS.
Main Turbine	TB-1	Yes	Thrust Bearing Wear	Turbine End	T	D	20, 40 mils	ERFIS	
Main Turbine	TB-1	Yes	Thrust Bearing Wear	Generator End	T	D	20, 40 mils	ERFIS	
Intercept Valve	CIV 1/2	Yes	Stoke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 1/2	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 3/4	Yes	Stroke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 3/4	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 1	Yes	Stoke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 1	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Intercept Valve	CIV 2	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Intercept Valve	CIV 3	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Intercept Valve	CIV 4	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Intercept Valve	CIV 1	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 2	Yes	Stoke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 2	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 3	Yes	Stoke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 3	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Intercept Valve	CIV 4	Yes	Stoke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Bypass Valves	Z-1B-2	Yes	Stroke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Bypass Valves	Z-1A-5	Yes	Stroke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Bypass Valves	Z-1A-5	Yes	Stroke Time Closed	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
Bypass Valves	Z-1B-6	Yes	Stroke Time Open	StopWatch	T	Q	OP 4160 (10% 20%)	OP-4160	
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Alterrex	Alterrex	Yes	ALTERREX EXCITER TEMP SLOT 2	G026	T	D	5 Deg, 10 deg dev	ERFIS	
Alterrex	Alterrex	Yes	ALTERREX EXCITER TEMP SLOT 3	G027	T	D	5 Deg, 10 deg dev	ERFIS	
Alterrex	Alterrex	Yes	GENERATOR SLOTS	G039 - G158	T	D	2 deg, 5 deg dev	ERFIS	
Generator	TG-1-1A	Yes	GENERATOR HYD PRESSURE psig	G010	T	D	>43, >41	ERFIS	
Generator	TG-1-1A	Yes	HYDROGEN TEMP TO COOLER A	G012	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	HYDROGEN TEMP OUT COOLER A	G017	T	D	5 Deg, 10 deg dev	ERFIS	
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Generator	TG-1-1A	Yes	HYDROGEN TEMP TO COOLER B	G013	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	HYDROGEN TEMP OUT COOLER B	G018	T	D	5 Deg, 10 deg dev	ERFIS	
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Generator	TG-1-1A	Yes	HYDROGEN TEMP TO COOLER C	G014	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	HYDROGEN TEMP OUT COOLER C	G019	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	Cooler C Delta		T	D	2 deg, 5 deg dev		

Generator	TG-1-1A	Yes	HYDROGEN TEMP TO COOLER D	G015	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	HYDROGEN TEMP OUT COOLER D	G020	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	Cooler D Delta	Calculation	T	D	2 deg, 5 deg dev		
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Generator	TG-1-1A	Yes	ALTERREX AIR OUT TEMP	G023	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	ALTERREX AIR IN TEMP	G024	T	D	5 Deg, 10 deg dev	ERFIS	
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Generator	TG-1-1A	Yes	COOLANT TEMP IN STATOR WINDING G021	G021	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	COOLANT TEMP Rise STATOR WINDING	Calculation	T	D	2 deg, 5 deg dev		
Generator	TG-1-1A	Yes	GEN H2 GAS TEMP RISE	C027	T	D	2 deg, 5 deg dev	ERFIS	
Generator	TG-1-1A	Yes	GEN HOT GAS AVERAGE TEMP	C028	T	D	5 Deg, 10 deg dev	ERFIS	
Generator	TG-1-1A	Yes	GEN COLD GAS AVERAGE TEMP	C063	T	D	5 Deg, 10 deg dev	ERFIS	

Attachment 3

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 263

Extended Power Uprate – Regulatory Commitment

Information Regarding Steam Dryer Monitoring and FIV Effects

Data Acquisition System for Steam Dryer Pressure Signals

Total number of pages in Attachment 3 (excluding this cover sheet) is 13.

Vermont Yankee Nuclear Power Station
Data Acquisition System for Steam Dryer Pressure and Accelerometer Signals

In Reference 1[1] Entergy committed to installing 32 additional strain gages (SG) on the main steam piping during the Fall 2005 refueling outage (RFO-25) to enhance the data acquisition system (DAS) and improve the accuracy of the steam dryer measurement system. The improvements in detection accuracy will reduce the measurement uncertainty associated with the acoustic circuit model. The commitment was met through the installation of 48 new strain gages and upgrades to the data acquisition system. Temporary Alteration change number TA-2005-15 R1 installed 48 new strain gages during RFO-25.

The DAS consists of strain gages, instrument cabling located inside the drywell, and a computer located in the reactor building. There is second data acquisition system in the turbine building to collect accelerometer data from piping in the heater bay area. Both systems are remotely accessed over a local area network thereby minimizing test engineer dose during power ascension testing.

Weldable, 350 ohm, high temperature strain gages with shielded high temperature cables were installed on the outside circumference of each of the four main steam lines inside the drywell at 60 degrees apart from at the locations described in Figure EMEB-B-77-1, Sheet 2 (see Attachment 3 to Reference 1). Installation of 6 strain gauges at each data input location provides for improved assessment of internal pressure. Each strain gage is configured in a quarter bridge arrangement rather than ½ bridge arrangement. The quarter bridge arrangement and 6 gages provide margin for signal failures. An update to Figure EMEB-B-77-1, Sheet 2 is included in the attached portions of the Temporary Alteration.

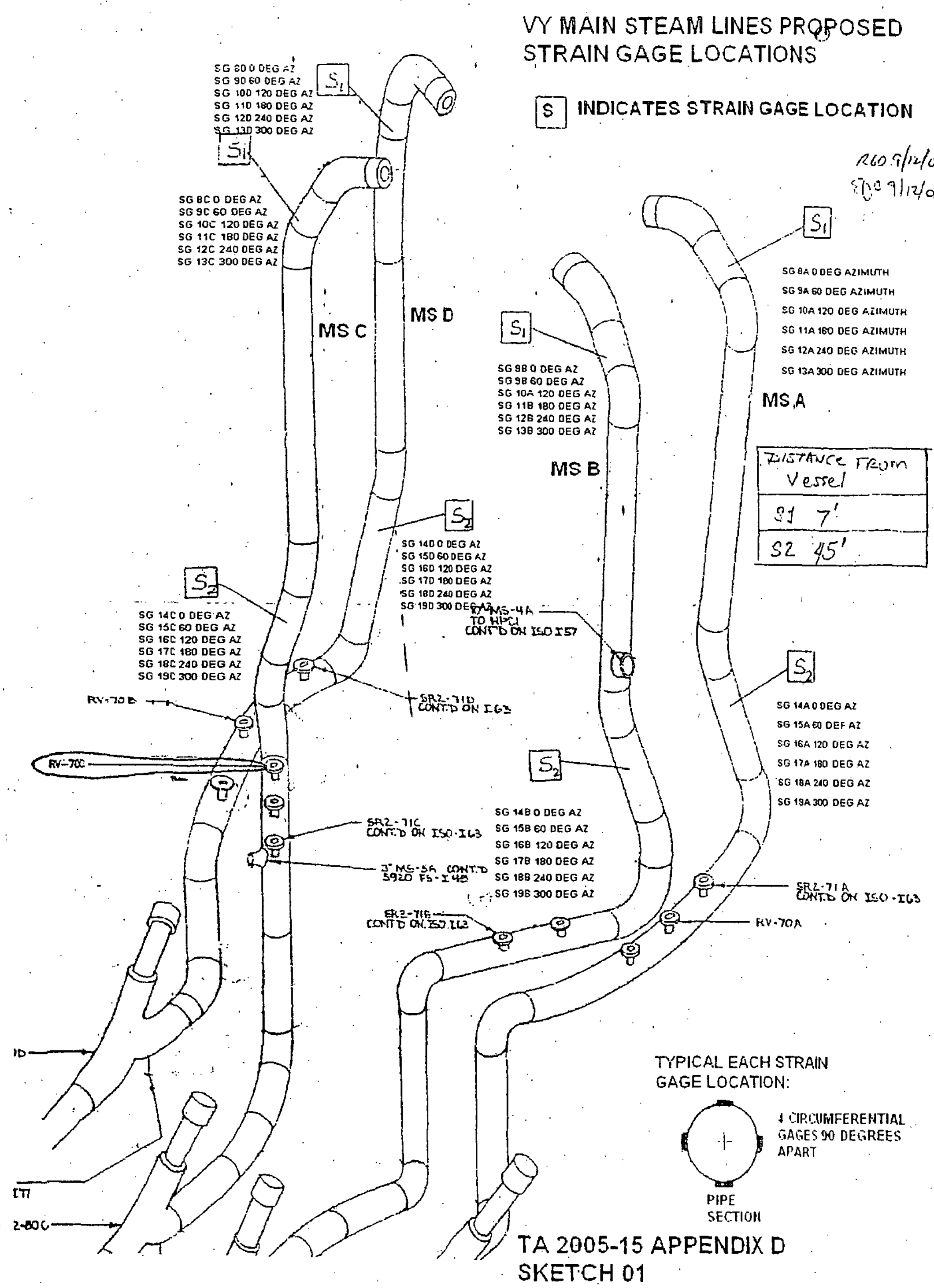
The upgrades to the DAS included 16-bit USB Digitizer with a sample rate of 200 kS/s. mounted in each chassis. Mounting the digitizer in the chassis eliminates noise introduced by the computer. There are 3 DC chassis for the SG signals and 1 AC chassis for the accelerometer signals. The SG chassis noise was eliminated by providing external power to the DC powered fans in the chassis. The Endevco 7703A-100 accelerometer units are each screwed to a mounting block that is strapped to the pipe. The accelerometer signal is routed to a charge converter in the drywell. The charge converter connects to an Endevco power supply located outside the drywell. The accelerometer signals are then routed to NI voltage conditioning cards then to a 16 bit digitizer. There is one personal computer controlling the 48 strain gages and 31 accelerometers for temporal collection of acceleration and strain data from the drywell.

Strain acquisition software allows for automatic Wheatstone bridge null and calibration prior to each data acquisition. The data acquisition software allows variation in acquisition rate, acquisition period, and voltage span to best define the input signal. The accelerometer circuits are tested with a calibrated shaker to confirm the hardware and software are functioning properly. The data is processed with two software packages—MatLab and LabView—for cross checking results.

[1] Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, Technical Specification Proposed Change No. 263 – Supplement No. 33, Extended Power Uprate – Response to Request for Additional Information," BVY 05-084, September 14, 2005

The Labview software will also calculate and plot the power spectral density data for each channel and display this data while running. Batch files have been developed efficiently to process the archived data with MatLab for Engineering evaluation and reporting.

APPENDIX 'D'
TEMPORARY ALTERATION SKETCHES

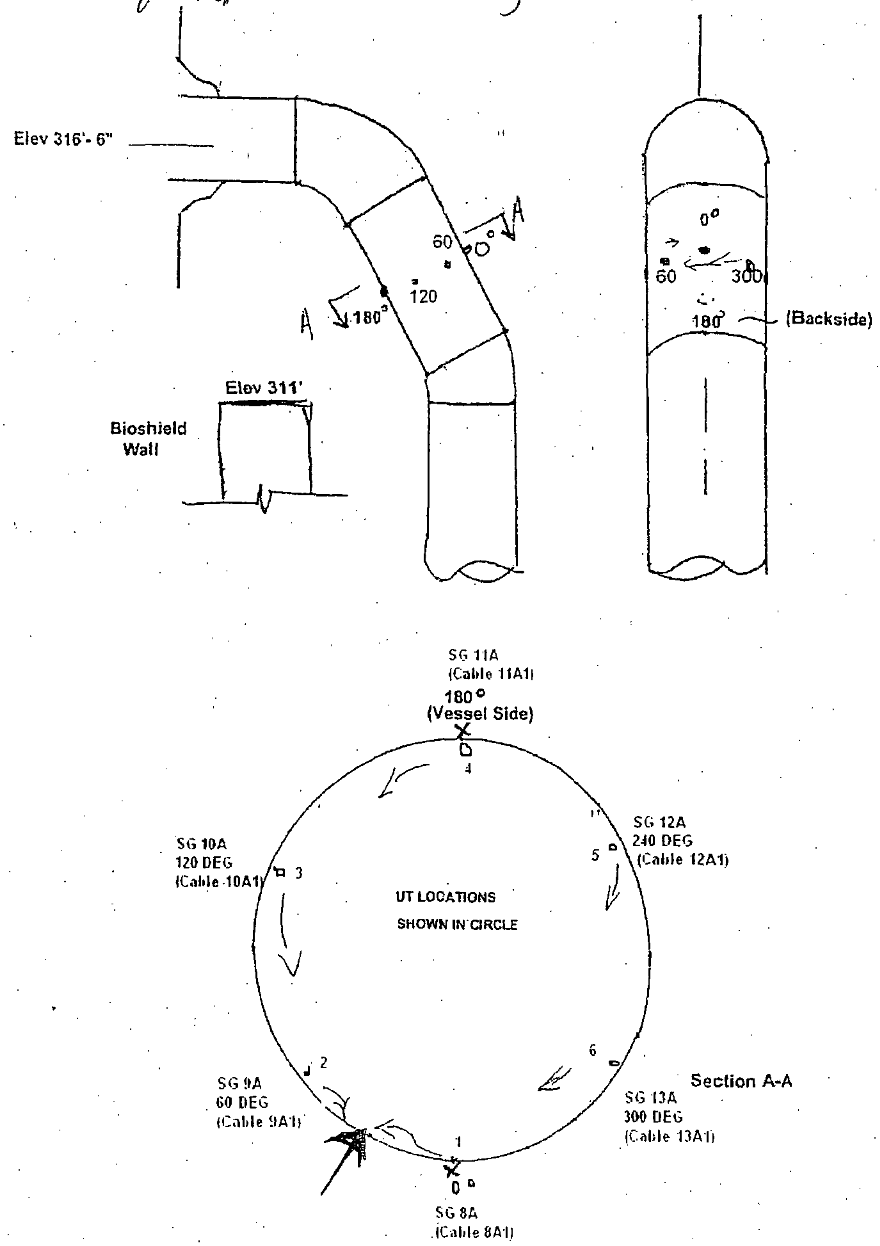


TA 2005-15 APPENDIX D
SKETCH 01

TA 2005-15 APPENDIX D SKETCH 04 PAGE 1 OF 8 MAIN STEAM LINE 'A'

UPPER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spence / Larry Spence 10/18/05 Reviewed By E J Betti / EJ Betti 10/18/05

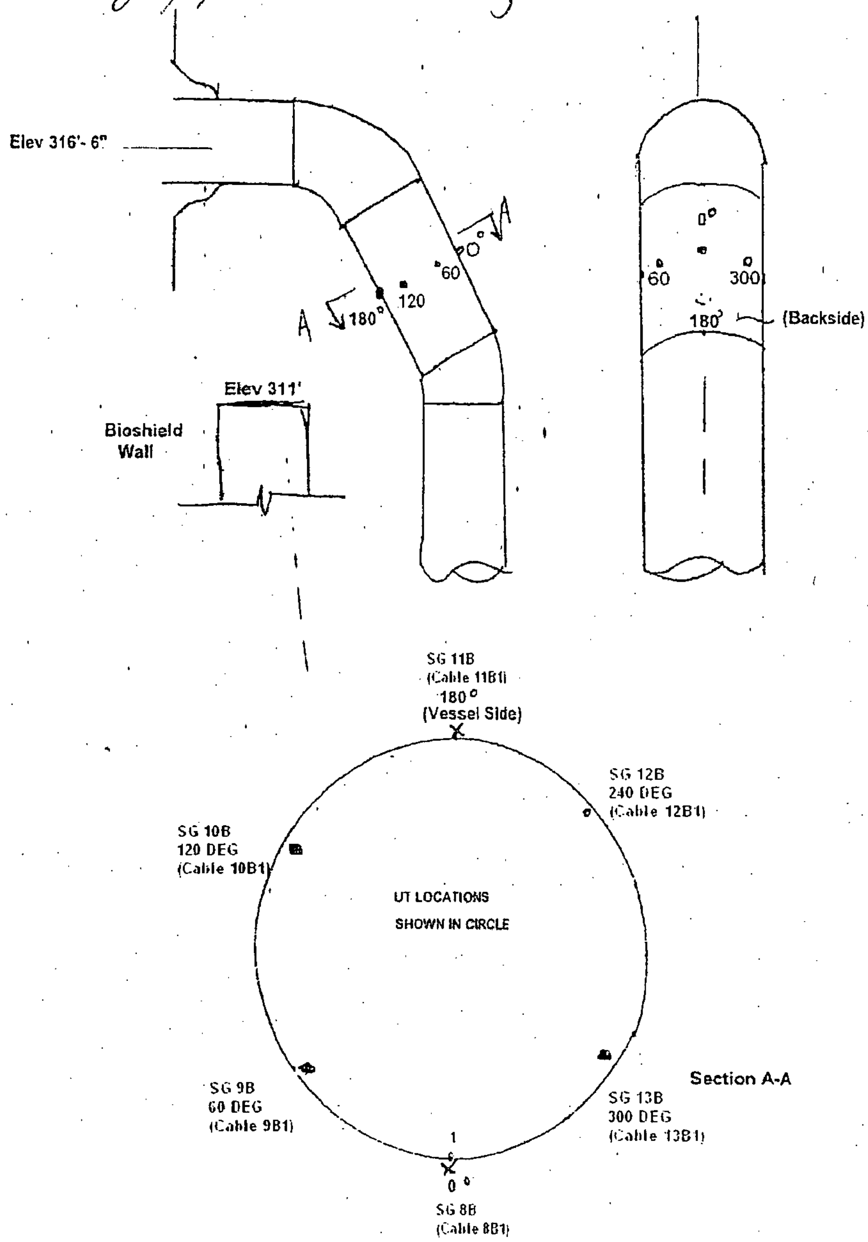


TA 2005-15 APPENDIX D SKETCH 04 PAGE 2 OF 8 MAIN STEAM LINE 'B'

UPPER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spencer Reviewed By E J Betti

Larry Spencer 10/18/05 10/18/05

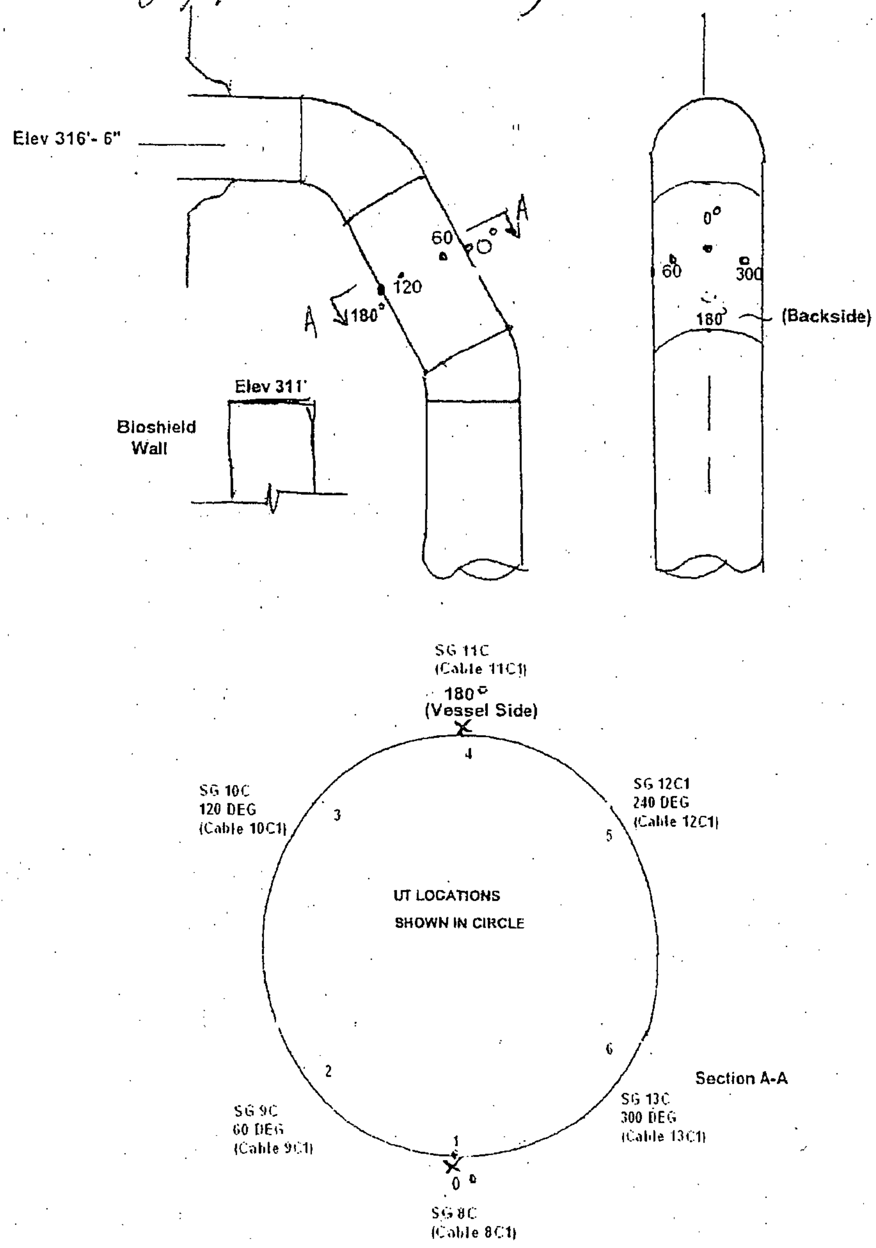


TA 2005-15 APPENDIX D SKETCH 04 PAGE 3 OF 8 MAIN STEAM LINE 'C'

UPPER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spencer Reviewed By E J Betti

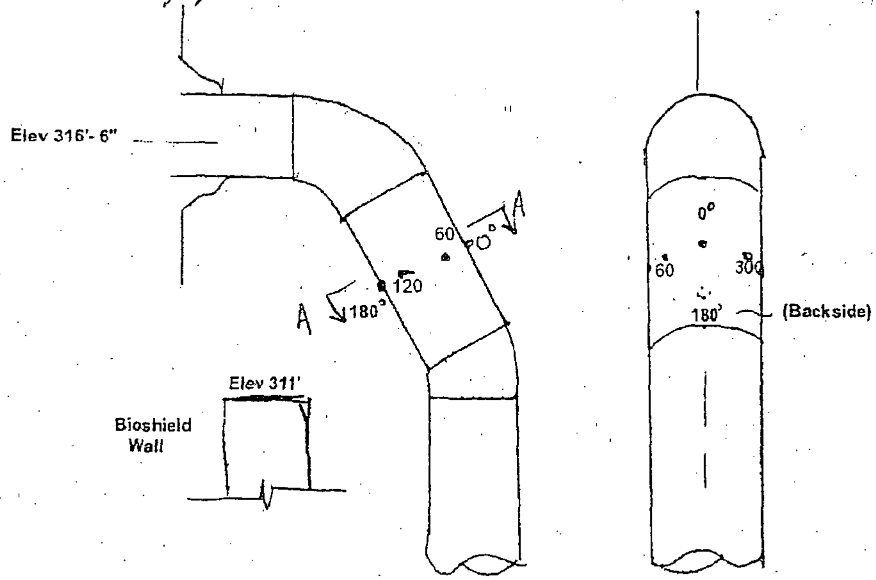
Larry Spencer 10/18/05 E J Betti 10/18/05

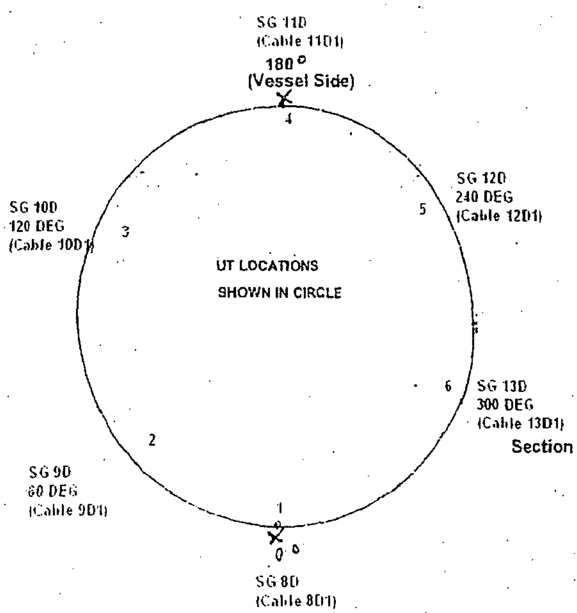


TA 2005-15 APPENDIX D SKETCH 04PAGE 4 OF 8 MAIN STEAM LINE 'D'

UPPER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spencer 10/18/05 Reviewed By EJ Beth 10/18/05



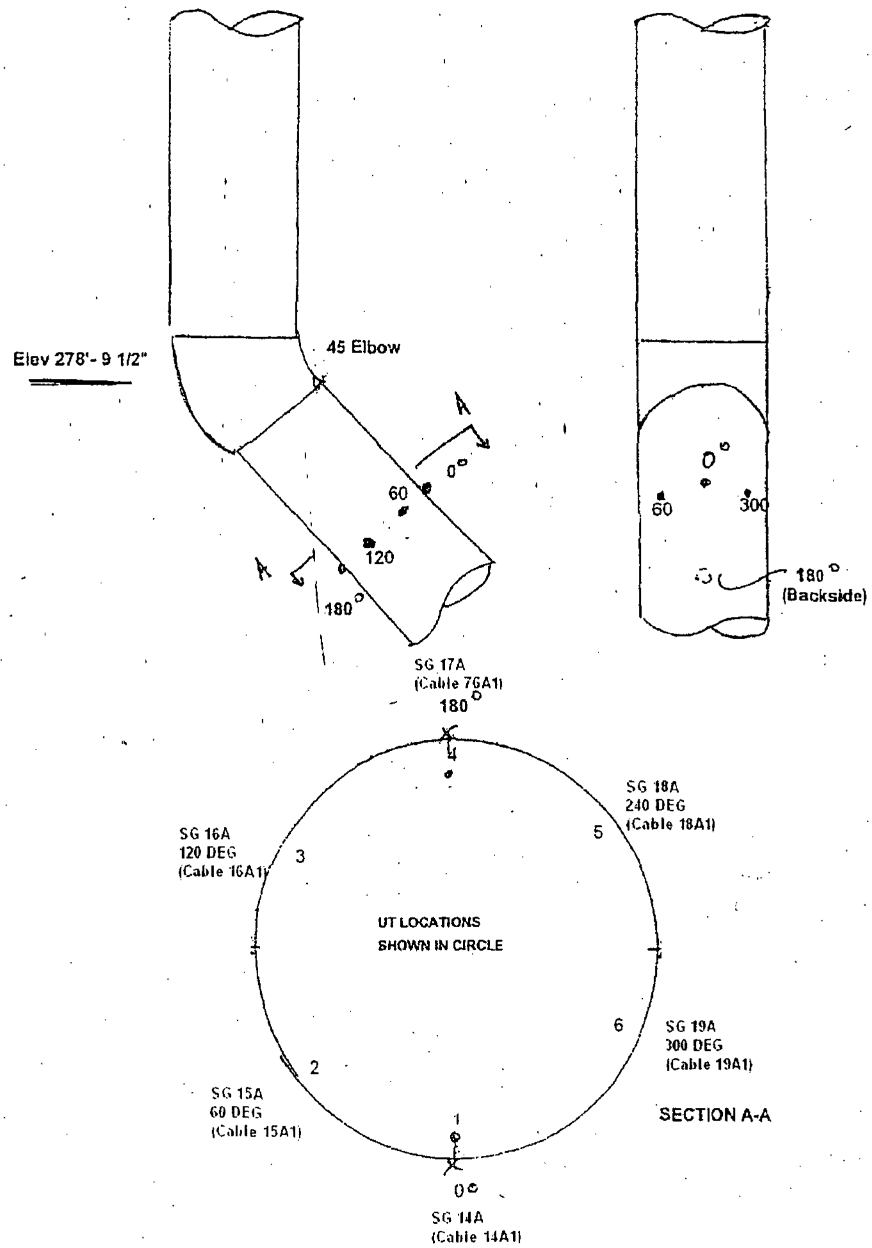


Section A-A

TA 2005-15 APPENDIX D SKETCH 04 PAGE 5 OF 8 MAIN STEAM LINE 'A'

LOWER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spencer 10/18/05 Reviewed By EJ Beth 10/18/05

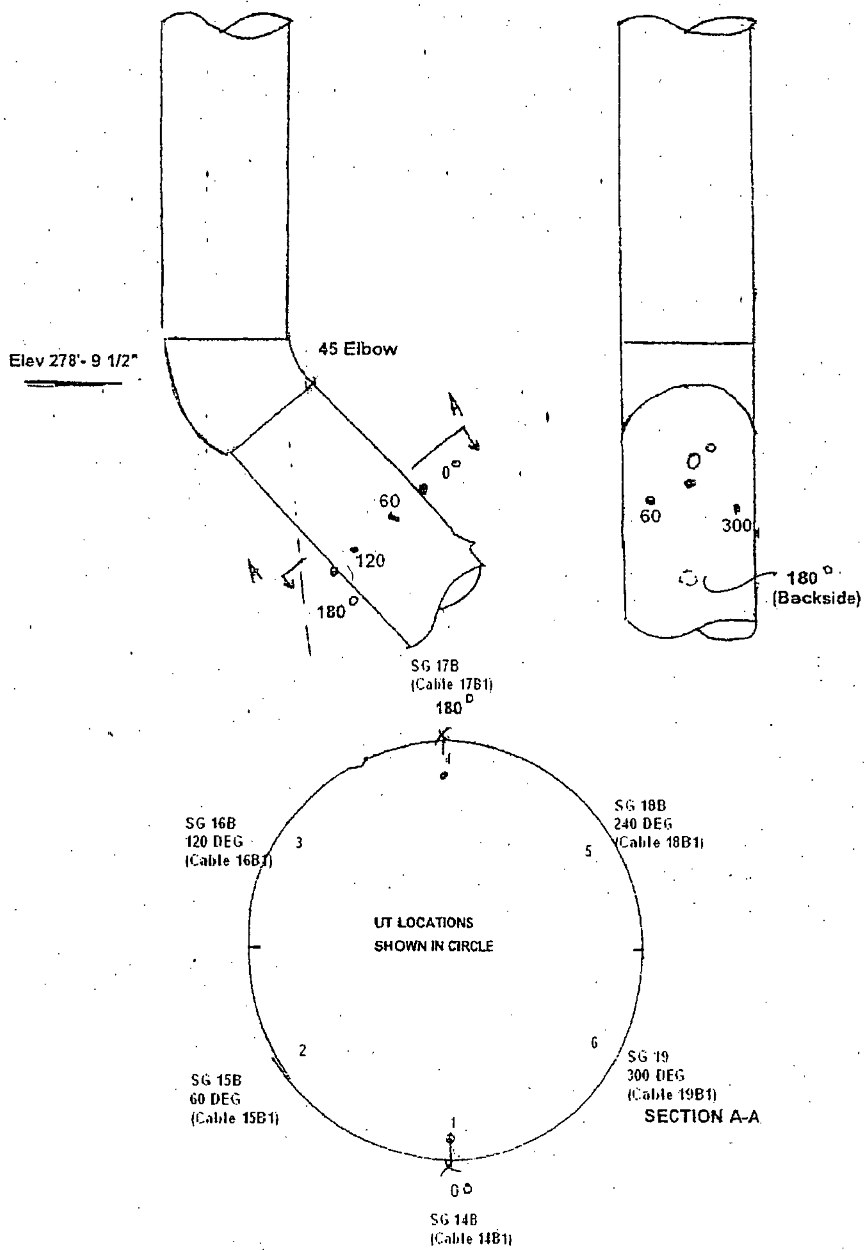


TA 2005-15 APPENDIX D SKETCH 04 PAGE 6 OF 8 MAIN STEAM LINE 'B'

LOWER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Sparks Reviewed By E J Beth

10/18/05 10/18/05

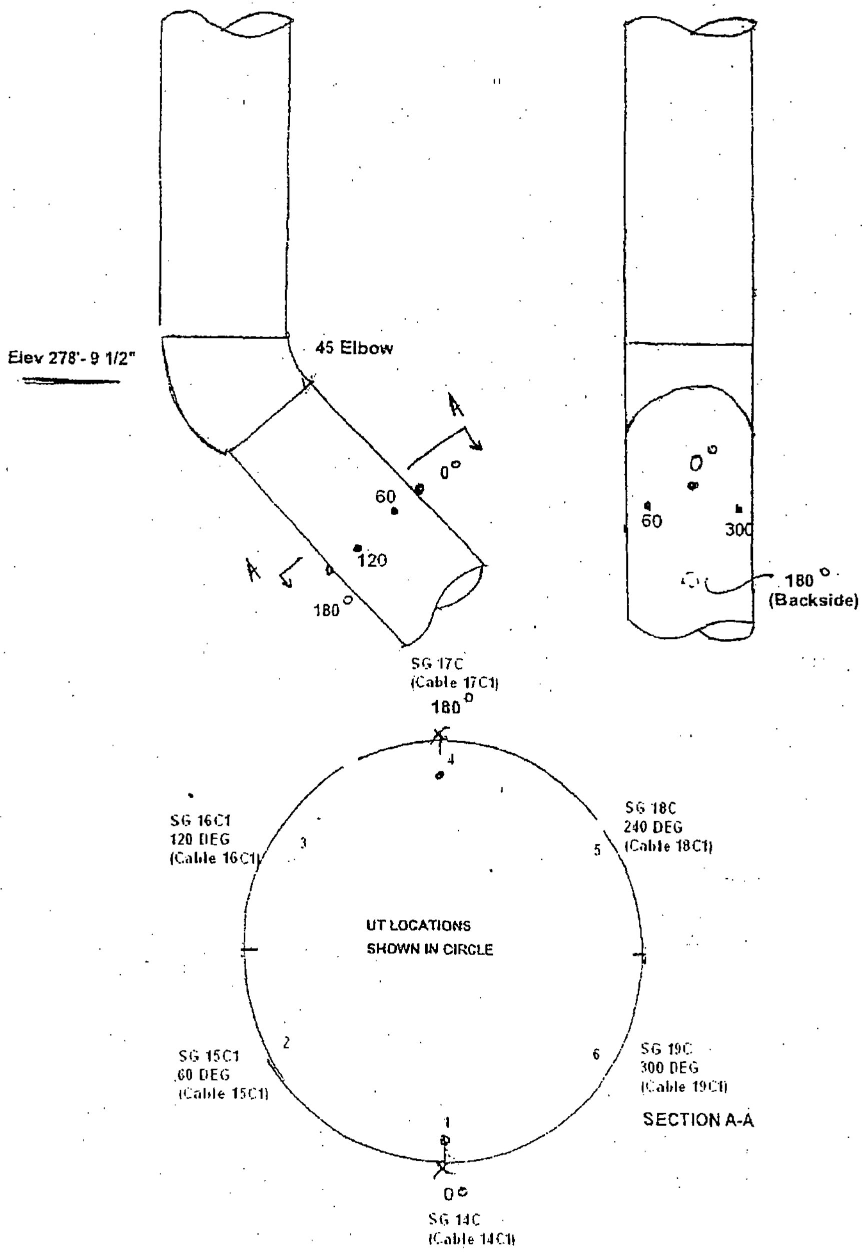


TA 2005-15 APPENDIX D SKETCH 04 PAGE 7 OF 8 MAIN STEAM LINE 'C'

LOWER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spencer Reviewed By E J Betti

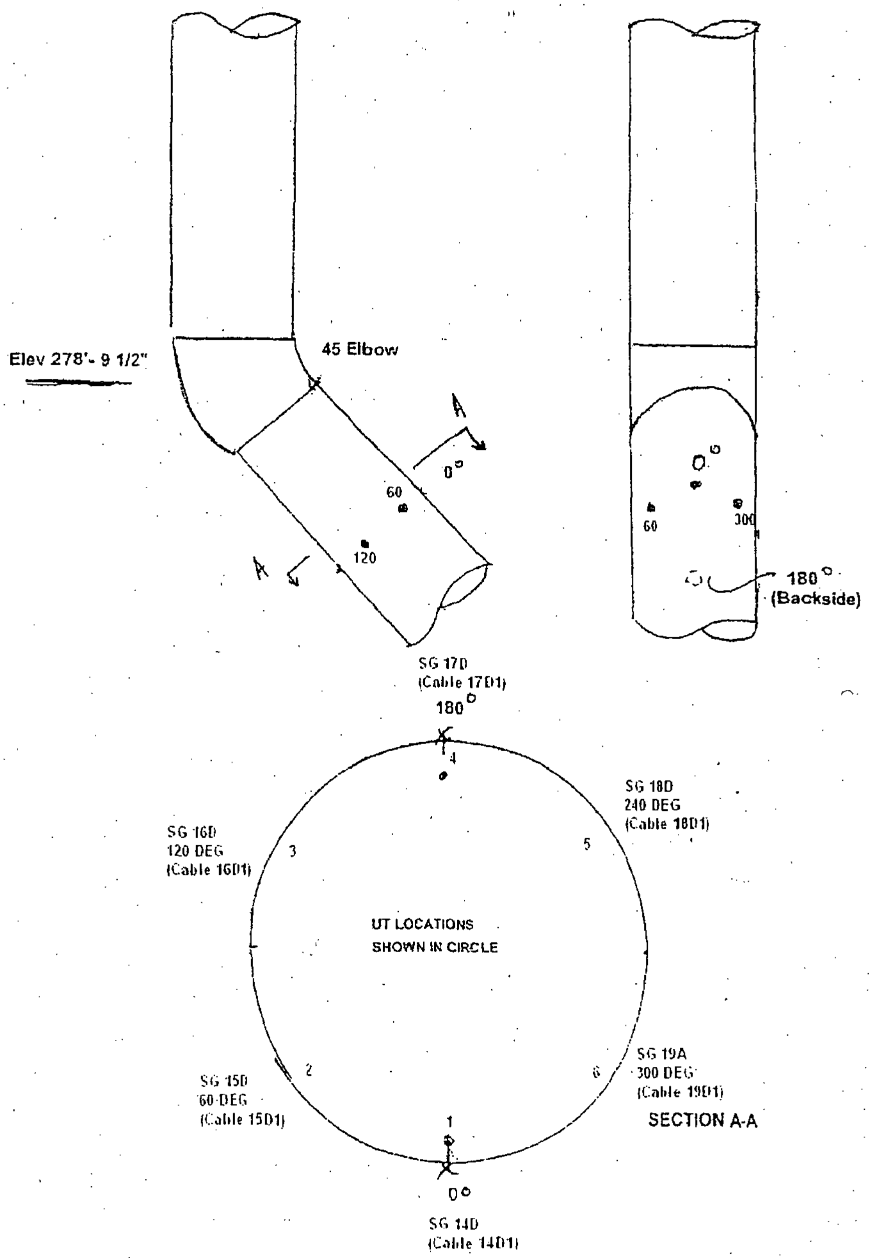
Larry Spencer 10/18/05 E J Betti 10/18/05



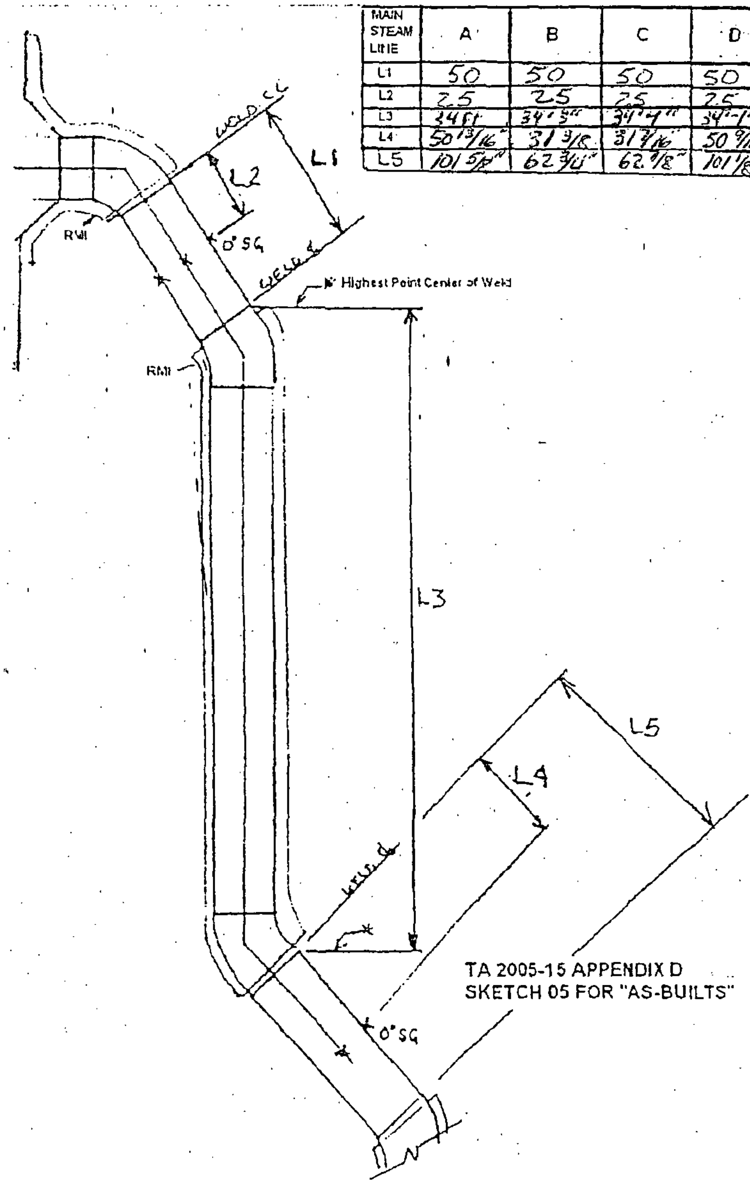
TA 2005-15 APPENDIX D SKETCH 04 PAGE 8 OF 8 MAIN STEAM LINE D

LOWER STRAIN GAGE LOCATION AND "UT" TEMPLATE

Prepared By Larry Spencer 10/18/05 Reviewed By EJ Deth 10/18/05



MAIN STEAM LINE	A	B	C	D
L1	50	50	50	50
L2	25	25	25	25
L3	34 ft	34' 5"	34' 4"	34'-1"
L4	50 13/16"	31 3/8	31 7/16"	50 9/16"
L5	101 5/8"	62 3/4"	62 7/8"	101 1/8"



TA 2005-15 APPENDIX D
SKETCH 05 FOR "AS-BUILTS"

DO

Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
Vermont Yankee
P.O. Box 0500
185 Old Ferry Road
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Entergy

March 26, 2006

Docket No. 50-271
BVY 06-031
TAC No. MC0761

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Vermont Yankee Nuclear Power Station**
Revision 1 to Steam Dryer Monitoring Plan

References:
1) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, License No. DPR-28 (Docket No. 50-271), Technical Specification Proposed Change No. 263, Extended Power Uprate," BVY 03-80, September 10, 2003

2) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, Extended Power Uprate – Regulatory Commitment Information Regarding Steam Dryer Monitoring and FIV Effects," BVY 06-019, February 26, 2006

This letter provides updated information pursuant to a regulatory commitment made in connection with the application by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy) for a license amendment (Reference 1, as supplemented) to increase the maximum authorized power level of the Vermont Yankee Nuclear Power Station (VYNPS) from 1593 megawatts thermal (MWt) to 1912 MWt.

Attachment 1 includes a revision (Revision 1) to the Steam Dryer Monitoring Plan (SDMP) that was previously provided in Reference 2. The SDMP will remain in effect until License Condition 3.M expires. The SDMP, together with the EPU Power Ascension Test Procedure (PATP) provides for monitoring, inspecting, evaluating, and prompt action in response to potential adverse flow effects on the steam dryer as a result of power uprate operation. These actions provide assurance of the continued structural integrity of the steam dryer under Extended Power Uprate conditions. Attachment 2 provides the justification, consistent with License Condition 3.M.4 for why this change does not require prior NRC approval.

Docket No. 7195
Attachment 13-2
27 Pages

There are no new regulatory commitments contained in this submittal.

If you have any questions or require additional information, please contact Mr. James DeVincentis at (802) 258-4236.

Sincerely,

Norman L. Rademacher
Director Nuclear Safety Assurance
Vermont Yankee Nuclear Power Station

Attachments (2)

cc: Mr. Samuel J. Collins (w/o attachments)
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Mr. David O'Brien, Commissioner
VT Department of Public Service
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Montpelier, Vermont 05620-2601

BVY 06-031
Docket No. 50-271

Attachment 1

Vermont Yankee Nuclear Power Station

Steam Dryer Monitoring Plan

Revision 1

Total number of pages in Attachment 1 (excluding this cover sheet) is 20.

Entergy Vermont Yankee Steam Dryer Monitoring Plan

Revision 1
March 25, 2006

Prepared By______________________/ 3/25/06
Craig J. Nichols Date

Reviewed By______________________/ 3/25/06
James Callaghan Date

Approved By______________________/ 3-25-6
John Dreyfuss Date

VERMONT YANKEE NUCLEAR POWER STATION
STEAM DRYER MONITORING PLAN

Introduction and Purpose

The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) 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. The SDMP also addresses long-term actions necessary to implement proposed License Condition 3.M. Through operating limits, periodic surveillances, and required actions, the impact of potentially adverse flow effects on the structural integrity of the steam dryer will be minimized.

The SDMP also provides information about the equipment and computer analysis methodologies used to monitor Steam Dryer performance.

Unacceptable steam dryer performance is a condition that could challenge steam dryer structural integrity and result in the generation of loose parts, cracks or tears in the steam dryer that result in excessive moisture carryover. During reactor power operation, performance is demonstrated through the measurement of a combination of plant parameters.

Scope

The SDMP is primarily an initial power ascension test plan designed to assess steam dryer performance from 100% OLTP (i.e., 1593 MWt) to 120% OLTP (i.e., 1912 MWt) and to perform confirmatory inspections for a period of time following initial and continued operation at uprated power levels. Power ascension to 120% OLTP will be achieved in a series of power step increases and holds at plateaus corresponding to 80 MWt increments above OLTP. Elements of this plan will be implemented before EPU power ascension testing, and others may continue after power ascension testing.

There are three main elements of the SDMP:

1. Slow and deliberate power ascension with defined hold points and durations, allowing time for monitoring and analysis;

2. A detailed power ascension monitoring and analysis program to trend steam dryer performance (primarily through the monitoring of steam dryer load signals and moisture carryover); and

3. A long term inspection program to verify steam dryer performance at EPU operating conditions.

Several elements of the SDMP also provide for completion of the necessary actions to satisfy the requirements of license conditions associated with the EPU license amendment. A complete tabulation of the provisions of the license condition and the implementing strategy to complete them is contained in Table 3.

Power Ascension

VYNPS procedure ERSTI-04-VY1-1409-000, "Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth," (PATP) will provide controls during power ascension testing and confirm acceptable plant performance. Other procedures may be entered to conduct specialized testing, such as condensate and feedwater testing. The VYNPS power ascension will occur over an extended period with gradual increases in power, hold periods, and engineering analyses of monitored data that must be approved by station management. Relevant data and evaluations will be transmitted to the NRC staff in accordance with the provisions of the license condition. The PATP includes:

1. Power ascension rate of 16 MWt/hr;

2. Hourly monitoring of steam dryer performance during power ascension (required by License Condition 3.M);

3. Four hour holds at each 40 MWt; and

4. Minimum 96 hour holds at each 80 MWt power plateau to perform steam dryer analysis allowing for NRC review, as appropriate (required by License Condition 3.M).

Monitoring Plans

Table 1 outlines the steam dryer surveillance requirements during reactor power ascension testing for EPU. The monitoring of moisture carryover and main steam line (MSL) pressure data provide measures for ensuring acceptable performance of the steam dryer. Frequent monitoring of these parameters will provide early detection capability of off-normal performance.

Proposed License Condition 3.M will require that steam dryer performance criteria are met and prompt action is taken if unacceptable performance is detected. Entergy has established two performance levels (Level 1 criteria and Level 2 criteria) as described in Table 2 for evaluating steam dryer performance during EPU power ascension testing. The Level 1 criteria correspond to the limits specified in the proposed license condition, while the Level 2 criteria are operating action levels that may indicate reductions in margin.

The comparison of measured plant data against defined criteria derived from the steam dryer analyses described below provide a means to assess continued steam dryer structural integrity under EPU conditions.

Main Steam Fluctuating Pressure Monitoring System (Details contained in VYC-3001)

- Main Steam Line Strain Gages
  Entergy has installed strain gages at two locations on each of the four MSLs in the primary containment and a data acquisition system (DAS) designed to reduce uncertainties in the evaluation of steam dryer loads. These strain gages and the associated data acquisition system have been selected and configured to maximize sensitivity and reliability while reducing data uncertainty.
- Acoustic Circuit Model (ACM)
  The CDI Acoustic Model has been improved based on results of the instrumented Steam Dryer at Exelon's Quad Cities Station. The revision has resulted in reduced uncertainty and a more conservative representation of the peak frequencies.

- Finite Element Model (FEM)
  In response to industry operating experience with steam dryer cover plate cracking, the ANSYS FEM has been updated to include more refined analysis of key dryer structural components such as the lower cover plate, the gussets, gusset shoes, and associated welds.
- Acoustic Circuit Analysis (ACA) System Uncertainty Evaluation
  The VY Acoustic Circuit Model (ACM) has been updated. The revised ACM was developed to bound maximum pressure loads from three sets of test data from the instrumented QC2 dryer testing performed in 2005. This updated ACM uncertainty assessment is based on the enhanced VY strain gage and data acquisition system and the revised CDI Bounding Pressure model parameters. The Scale Model Test (SMT) benchmark evaluation and previous 790 MWe QC2 benchmark assessment that provided the uncertainty bases for the prior ACM have been accordingly deleted from this calculation.
  The overall system uncertainty is based on the combination of the uncertainties of each of the elements. The uncertainty in the ACM loads is derived from the following sources:
  - Uncertainty of the ACM to conservatively predict pressure response at the significant frequencies
  - Uncertainty introduced by differences in sensor locations between QC2 and VY
  - Uncertainty introduced as a result of the ability of the ACM or Structural Model to match load and structural frequencies
  - Uncertainty resulting from strain gage and measure uncertainties.

  These uncertainties will then be combined by the square root sum of the squares (SRSS) method to assess the ACM load uncertainty.
  As calculated in VYC-3001 the overall system uncertainty is 38%. This value is used in the determination of the reduction of the limit curve factor resulting in the final limit curve, shown as Figures 1 through 8 of the SDMP. The contribution of each of the factors noted above is as follows:

Maximum Uncertainty of the ACA Methodology

ACM ability to conservatively match peak response at the highest frequencies:	32%
Difference in sensor locations from QC2 to VY	7%
Ability of ACM or Structural Model to match response frequencies:	15%
SG and DAS ability to measure pressure in Pipe	11%
Combined Uncertainty by Square Root Sum of the Squares	38%

- CFD Load Uncertainty (Remains unchanged from Revision 0 of VYC 3001)
  The CFD predictions using the Large Eddy Simulation runs for VY are on average 118% above the RMS values of in-plant data with a standard deviation of 82%. Therefore a conservative estimate of uncertainty is 118% - 82% = +38%. This would support 0% uncertainty for the CFD load. Conservatively, VY has maintained a 15% CFD load uncertainty in the Limit Curve Factor assessment.

  The CFD analysis with the +/-10% change in load step had an impact on the limiting stress by 4%. Therefore the CFD frequency uncertainty is determined to be 4%. The total CFD uncertainty; uncCFD= sqrt(15^2 + 4^2) = 16%.

- *System Monitoring Requirements*
  - During power ascension, steam dryer performance will be monitored hourly through the evaluation of pressure fluctuation data collected from strain gages installed on the MSLs.
  - The strain gage data collected hourly during power ascension will be compared against the stress limit curve that is provided as Figures 1 - 8 of the SDMP and is based on Entergy Calculation VYC-3001. If any frequency peak from the MSL strain gage data exceeds the stress limit curve (Level 1), Entergy will reduce the reactor power to a level at which the stress limit curve is not exceeded.
  - Additionally, Entergy will monitor data collected from accelerometers mounted to the main steam piping inside the drywell to provide additional insights into the strain gage signals.
  - During hold points at each 80 MWt power level above current licensed thermal power, the collected data, along with a comparison to the steam dryer limit curve, will be transmitted to the NRC staff.
  - For any circumstance requiring a revision to the steam dryer limit curve, Entergy will resolve uncertainties in the steam dryer analysis and provide the results of that evaluation to the NRC staff prior to further increases in reactor power.
  - Entergy will resolve uncertainties in the steam dryer analysis with the NRC staff within 90 days of issuance of the EPU license amendment. If resolution is not made within this time interval, reactor operation will not exceed 1593 MWt. These planned actions are in compliance with proposed License Condition 3.M.

Moisture Carryover

- Moisture carryover trending provides an indicator of steam dryer integrity. At each 40 MWt step, moisture carryover data will be taken and compared to the predetermined acceptance criteria (Table 2).
- Level 1 criterion (0.35%) is based on the maximum analyzed value.
- The data taken at each 80 MWt plateau will be evaluated and documented in the assessment sent to the NRC for information.

Other Monitoring

- Plant data that may be indicative of off-normal steam dryer performance will be monitored during power ascension (e.g., reactor water level, steam flow, feed flow, steam flow distribution between the individual steam lines). Plant data can provide an early indication of unacceptable steam dryer performance. The enhanced monitoring of selected plant parameters will be controlled by the PATP and other plant procedures.

NRC Notifications

- In accordance with proposed License Condition 3.M., at discrete power levels, and if the steam dryer stress limit curve (i.e., Level 1 criterion) is exceeded, Entergy will provide notifications to the NRC staff consisting of data and evaluations performed during EPU power ascension testing above 1593 MWt. Detailed discussions regarding new plant data, inspections, and evaluations will be held with NRC staff upon request. The designated NRC point of contact for such information is the NRC Project Manager for the VYNPS EPU.
- The results of the SDMP will 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 (i.e., steam dryer stress limit curve) will be submitted to the NRC staff within 90 days of license amendment issuance. Contemporary data and results from steam 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 steam 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 steam dryer structural integrity monitoring.

Long Term Monitoring

The long-term monitoring of plant parameters potentially indicative of steam dryer failure will be conducted, as recommended by General Electric Service Information Letter 644, Rev. 1 and consistent with License Condition 3.M.

Moisture Carryover

Per VYNPS station operating procedure OP-0631, “Radiochemistry,” moisture carryover is periodically monitored for moisture carryover during normal plant operations. VYNPS off-normal procedure ON-3178, “Increased Moisture Carryover,” provides guidance to evaluate any elevated moisture carryover results including that resulting from potential vessel internals damage. This monitoring will also provide insight into changes in moisture carryover values during changing reactor core configurations (control rod patterns)

Strain Gage Monitoring

As the strain gages will remain operational and can provide for future data collection, additional strain gage monitoring will be performed as determined appropriate during the remainder of the operating cycle following EPU implementation.

Inspections

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

Reporting to NRC

Steam Dryer Visual Inspections: The results of the visual inspections of the steam dryer conducted during the next three refueling outages shall be reported to the NRC staff within 60 days following startup from the respective refueling outage.

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 40 MWt (nominal) power step above 100% OLTP (Note 3)
3. Main steam line data from accelerometers	At least once at every 40 MWt (nominal) power step above 100% OLTP (Note 3) AND Within one hour after achieving every 40 MWt (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 an 80 MWt 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 40 MWt, 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 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 MSL pressure data is also required to be performed once at each 40 MWt power step above 1593 MWt and within one hour of achieving each 40 MWt 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 (i.e., 1593 MWt). If the surveillance is met at a given power level, additional surveillances do not need to be performed at a 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 40 MWt power step from at least three of the four MSLs, 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
Level 2: • Moisture carryover exceeds 0.1% OR • Moisture carryover exceeds 0.1% and increases by > 50% over the average of the three previous measurements taken at > 1593 MWt OR • Pressure data exceed Level 2 Spectra[1]	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.
Level 1: • Moisture carryover exceeds 0.35% OR • Pressure data exceed Level 1 Spectra[1]	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 steam 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 20 MWt and 40 MWt, 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).

Table 3
Steam Dryer License Conditions

License Condition	Requirement	Implementing Actions
3.M.1.a	Entergy shall monitor hourly the 32 main steam line (MSL) strain gages during power ascension above 1593 MWt for increasing pressure fluctuations in the steam lines.	During initial power ascension above 1593 MWt, data from at least 32 strain gages will be collected and evaluated by Entergy's power ascension test team to verify that acoustic signals indicative of increasing pressure fluctuations in the steam lines are not challenging the steam dryer stress limit curve. Monitoring will be conducted hourly during any power ascension above a previously attained power level. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.b	Entergy shall hold the facility for 24 hours at 105%, 110%, and 115% of OLTP (i.e., 1593 MWt) to collect data from the 32 MSL strain gages required by License Condition 3.M.1.a, conduct plant inspections and walkdowns, and evaluate steam dryer performance based on these data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.	The PATP has established test plateau increments of approximately 80 MWt (corresponding to 105%, 110%, and 115% of 1593 MWt). Reactor power will not be increased above the plateau for a minimum of 96 hours. During the first 24 hours of steady state operation at each plateau, strain gage data will be collected from all available strain gages (minimum of 32) and evaluated to demonstrate acceptable steam dryer performance. Additionally, moisture carryover measurements will be made at each plateau and every 24 hours during power ascension testing. At the 80 MWt plateau hold points, Entergy will conduct plant walkdowns and inspections of plant equipment, including piping and components identified as potentially vulnerable to flow-induced vibration (FIV) in accordance with the PATP and other plant procedures. Steam dryer performance will be evaluated based on these data. The 24-hour period and the 96-hour period may overlap once the transmittal is provided to the NRC staff. The evaluations of steam dryer performance, based on the data collected during each of the 80 MWt plateaus, as well as the results of walkdowns and other measurements of FIV for various piping and plant components, will be provided to the NRC staff. Arrangements have been made for electronic transmission through email and/or uploading to a designated website. Upon the NRC Project Manager confirming receipt of the steam dryer data and performance evaluation, the 96 hours of hold

License Condition	Requirement	Implementing Actions
		time will commence. Power will not be increased above each of the 80 MWt hold points until the expiration of the 96-hour hold. If during the hold periods, or at any other time, the NRC staff requests a discussion or requires clarification of the engineering evaluations provided in fulfillment of this requirement, Entergy will promptly arrange for such discussions. Entergy will maintain a power ascension control center, including management oversight, available 24/7 on-site during power increases to previously unattained power levels. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.c	If any frequency peak from the MSL strain gage data exceeds the limit curve established by Entergy Nuclear Operations, Inc. and submitted to the NRC staff prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall return the facility to a power level at which the limit curve is not exceeded. Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.	The steam dryer stress limit curve provided herewith contains Level 1 and Level 2 criteria. If frequency peaks from MSL strain gage data exceed either Level 1 or Level 2 criteria, prompt action will be taken in response to the potential adverse flow effects that might result. Similar actions will occur if moisture carryover is excessive and previously established Level 1 or Level 2 criteria are exceeded. The Level 2 criteria represent a conservative action level for evaluation and close monitoring of steam dryer performance—not a limit. The Level 1 criteria represent analytical limits and additional actions may be warranted. If any frequency peak from the MSL strain gage data exceeds the Level 1 steam dryer stress limit curve, Entergy will reduce reactor power to a power level at which the limit curve is not exceeded. (Reference ERSTI-04-VY1-1409-000) Prior to any further increase in power above the reduced power level, Entergy will (1) resolve the uncertainties in the steam dryer analysis, (2) evaluate and document the adequate structural integrity of the steam dryer, and (3) provide that documentation to the NRC staff. Any revision to the limit curve based on this evaluation will be provided to the NRC staff. (Reference PCRS tracking item WT-VTY-2005-00000-01803)

License Condition	Requirement	Implementing Actions
3.M.1.d	In addition to evaluating the MSL strain gage data, Entergy Nuclear Operations, Inc. shall monitor reactor pressure vessel water level instrumentation or MSL piping accelerometers on an hourly basis during power ascension above OLTP. If resonance frequencies are identified as increasing above nominal levels in proportion to strain gage instrumentation data, Entergy Nuclear Operations, Inc. shall stop power ascension, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.	Accelerometers mounted on MSL piping will be monitored on an hourly basis during power ascension testing to identify if resonances are increasing above nominal levels in proportion to MSL strain gage data. If abnormally increasing resonant frequencies are detected, power ascension will be halted. Prior to any further increase in power, Entergy will (1) evaluate and document the adequate structural integrity of the steam dryer, and (2) provide that documentation to the NRC staff. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.e	Following start-up testing, Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis and provide that resolution to the NRC staff by facsimile or electronic transmission to the NRC project manager. If the uncertainties are not resolved within 90 days of issuance of the license amendment authorizing operation at 1912 MWt, Entergy Nuclear Operations, Inc. shall return the facility to OLTP.	After collecting strain gage data at approximately the EPU full power level, Entergy will resolve the uncertainties in the steam dryer analysis and provide documentation of the resolution to the NRC staff. If these actions cannot be achieved within 90 days of issuance of the license amendment, reactor power will be limited to 1593 MWt. This uncertainty evaluation may be prepared and provided to the NRC prior to reaching EPU full power levels associated with any proposed revision to the steam dryer limit curve. (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.2.a	Prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall install 32 additional strain gages on the main steam piping and shall enhance the data acquisition system in order to reduce the measurement uncertainty associated with the acoustic circuit model (ACM).	COMPLETE - To enhance performance and improve the accuracy of the steam dryer measurement system, Entergy has installed 48 strain gages on MSL piping and will maintain a minimum of 32 operable strain gages during power ascension testing. The data acquisition system (DAS) was upgraded to reduce the uncertainty associated with the ACM. (Reference Entergy VYNPS Temporary Alteration TA-2005-15 R1)
3.M.2.b	In the event that acoustic signals are identified that challenge the limit curve during power ascension	COMPLETE - As part of the evaluation performed at 1673MWt Entergy Vermont Yankee employed a new revision of the Acoustic Circuit Model. In

License Condition	Requirement	Implementing Actions
	above OLTP, Entergy Nuclear Operations, Inc. shall evaluate steam dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency.	association with the benchmarking of the new ACM a frequency specific assessment of the ACM uncertainty was performed and is contained in Calculation VYC-3001, Rev. 1. (Reference ERSTI-04-VY1-1409-000) (Reference VYC-3001 Rev. 1)
3.M.2.c	After reaching 120% of OLTP, Entergy Nuclear Operations, Inc. shall obtain measurements from the MSL strain gages and establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the steam dryer monitoring plan (SDMP) limit curve with the updated ACM load definition and revised instrument uncertainty, which will be provided to the NRC staff.	After collecting strain gage data at approximately the EPU full power level, Entergy will establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the stress limit curve with the updated ACM load definition and revised instrument uncertainty. This information will be included in the report to the NRC staff being made in accordance with License Condition 3.M.1.e. (Reference PCRS tracking item WT-VTY-2006-00000-00249)
3.M.2.d	During power ascension above OLTP, if an engineering evaluation is required in accordance with the SDMP, Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to ±10% and assure that peak responses that fall within this uncertainty band are addressed.	COMPLETE - As part of the evaluation performed at 1673MWt Entergy Vermont Yankee completed revisions to the VY Steam Dryer model used in the Finite Element Model (FEM). Additional analysis of the FEM output was performed to assess the frequency uncertainties. The results of this assessment are contained in Calculation VYC-3001, Rev. 1. (Reference ERSTI-04-VY1-1409-000)
3.M.2.e	Entergy Nuclear Operations, Inc. shall revise the SDMP to reflect long-term monitoring of plant parameters potentially indicative of steam dryer failure; to reflect consistency of the facility's steam dryer inspection program with General Electric Services Information Letter 644, Revision 1; and to identify the NRC Project Manager for the facility as the point of contact for providing SDMP information during power ascension.	The revised SDMP provides long-term monitoring of steam dryer performance in accordance with GE SIL 644 Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00250) COMPLETE - The SDMP and the PATP identify the NRC Project Manager for the VYNPS EPU as the point of contact for providing SDMP information during power ascension. (Reference ERSTI-04-VY1-1409-000) COMPLETE - For moisture carryover, procedures OP-0631 and ON-3178 provide for long-term monitoring and controls.

License Condition	Requirement	Implementing Actions
3.M.2.f	Entergy Nuclear Operations, Inc. shall submit the final extended power uprate (EPU) steam dryer load definition for the facility to the NRC upon completion of the power ascension test program.	The final EPU steam dryer load definition will be included in the report provided to the NRC staff in accordance with License Conditions 3.M.1.e. and 3.M.2.c. (Reference PCRS tracking item WT-VTY-2006-00000-00251)
3.M.2.g	Entergy Nuclear Operations, Inc. shall submit the flow-induced vibration related portions of the EPU startup test procedure to the NRC, including methodology for updating the limit curve, prior to initial power ascension above OLTP.	COMPLETE - Entergy letter BVY 06-019 forwards the FIV-related portions of the EPU power ascension test procedure to the NRC. (Reference ERSTI-04-VY1-1409-000) The methodology for updating the steam dryer stress limit curve is as follows: Prerequisite: Generate report resolving uncertainties in the steam dryer analysis. 1. Collect representative data from 32 strain gages at eight MSL locations. 2. Using a plant-specific ACM, analyze strain gage data to determine steam dryer loads. 3. Input ACM loads into a finite element model to determine dryer stresses. 4. Perform an updated uncertainty evaluation. 5. Generate revised steam dryer stress limit curve(s). (Reference PCRS tracking item WT-VTY-2006-00000-00252)
3.M.3(a)	Entergy shall prepare the EPU startup test procedure to include the stress limit curve to be applied for evaluating steam dryer performance.	COMPLETE - The steam dryer stress limit curve to be applied for evaluating steam dryer performance during power ascension is provided herewith. The limit curve was developed on the basis of calculation VYC-3001, which is incorporated by reference into the EPU PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(b)	Entergy shall prepare the EPU startup test procedure to include specific hold points and their duration during EPU power ascension.	COMPLETE - Specific hold points and durations are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(c)	Entergy shall prepare the EPU startup test procedure to include activities to be accomplished during hold points.	COMPLETE - Activities to be accomplished during hold points are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

License Condition	Requirement	Implementing Actions
3.M.3(d)	Entergy shall prepare the EPU startup test procedure to include plant parameters to be monitored.	COMPLETE - Plant parameters to be monitored are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(e)	Entergy shall prepare the EPU startup test procedure to include inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during the hold points.	COMPLETE - Inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during hold points are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(f)	Entergy shall prepare the EPU startup test procedure to include methods to be used to trend plant parameters.	COMPLETE - Methods to be used to trend plant parameters are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(g)	Entergy shall prepare the EPU startup test procedure to include acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections.	COMPLETE - Acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(h)	Entergy shall prepare the EPU startup test procedure to include actions to be taken if acceptance criteria are not satisfied.	COMPLETE - Actions to be taken if acceptance criteria are not satisfied are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(i)	Entergy shall prepare the EPU startup test procedure to include verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer.	COMPLETE - Verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer is specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

3.M.4	When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04.	These restrictions are provided in the PATP and/or the SDMP. (Reference ERSTI-04-VY1-1409-000)
3.M.5	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00253) (Reference PCRS tracking item WT-VTY-2006-00000-00254) (Reference PCRS tracking item WT-VTY-2006-00000-00255)

3.M.6	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. The results will be documented in a report and submitted to the NRC within 60 days following completion of all EPU power ascension testing. (Reference PCRS tracking item WT-VTY-2006-00000-00256) (Reference PCRS tracking item WT-VTY-2006-00000-00257) (Reference PCRS tracking item WT-VTY-2006-00000-00258)
3.M.7	The requirements of paragraph 3.M.4 above for meeting the SDMP 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 paragraph 4 shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.	When operating above 1593 MWt, the operating limits, required actions, and surveillances specified in the SDMP will be met. Those key attributes of the SDMP specified in License Condition 3.M.4 will not be made less restrictive without prior NRC approval. (Reference PCRS tracking item WT-VTY-2006-00000-00259)
3.M.8	This license condition shall expire upon satisfaction of the requirements in paragraphs 5, 6, and 7 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.	(Reference PCRS tracking item WT-VTY-2006-00000-00260)

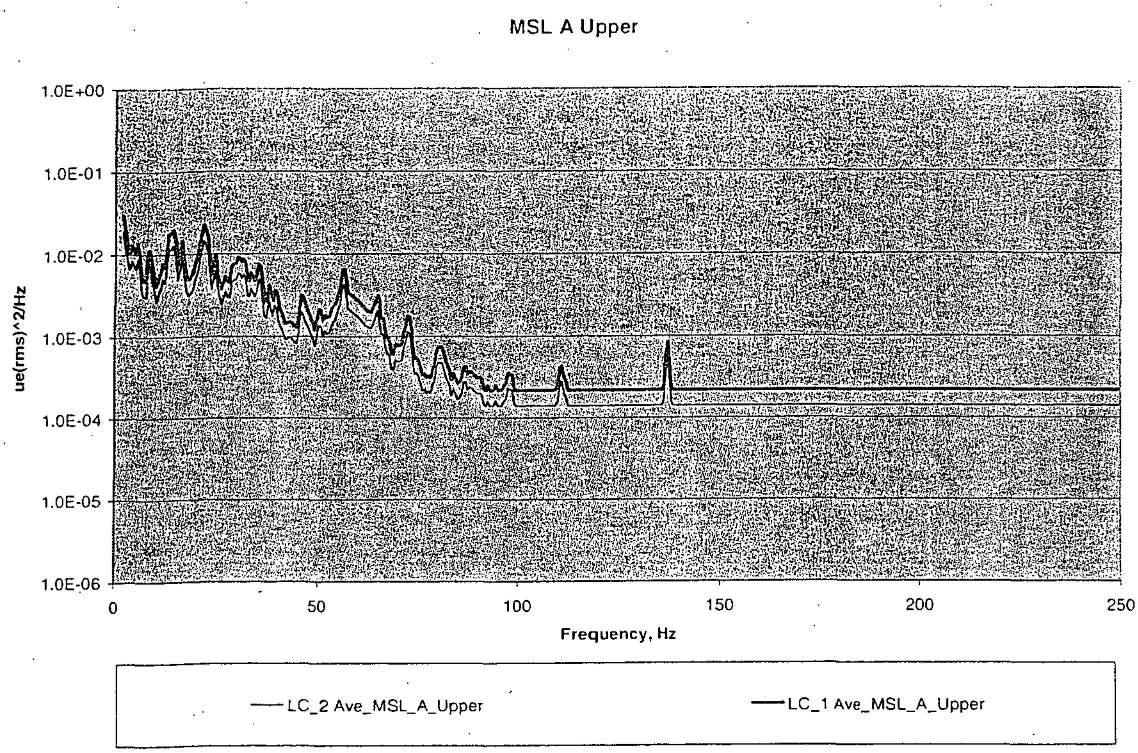

Figure 1: Steam Dryer Stress Limit Curve – MSL 'A' Upper

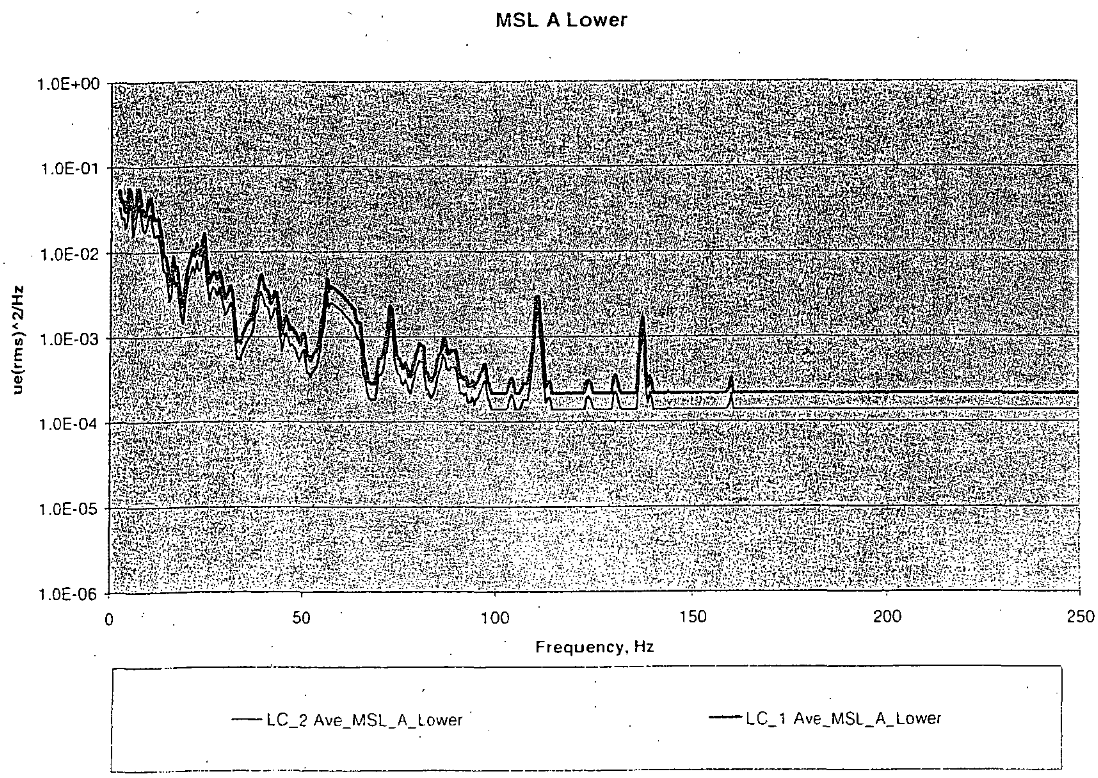

Figure 2: Steam Dryer Stress Limit Curve – MSL 'A' Lower

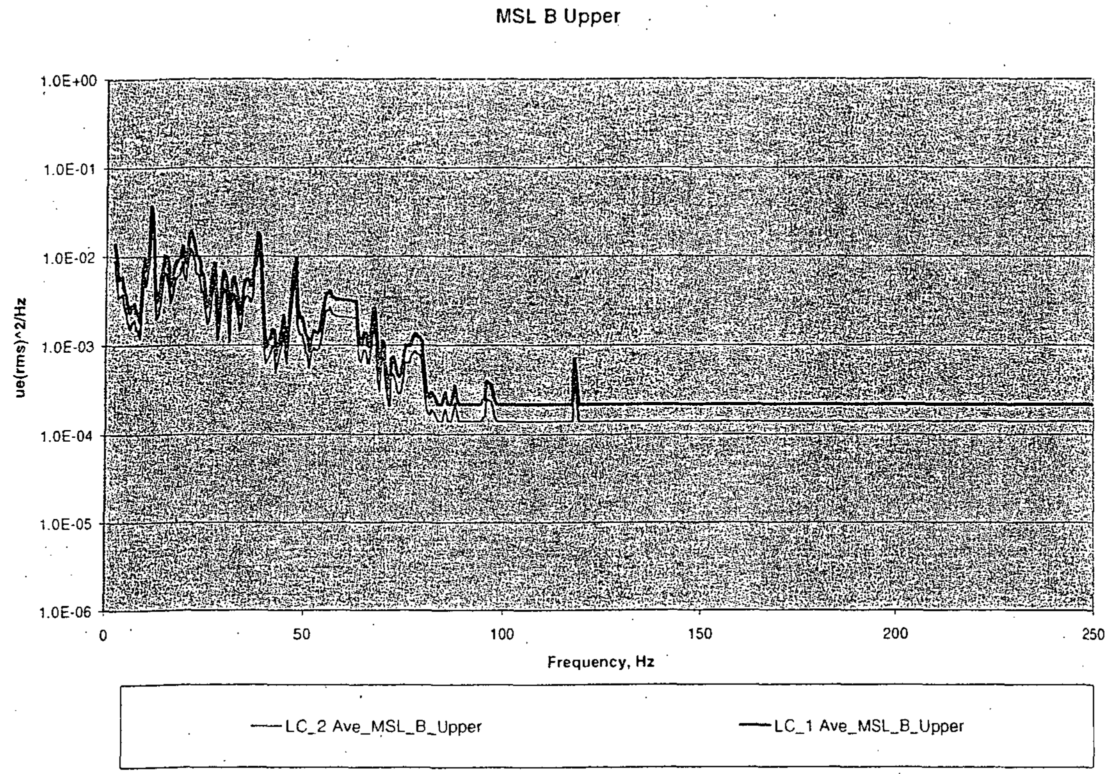

Figure 3: Steam Dryer Stress Limit Curve – MSL 'B' Upper

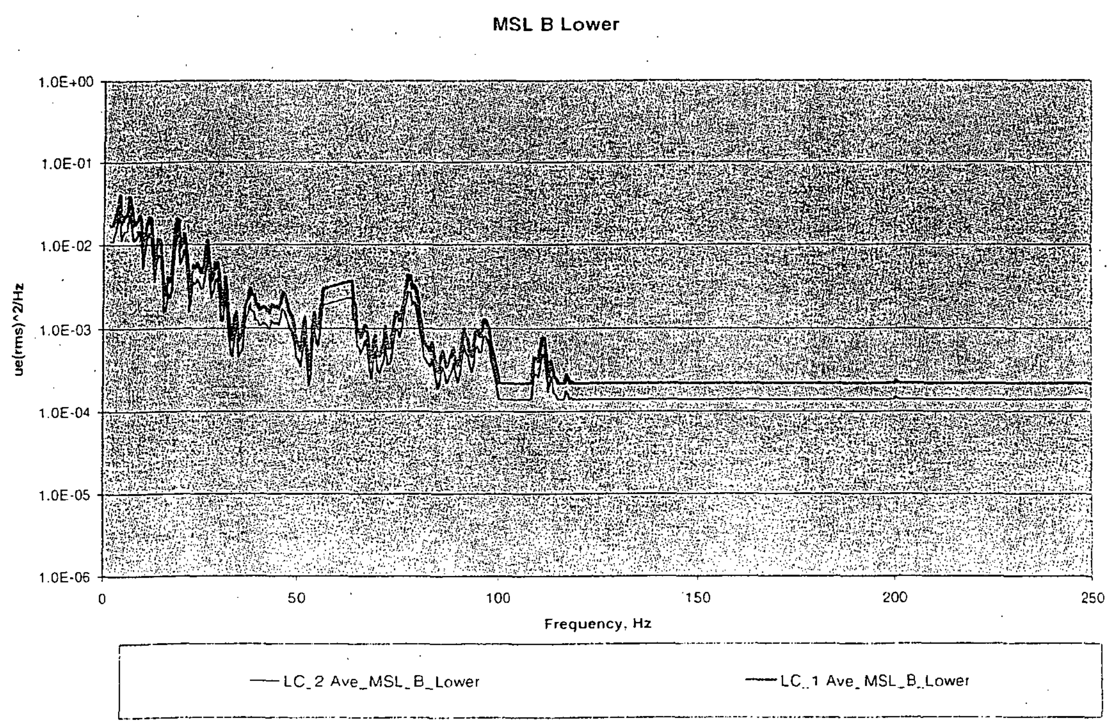

Figure 4: Steam Dryer Stress Limit Curve – MSL 'B' Lower

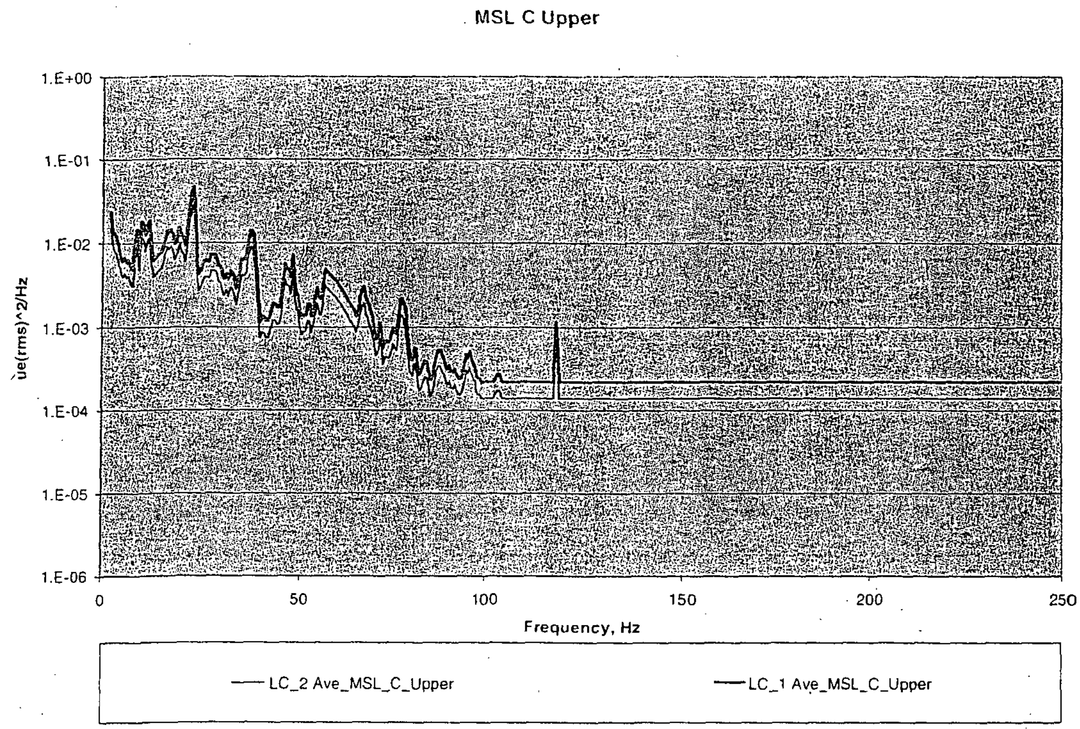

Figure 5: Steam Dryer Stress Limit Curve – MSL 'C' Upper

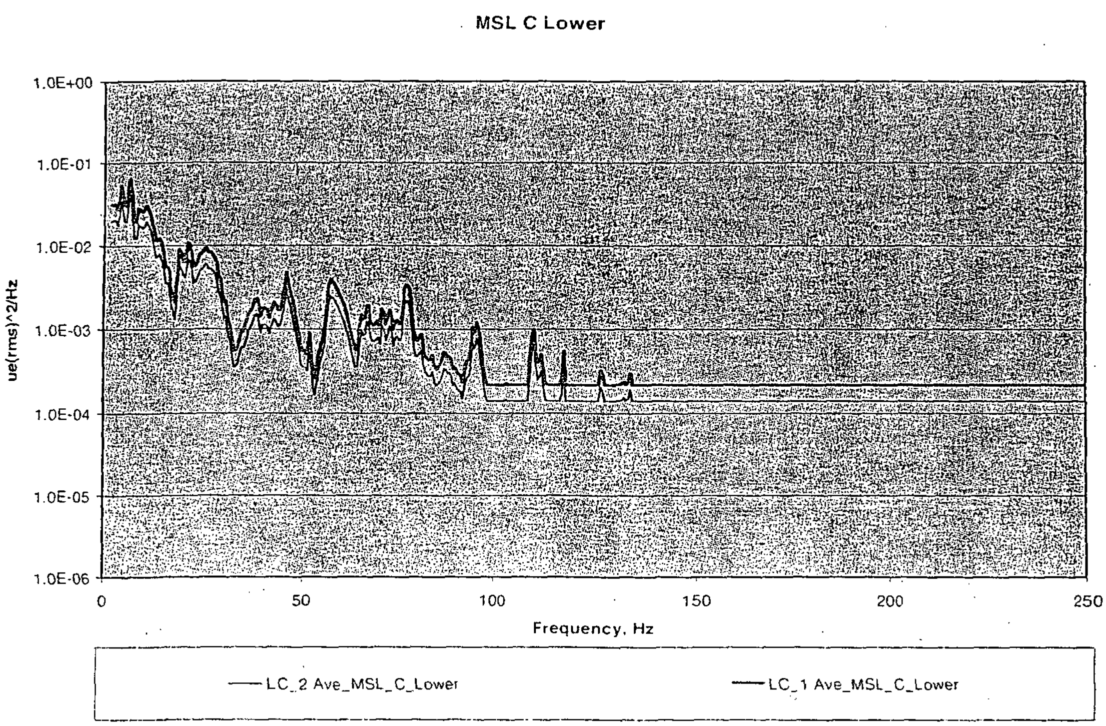

Figure 6: Steam Dryer Stress Limit Curve – MSL 'C' Lower

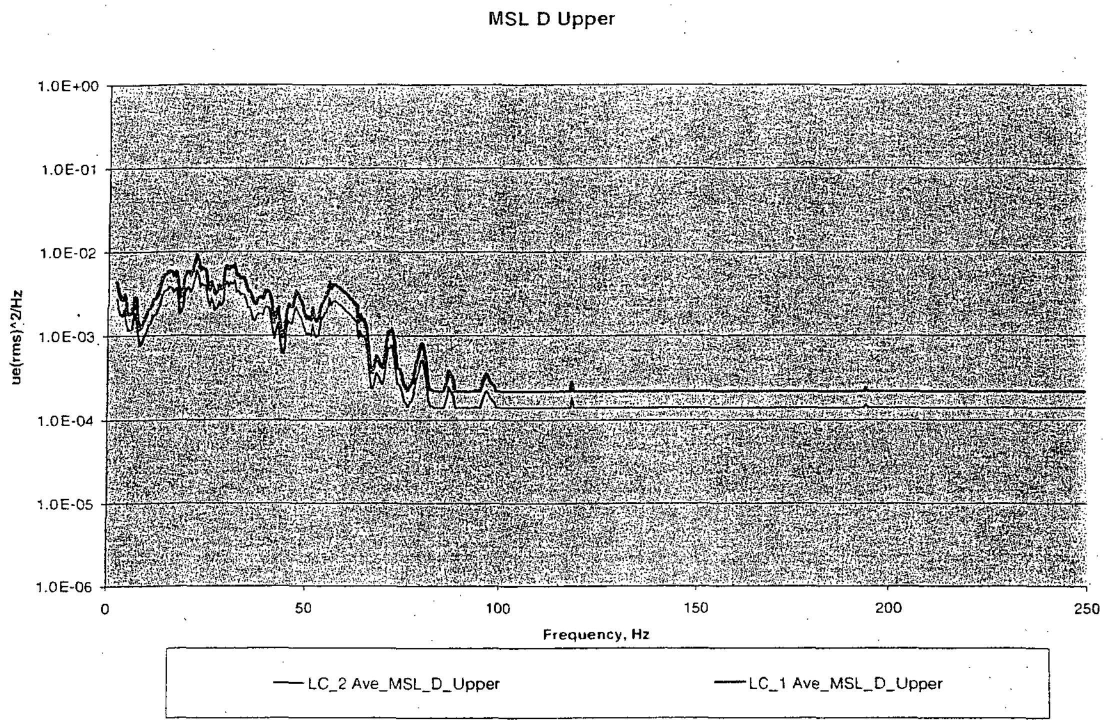

Figure 7: Steam Dryer Stress Limit Curve – MSL 'D' Upper

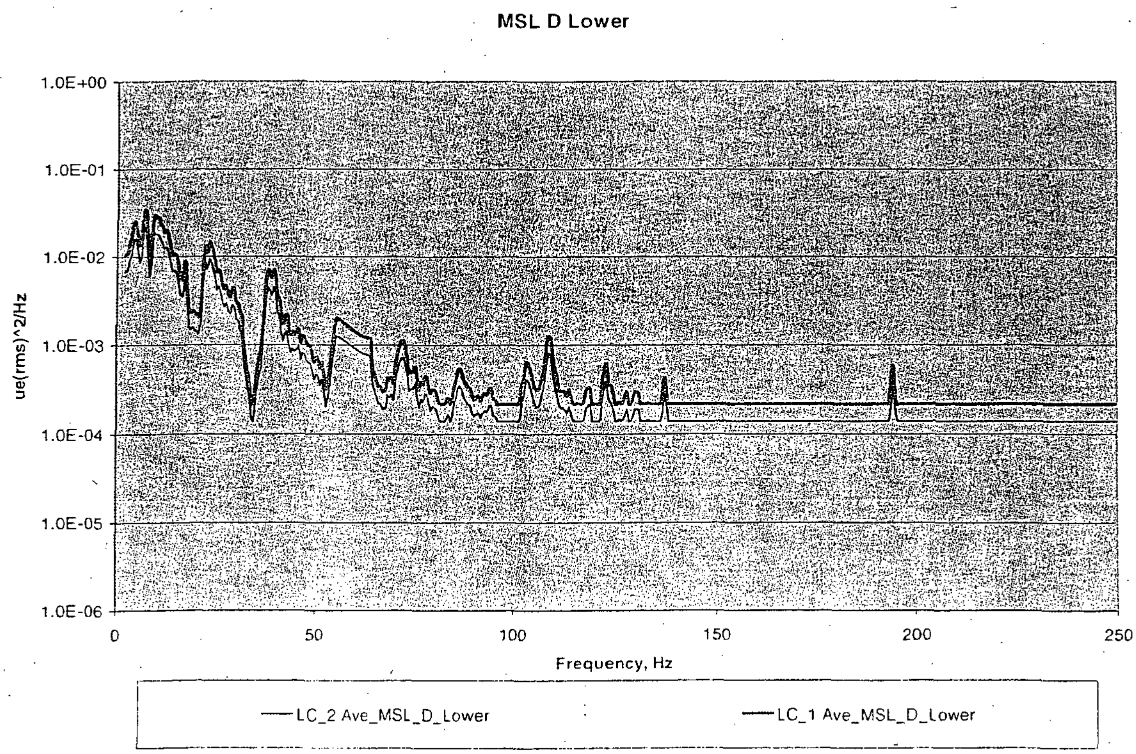

Figure 8: Steam Dryer Stress Limit Curve – MSL 'D' Lower

Attachment 2

Vermont Yankee Nuclear Power Station

Steam Dryer Monitoring Plan

Basis for Compliance with License Condition 3.M.4

Total number of pages in Attachment 2
(excluding this cover sheet) is 3).

Bases for Compliance with License Condition 3.M.4

Reference: ERSTI-04-VY1-1409-000, "Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWt (PATP)

Purpose:

This document assesses compliance of changes to the Vermont Yankee steam dryer monitoring models with Vermont Yankee License Condition 3.M.4. In addition, an assessment of the ability of the steam dryer to support operation at the next power plateau is also included herein.

Discussion:

On March 4, 2006 Vermont Yankee Nuclear Power Stations (VYNPS) raised reactor power from 1593 MWt to approximately 1673 MWt, the first power ascension plateau. At that power level the lower set of strain gages on the 'A' main steam line provided an indication at 137 Hz that exceeded the Level 2 Acceptance Criteria of the Steam Dryer Monitoring Plan (SDMP). Entergy Vermont Yankee entered the corrective action program and performed an engineering evaluation which concluded that continuous operation at the first power plateau (1673 MWt) would not challenge steam dryer integrity.

Entergy Vermont Yankee uses an Acoustic Circuit Model (ACM) and an ANSYS Finite Element Model (FEM) to monitor performance of the steam dryer. To address the aforementioned 137 Hz peak, these models have been updated in accordance with requirements established in License Condition 3.M of the Vermont Yankee Extended Power Uprate License Amendment. Details of these changes are discussed later in this document.

The scope of the analyses performed and the results are included in Entergy Vermont Yankee calculation VYC-3001, Revision 1. This calculation includes in part:

- Strain Gage Data from 1593 MWt and 1673 MWt
- Acoustic Circuit Model Benchmark Report
- ACM Uncertainty Evaluation
- Stress Analysis Model Description
- Stress Analysis Results
- Limit Curve Development
- Revised Limit Curves

Based on the improvements in the monitoring system and analysis techniques and evaluation of the VYNPS specific signals at 1673 MWt, an engineering evaluation has been completed and has concluded that the strain gage signals are expected to remain below the Level 1 Acceptance Criteria during operation up to and including the next power ascension plateau at 1753 MWt. A summary of the changes to the models and the uncertainty evaluation, along with the new Steam Dryer Strain Gage Limit Curves is contained in the Steam Dryer Monitoring Plan (SDMP) (Attachment 1 of BVY 06-031). The details of these analyses, including any proprietary documents, have been made available to the NRC Technical Staff for review.

The changes made to the steam dryer models and generation of revised steam dryer limit curves have been assessed against the requirements of License Condition 3.M.4 which states:

> *"When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04."*

As described above, License Condition 3.M.4 specifies those attributes of the approach to steam dryer monitoring that require NRC approval prior to being made less restrictive. As addressed below, Vermont Yankee concludes that the key attributes have NOT been made less restricted and, therefore, the proposed model and limit curve changes do NOT require NRC approval.

The following changes have been incorporated into the VY approach to steam dryer monitoring:

1. Incorporation of strain gage accuracy improvements in accordance with License Condition 3.M requirements.

2. Use of an updated CDI Acoustic Circuit Model (ACM) that has been modified to be conservative in the areas of interest and benchmarked against instrumented dryer data from several power levels at Quad Cities. The ACM update to address industry operating experience is required by the License Condition.

3. Revisions to the Finite Element Model (FEM) to incorporate refinement of model in areas of concern related to past failures at Quad Cities and Dresden as required by the License Condition.

4. Generation of a new Uncertainty Calculation based on plant data and the changes above as required by the License Condition.

5. An updated Level 1 Limit Curve representing a conservative reduction of the ASME design limit (13.6 ksi) by the values obtained in the uncertainty assessment.

6. There have been no changes to the Computation Fluid Dynamics (CFD) Model or the role of the CFD analysis to provide additional conservatism for low frequency flow sources.

This revision of the SDMP was evaluated against the criteria in License Condition 3.M.4 to determine if NRC approval is required as summarized below:

a. This revision proposes no change in the test plateau increments from those specified in the criteria.

b. The Level 1 performance criteria is defined as a limit curve for strain gage results that represents a stress on the dryer equal to the ASME Design Limit of 13.6 ksi minus the calculated total model and measurement uncertainty.

   The application of model refinements that provide for higher accuracy in determining Vermont Yankee specific dryer stress limits does not constitute a change in methodology. The updated limit curves still represent the ASME criteria minus the calculated uncertainty.

c. The methodology for establishing stress spectra for the Level 1 and Level 2 criteria is not altered by this change.

   As required by License Condition 3.M the output of the strain gages is generated as input to the Acoustic Circuit Model (ACM) analysis. The ACM generates pressure loads on the Steam Dryer using the Helmholtz equations. The ANSYS FEM code is used to generate stress loads for affected components of the dryer.

The above changes were evaluated using the guidance provided in NEI 99-04.

Conclusion:

1. Based on the analysis performed using VYNPS Strain Gage data taken at the 1673 MWt plateau and employing the improved models as required by the EPU License Amendment the VYNPS Steam Dryer is not expected to reach Level 1 Acceptance Criteria prior to or at the next power ascension plateau (1753 MWt) and Power Ascension can continue.
2. The SDMP has not been made less restrictive by the changes made to the ACM and FEM and prior NRC approval is not required to implement these changes.

Preparer: Craig Nichols	[signature]	3/25/06
Name	Signature	Date
Reviewer: James Callaghan	[signature]	3/25/06
Name	Signature	Date
Reviewer: James DeVincentis	[signature]	3/25/06
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Entergy

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April 20, 2006

Docket No. 50-271
BVY 06-039
TAC No. MC0761

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Vermont Yankee Nuclear Power Station**
<u>Revision 2 to Steam Dryer Monitoring Plan</u>

References:

1) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, License No. DPR-28 (Docket No. 50-271), Technical Specification Proposed Change No. 263, Extended Power Uprate," BVY 03-80, September 10, 2003

2) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, Revision 1 to Steam Dryer Monitoring Plan," BVY 06-031, March 26, 2006

This letter provides updated information pursuant to a regulatory commitment made in connection with the application by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy) for a license amendment (Reference 1, as supplemented) to increase the maximum authorized power level of the Vermont Yankee Nuclear Power Station (VYNPS) from 1593 megawatts thermal (MWt) to 1912 MWt.

Attachment 1 includes a revision (Revision 2) to the Steam Dryer Monitoring Plan (SDMP) that was previously provided in Reference 2. The SDMP will remain in effect until License Condition 3.M expires. The SDMP, together with the EPU Power Ascension Test Procedure (PATP), provides for monitoring, inspecting, evaluating, and prompt action in response to potential adverse flow effects on the steam dryer as a result of power uprate operation. These actions provide assurance of the continued structural integrity of the steam dryer under Extended Power Uprate conditions. This revision has been reviewed in accordance with License Condition 3.M.4 and does not require prior NRC approval.

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23 Pages

There are no new regulatory commitments contained in this submittal.

If you have any questions or require additional information, please contact Mr. James DeVincentis at (802) 258-4236.

Sincerely,

Jay K. Thayer
Site Vice President
Vermont Yankee Nuclear Power Station

Attachments (1)

cc: Mr. Samuel J. Collins (w/o attachments)
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VT Department of Public Service
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Attachment 1

Vermont Yankee Nuclear Power Station

Steam Dryer Monitoring Plan

Revision 2

Entergy Vermont Yankee Steam Dryer Monitoring Plan

Revision 2
April 20, 2006

Prepared By ______________________ / 4/20/06
Craig J. Nichols — Date

Reviewed By ______________________ / 4/20/06
James Callaghan — Date

Approved By ______________________ / 4-20-06
John Dreyfuss — Date

VERMONT YANKEE NUCLEAR POWER STATION
STEAM DRYER MONITORING PLAN

Introduction and Purpose

The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) 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. The SDMP also addresses long-term actions necessary to implement proposed License Condition 3.M. Through operating limits, periodic surveillances, and required actions, the impact of potentially adverse flow effects on the structural integrity of the steam dryer will be minimized.

The SDMP also provides information about the equipment and computer analysis methodologies used to monitor Steam Dryer performance.

Unacceptable steam dryer performance is a condition that could challenge steam dryer structural integrity and result in the generation of loose parts, cracks or tears in the steam dryer that result in excessive moisture carryover. During reactor power operation, performance is demonstrated through the measurement of a combination of plant parameters.

Scope

The SDMP is primarily an initial power ascension test plan designed to assess steam dryer performance from 100% OLTP (i.e., 1593 MWt) to 120% OLTP (i.e., 1912 MWt) and to perform confirmatory inspections for a period of time following initial and continued operation at uprated power levels. Power ascension to 120% OLTP will be achieved in a series of power step increases and holds at plateaus corresponding to 80 MWt increments above OLTP. Elements of this plan will be implemented before EPU power ascension testing, and others may continue after power ascension testing.

There are three main elements of the SDMP:

1. Slow and deliberate power ascension with defined hold points and durations, allowing time for monitoring and analysis;

2. A detailed power ascension monitoring and analysis program to trend steam dryer performance (primarily through the monitoring of steam dryer load signals and moisture carryover); and

3. A long term inspection program to verify steam dryer performance at EPU operating conditions.

Several elements of the SDMP also provide for completion of the necessary actions to satisfy the requirements of license conditions associated with the EPU license amendment. A complete tabulation of the provisions of the license condition and the implementing strategy to complete them is contained in Table 3.

Power Ascension

VYNPS procedure ERSTI-04-VY1-1409-000, "Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth," (PATP) will provide controls during power ascension testing and confirm acceptable plant performance. Other procedures may be entered to conduct specialized testing, such as condensate and feedwater testing. The VYNPS power ascension will occur over an extended period with gradual increases in power, hold periods, and engineering analyses of monitored data that must be approved by station management. Relevant data and evaluations will be transmitted to the NRC staff in accordance with the provisions of the license condition. The PATP includes:

1. Power ascension rate of 16 MWt/hr;
2. Hourly monitoring of steam dryer performance during power ascension (required by License Condition 3.M);
3. Four hour holds at each 40 MWt; and
4. Minimum 96 hour holds at each 80 MWt power plateau to perform steam dryer analysis allowing for NRC review, as appropriate (required by License Condition 3.M).

Monitoring Plans

Table 1 outlines the steam dryer surveillance requirements during reactor power ascension testing for EPU. The monitoring of moisture carryover and main steam line (MSL) pressure data provide measures for ensuring acceptable performance of the steam dryer. Frequent monitoring of these parameters will provide early detection capability of off-normal performance.

Proposed License Condition 3.M will require that steam dryer performance criteria are met and prompt action is taken if unacceptable performance is detected. Entergy has established two performance levels (Level 1 criteria and Level 2 criteria) as described in Table 2 for evaluating steam dryer performance during EPU power ascension testing. The Level 1 criteria correspond to the limits specified in the proposed license condition, while the Level 2 criteria are operating action levels that may indicate reductions in margin.

The comparison of measured plant data against defined criteria derived from the steam dryer analyses described below provide a means to assess continued steam dryer structural integrity under EPU conditions.

Main Steam Fluctuating Pressure Monitoring System (Details contained in VYC-3001)

- Main Steam Line Strain Gages
  Entergy has installed strain gages at two locations on each of the four MSLs in the primary containment and a data acquisition system (DAS) designed to reduce uncertainties in the evaluation of steam dryer loads. These strain gages and the associated data acquisition system have been selected and configured to maximize sensitivity and reliability while reducing data uncertainty.
- Acoustic Circuit Model (ACM)
  The CDI Acoustic Model has been improved based on results of the instrumented Steam Dryer at Exelon's Quad Cities Station. The revision has resulted in reduced uncertainty and a more conservative representation of the peak frequencies.

- Finite Element Model (FEM)
  In response to industry operating experience with steam dryer cover plate cracking, the ANSYS FEM has been updated to include more refined analysis of key dryer structural components such as the lower cover plate, the gussets, gusset shoes, and associated welds.
- Acoustic Circuit Analysis (ACA) System Uncertainty Evaluation
  The VY Acoustic Circuit Model (ACM) has been updated. The revised ACM was developed to bound maximum pressure loads from three sets of test data from the instrumented QC2 dryer testing performed in 2005. This updated ACM uncertainty assessment is based on the enhanced VY strain gage and data acquisition system and the revised CDI Bounding Pressure model parameters. The Scale Model Test (SMT) benchmark evaluation and previous 790 MWe QC2 benchmark assessment that provided the uncertainty bases for the prior ACM have been accordingly deleted from this calculation.
  The overall system uncertainty is based on the combination of the uncertainties of each of the elements. The uncertainty in the ACM loads is derived from the following sources:
  - Uncertainty of the ACM to conservatively predict pressure response at the significant frequencies
  - Uncertainty introduced by differences in sensor locations between QC2 and VY
  - Uncertainty introduced as a result of the ability of the ACM or Structural Model to match load and structural frequencies
  - Uncertainty resulting from strain gage and measure uncertainties.

  These uncertainties will then be combined by the square root sum of the squares (SRSS) method to assess the ACM load uncertainty.
  As calculated in VYC-3001 the overall system uncertainty is 43%. This value is used in the determination of the reduction of the limit curve factor resulting in the final limit curve, shown as Figures 1 through 8 of the SDMP. The contribution of each of the factors noted above is as follows:

Maximum Uncertainty of the ACA Methodology (per VYC 3001 Rev. 2)

ACM ability to conservatively match peak response at the highest frequencies:	32%
Difference in Sensor Locations from QC2 to VY	7%
Ability of ACM or Structural Model to match response frequencies:	25%
SG and DAS ability to measure pressure in Pipe	11%
Uncertainty of Dryer Pressure data Measurements at QC2	3%
Combined Uncertainty by Square Root Sum of the Squares	43%

The uncertainty of the ACM to predict peak response at observed dryer acoustic frequencies is the largest contributor to overall ACA load uncertainty. The other uncertainties including the sensor location uncertainty, frequency uncertainty, pipe pressure measurement uncertainty, and QC2 dryer pressure measurement uncertainty are independent elements of uncertainty because they are derived from unrelated variables such as location, frequency, independent benchmark assessment, and detection equipment. Therefore the SRSS combination methodology is appropriate.

- CFD Load Uncertainty (Remains unchanged from Revision 0 of VYC 3001)
  The CFD predictions using the Large Eddy Simulation runs for VY are on average 118% above the RMS values of in-plant data with a standard deviation of 82%. Therefore a conservative estimate of uncertainty is 118% - 82% = +36%. This would support 0%

uncertainty for the CFD load. Conservatively, VY has maintained a 15% CFD load uncertainty in the Limit Curve Factor assessment.

The CFD analysis with the +/-10% change in load step had an impact on the limiting stress by 4%. Therefore the CFD frequency uncertainty is determined to be 4%. The total CFD uncertainty; uncCFD= sqrt(15^2 + 4^2) = 16%.

- System Monitoring Requirements
  - During power ascension, steam dryer performance will be monitored hourly through the evaluation of pressure fluctuation data collected from strain gages installed on the MSLs.
  - The strain gage data collected hourly during power ascension will be compared against the stress limit curve that is provided as Figures 1 - 8 of the SDMP and is based on Entergy Calculation VYC-3001. If any frequency peak from the MSL strain gage data exceeds the stress limit curve (Level 1), Entergy will reduce the reactor power to a level at which the stress limit curve is not exceeded.
  - Additionally, Entergy will monitor data collected from accelerometers mounted to the main steam piping inside the drywell to provide additional insights into the strain gage signals.
  - During hold points at each 80 MWt power level above current licensed thermal power, the collected data, along with a comparison to the steam dryer limit curve, will be transmitted to the NRC staff.
  - For any circumstance requiring a revision to the steam dryer limit curve, Entergy will resolve uncertainties in the steam dryer analysis and provide the results of that evaluation to the NRC staff prior to further increases in reactor power.
  - Entergy will resolve uncertainties in the steam dryer analysis with the NRC staff within 90 days of issuance of the EPU license amendment. If resolution is not made within this time interval, reactor operation will not exceed 1593 MWt. These planned actions are in compliance with proposed License Condition 3.M.

Moisture Carryover

- Moisture carryover trending provides an indicator of steam dryer integrity. At each 40 MWt step, moisture carryover data will be taken and compared to the predetermined acceptance criteria (Table 2).
- Level 1 criterion (0.35%) is based on the maximum analyzed value.
- The data taken at each 80 MWt plateau will be evaluated and documented in the assessment sent to the NRC for information.

Other Monitoring

- Plant data that may be indicative of off-normal steam dryer performance will be monitored during power ascension (e.g., reactor water level, steam flow, feed flow, steam flow distribution between the individual steam lines). Plant data can provide an early indication of unacceptable steam dryer performance. The enhanced monitoring of selected plant parameters will be controlled by the PATP and other plant procedures.

NRC Notifications

- In accordance with proposed License Condition 3.M., at discrete power levels, and if the steam dryer stress limit curve (i.e., Level 1 criterion) is exceeded, Entergy will provide notifications to the NRC staff consisting of data and evaluations performed during EPU power ascension testing above 1593 MWt. Detailed discussions regarding new plant data, inspections, and evaluations will be held with NRC staff upon request. The designated NRC point of contact for such information is the NRC Project Manager for the VYNPS EPU.

- The results of the SDMP will 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 (i.e., steam dryer stress limit curve) will be submitted to the NRC staff within 90 days of license amendment issuance. Contemporary data and results from steam 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 steam 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 steam dryer structural integrity monitoring.

Long Term Monitoring

The long-term monitoring of plant parameters potentially indicative of steam dryer failure will be conducted, as recommended by General Electric Service Information Letter 644, Rev. 1 and consistent with License Condition 3.M.

Moisture Carryover

Per VYNPS station operating procedure OP-0631, "Radiochemistry," moisture carryover is periodically monitored for moisture carryover during normal plant operations. VYNPS off-normal procedure ON-3178, "Increased Moisture Carryover," provides guidance to evaluate any elevated moisture carryover results including that resulting from potential vessel internals damage. This monitoring will also provide insight into changes in moisture carryover values during changing reactor core configurations (control rod patterns)

Strain Gage Monitoring

As the strain gages will remain operational and can provide for future data collection, additional strain gage monitoring will be performed as determined appropriate during the remainder of the operating cycle following EPU implementation.

Inspections

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

Reporting to NRC

Steam Dryer Visual Inspections: The results of the visual inspections of the steam dryer conducted during the next three refueling outages shall be reported to the NRC staff within 60 days following startup from the respective refueling outage.

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 40 MWt (nominal) power step above 100% OLTP (Note 3)
3. Main steam line data from accelerometers	At least once at every 40 MWt (nominal) power step above 100% OLTP (Note 3) AND Within one hour after achieving every 40 MWt (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 an 80 MWt 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 40 MWt, 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 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 MSL pressure data is also required to be performed once at each 40 MWt power step above 1593 MWt and within one hour of achieving each 40 MWt 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 (i.e., 1593 MWt). If the surveillance is met at a given power level, additional surveillances do not need to be performed at a 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 40 MWt power step from at least three of the four MSLs, 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
Level 2: • Moisture carryover exceeds 0.1% OR • Moisture carryover exceeds 0.1% and increases by > 50% over the average of the three previous measurements taken at > 1593 MWt OR • Pressure data exceed Level 2 Spectra[1]	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.
Level 1: • Moisture carryover exceeds 0.35% OR • Pressure data exceed Level 1 Spectra[1]	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 steam 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 20 MWt and 40 MWt, 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).

Table 3
Steam Dryer License Conditions

License Condition	Requirement	Implementing Actions
3.M.1.a	Entergy shall monitor hourly the 32 main steam line (MSL) strain gages during power ascension above 1593 MWt for increasing pressure fluctuations in the steam lines.	During initial power ascension above 1593 MWt, data from at least 32 strain gages will be collected and evaluated by Entergy's power ascension test team to verify that acoustic signals indicative of increasing pressure fluctuations in the steam lines are not challenging the steam dryer stress limit curve. Monitoring will be conducted hourly during any power ascension above a previously attained power level. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.b	Entergy shall hold the facility for 24 hours at 105%, 110%, and 115% of OLTP (i.e., 1593 MWt) to collect data from the 32 MSL strain gages required by License Condition 3.M.1.a, conduct plant inspections and walkdowns, and evaluate steam dryer performance based on these data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.	The PATP has established test plateau increments of approximately 80 MWt (corresponding to 105%, 110%, and 115% of 1593 MWt). Reactor power will not be increased above the plateau for a minimum of 96 hours. During the first 24 hours of steady state operation at each plateau, strain gage data will be collected from all available strain gages (minimum of 32) and evaluated to demonstrate acceptable steam dryer performance. Additionally, moisture carryover measurements will be made at each plateau and every 24 hours during power ascension testing. At the 80 MWt plateau hold points, Entergy will conduct plant walkdowns and inspections of plant equipment, including piping and components identified as potentially vulnerable to flow-induced vibration (FIV) in accordance with the PATP and other plant procedures. Steam dryer performance will be evaluated based on these data. The 24-hour period and the 96-hour period may overlap once the transmittal is provided to the NRC staff. The evaluations of steam dryer performance, based on the data collected during each of the 80 MWt plateaus, as well as the results of walkdowns and other measurements of FIV for various piping and plant components, will be provided to the NRC staff. Arrangements have been made for electronic transmission through email and/or uploading to a designated website. Upon the NRC Project Manager confirming receipt of the steam dryer data and performance evaluation, the 96 hours of hold

License Condition	Requirement	Implementing Actions
		time will commence. Power will not be increased above each of the 80 MWt hold points until the expiration of the 96-hour hold. If during the hold periods, or at any other time, the NRC staff requests a discussion or requires clarification of the engineering evaluations provided in fulfillment of this requirement, Entergy will promptly arrange for such discussions. Entergy will maintain a power ascension control center, including management oversight, available 24/7 on-site during power increases to previously unattained power levels. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.c	If any frequency peak from the MSL strain gage data exceeds the limit curve established by Entergy Nuclear Operations, Inc. and submitted to the NRC staff prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall return the facility to a power level at which the limit curve is not exceeded. Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.	The steam dryer stress limit curve provided herewith contains Level 1 and Level 2 criteria. If frequency peaks from MSL strain gage data exceed either Level 1 or Level 2 criteria, prompt action will be taken in response to the potential adverse flow effects that might result. Similar actions will occur if moisture carryover is excessive and previously established Level 1 or Level 2 criteria are exceeded. The Level 2 criteria represent a conservative action level for evaluation and close monitoring of steam dryer performance—not a limit. The Level 1 criteria represent analytical limits and additional actions may be warranted. If any frequency peak from the MSL strain gage data exceeds the Level 1 steam dryer stress limit curve, Entergy will reduce reactor power to a power level at which the limit curve is not exceeded. (Reference ERSTI-04-VY1-1409-000) Prior to any further increase in power above the reduced power level, Entergy will (1) resolve the uncertainties in the steam dryer analysis, (2) evaluate and document the adequate structural integrity of the steam dryer, and (3) provide that documentation to the NRC staff. Any revision to the limit curve based on this evaluation will be provided to the NRC staff. (Reference PCRS tracking item WT-VTY-2005-00000-01803)

License Condition	Requirement	Implementing Actions
3.M.1.d	In addition to evaluating the MSL strain gage data, Entergy Nuclear Operations, Inc. shall monitor reactor pressure vessel water level instrumentation or MSL piping accelerometers on an hourly basis during power ascension above OLTP. If resonance frequencies are identified as increasing above nominal levels in proportion to strain gage instrumentation data, Entergy Nuclear Operations, Inc. shall stop power ascension, document the continued structural integrity of the steam dryer, and provide that documentation to the NRC staff by facsimile or electronic transmission to the NRC project manager prior to further increases in reactor power.	Accelerometers mounted on MSL piping will be monitored on an hourly basis during power ascension testing to identify if resonances are increasing above nominal levels in proportion to MSL strain gage data. If abnormally increasing resonant frequencies are detected, power ascension will be halted. Prior to any further increase in power, Entergy will (1) evaluate and document the adequate structural integrity of the steam dryer, and (2) provide that documentation to the NRC staff. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.e	Following start-up testing, Entergy Nuclear Operations, Inc. shall resolve the uncertainties in the steam dryer analysis and provide that resolution to the NRC staff by facsimile or electronic transmission to the NRC project manager. If the uncertainties are not resolved within 90 days of issuance of the license amendment authorizing operation at 1912 MWt, Entergy Nuclear Operations, Inc. shall return the facility to OLTP.	After collecting strain gage data at approximately the EPU full power level, Entergy will resolve the uncertainties in the steam dryer analysis and provide documentation of the resolution to the NRC staff. If these actions cannot be achieved within 90 days of issuance of the license amendment, reactor power will be limited to 1593 MWt. This uncertainty evaluation may be prepared and provided to the NRC prior to reaching EPU full power levels associated with any proposed revision to the steam dryer limit curve. (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.2.a	Prior to operation above OLTP, Entergy Nuclear Operations, Inc. shall install 32 additional strain gages on the main steam piping and shall enhance the data acquisition system in order to reduce the measurement uncertainty associated with the acoustic circuit model (ACM).	COMPLETE - To enhance performance and improve the accuracy of the steam dryer measurement system, Entergy has installed 48 strain gages on MSL piping and will maintain a minimum of 32 operable strain gages during power ascension testing. The data acquisition system (DAS) was upgraded to reduce the uncertainty associated with the ACM. (Reference Entergy VYNPS Temporary Alteration TA-2005-15 R1)
3.M.2.b	In the event that acoustic signals are identified that challenge the limit curve during power ascension	COMPLETE - As part of the evaluation performed at 1673MWt Entergy Vermont Yankee employed a new revision of the Acoustic Circuit Model. In

License Condition	Requirement	Implementing Actions
	above OLTP, Entergy Nuclear Operations, Inc. shall evaluate steam dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a *frequency-specific assessment* of ACM uncertainty at the acoustic signal frequency.	association with the benchmarking of the new ACM a frequency specific assessment of the ACM uncertainty was performed and is contained in Calculation VYC-3001, Rev. 1. (Reference ERSTI-04-VY1-1409-000) (Reference VYC-3001 Rev. 1)
3.M.2.c	After reaching 120% of OLTP, Entergy Nuclear Operations, Inc. shall obtain measurements from the MSL strain gages and establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the steam dryer monitoring plan (SDMP) limit curve with the updated ACM load definition and revised instrument uncertainty, which will be provided to the NRC staff.	After collecting strain gage data at approximately the EPU full power level, Entergy will establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the stress limit curve with the updated ACM load definition and revised instrument uncertainty. This information will be included in the report to the NRC staff being made in accordance with License Condition 3.M.1.e. (Reference PCRS tracking item WT-VTY-2006-00000-00249)
3.M.2.d	During power ascension above OLTP, if an engineering evaluation *is required in accordance with the* SDMP, Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to ±10% and assure that peak responses that fall within this uncertainty band are addressed.	COMPLETE - As part of the evaluation performed at 1673MWt Entergy Vermont Yankee completed *revisions to the VY Steam Dryer model used in the* Finite Element Model (FEM). Additional analysis of the FEM output was performed to assess the frequency uncertainties. The results of this assessment are contained in Calculation VYC-3001, Rev. 1. (Reference ERSTI-04-VY1-1409-000)
3.M.2.e	Entergy Nuclear Operations, Inc. shall revise the SDMP to reflect long-term monitoring of plant parameters potentially indicative of steam dryer failure; to reflect consistency of the facility's steam dryer inspection program with General Electric Services Information Letter 644, Revision 1; and to identify the NRC Project Manager for the facility as the point of contact for providing SDMP information during power ascension.	The revised SDMP provides long-term monitoring of steam dryer performance in accordance with GE SIL 644 Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00250) COMPLETE - The SDMP and the PATP identify the NRC Project Manager for the VYNPS EPU as the point of contact for providing SDMP information during power ascension. (Reference ERSTI-04-VY1-1409-000) COMPLETE - For moisture carryover, procedures OP-0631 and ON-3178 provide for long-term monitoring and controls.

License Condition	Requirement	Implementing Actions
3.M.2.f	Entergy Nuclear Operations, Inc. shall submit the final extended power uprate (EPU) steam dryer load definition for the facility to the NRC upon completion of the power ascension test program.	The final EPU steam dryer load definition will be included in the report provided to the NRC staff in accordance with License Conditions 3.M.1.e. and 3.M.2.c. (Reference PCRS tracking item WT-VTY-2006-00000-00251)
3.M.2.g	Entergy Nuclear Operations, Inc. shall submit the flow-induced vibration related portions of the EPU startup test procedure to the NRC, including methodology for updating the limit curve, prior to initial power ascension above OLTP.	COMPLETE - Entergy letter BVY 06-019 forwards the FIV-related portions of the EPU power ascension test procedure to the NRC. (Reference ERSTI-04-VY1-1409-000) The methodology for updating the steam dryer stress limit curve is as follows: Prerequisite: Generate report resolving uncertainties in the steam dryer analysis. 1. Collect representative data from 32 strain gages at eight MSL locations. 2. Using a plant-specific ACM, analyze strain gage data to determine steam dryer loads. 3. Input ACM loads into a finite element model to determine dryer stresses. 4. Perform an updated uncertainty evaluation. 5. Generate revised steam dryer stress limit curve(s). (Reference PCRS tracking item WT-VTY-2006-00000-00252)
3.M.3(a)	Entergy shall prepare the EPU startup test procedure to include the stress limit curve to be applied for evaluating steam dryer performance.	COMPLETE - The steam dryer stress limit curve to be applied for evaluating steam dryer performance during power ascension is provided herewith. The limit curve was developed on the basis of calculation VYC-3001, which is incorporated by reference into the EPU PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(b)	Entergy shall prepare the EPU startup test procedure to include specific hold points and their duration during EPU power ascension.	COMPLETE - Specific hold points and durations are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(c)	Entergy shall prepare the EPU startup test procedure to include activities to be accomplished during hold points.	COMPLETE - Activities to be accomplished during hold points are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

License Condition	Requirement	Implementing Actions
3.M.3(d)	Entergy shall prepare the EPU startup test procedure to include plant parameters to be monitored.	COMPLETE - Plant parameters to be monitored are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(e)	Entergy shall prepare the EPU startup test procedure to include inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during the hold points.	COMPLETE - Inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during hold points are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(f)	Entergy shall prepare the EPU startup test procedure to include methods to be used to trend plant parameters.	COMPLETE - Methods to be used to trend plant parameters are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(g)	Entergy shall prepare the EPU startup test procedure to include acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections.	COMPLETE - Acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(h)	Entergy shall prepare the EPU startup test procedure to include actions to be taken if acceptance criteria are not satisfied.	COMPLETE - Actions to be taken if acceptance criteria are not satisfied are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(i)	Entergy shall prepare the EPU startup test procedure to include verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer.	COMPLETE - Verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer is specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

3.M.4	When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04.	These restrictions are provided in the PATP and/or the SDMP. (Reference ERSTI-04-VY1-1409-000)
3.M.5	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00253) (Reference PCRS tracking item WT-VTY-2006-00000-00254) (Reference PCRS tracking item WT-VTY-2006-00000-00255)

3.M.6	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. The results will be documented in a report and submitted to the NRC within 60 days following completion of all EPU power ascension testing. (Reference PCRS tracking item WT-VTY-2006-00000-00256) (Reference PCRS tracking item WT-VTY-2006-00000-00257) (Reference PCRS tracking item WT-VTY-2006-00000-00258)
3.M.7	The requirements of paragraph 3.M.4 above for meeting the SDMP 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 paragraph 4 shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.	When operating above 1593 MWt, the operating limits, required actions, and surveillances specified in the SDMP will be met. Those key attributes of the SDMP specified in License Condition 3.M.4 will not be made less restrictive without prior NRC approval. (Reference PCRS tracking item WT-VTY-2006-00000-00259)
3.M.8	This license condition shall expire upon satisfaction of the requirements in paragraphs 5, 6, and 7 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.	(Reference PCRS tracking item WT-VTY-2006-00000-00260)

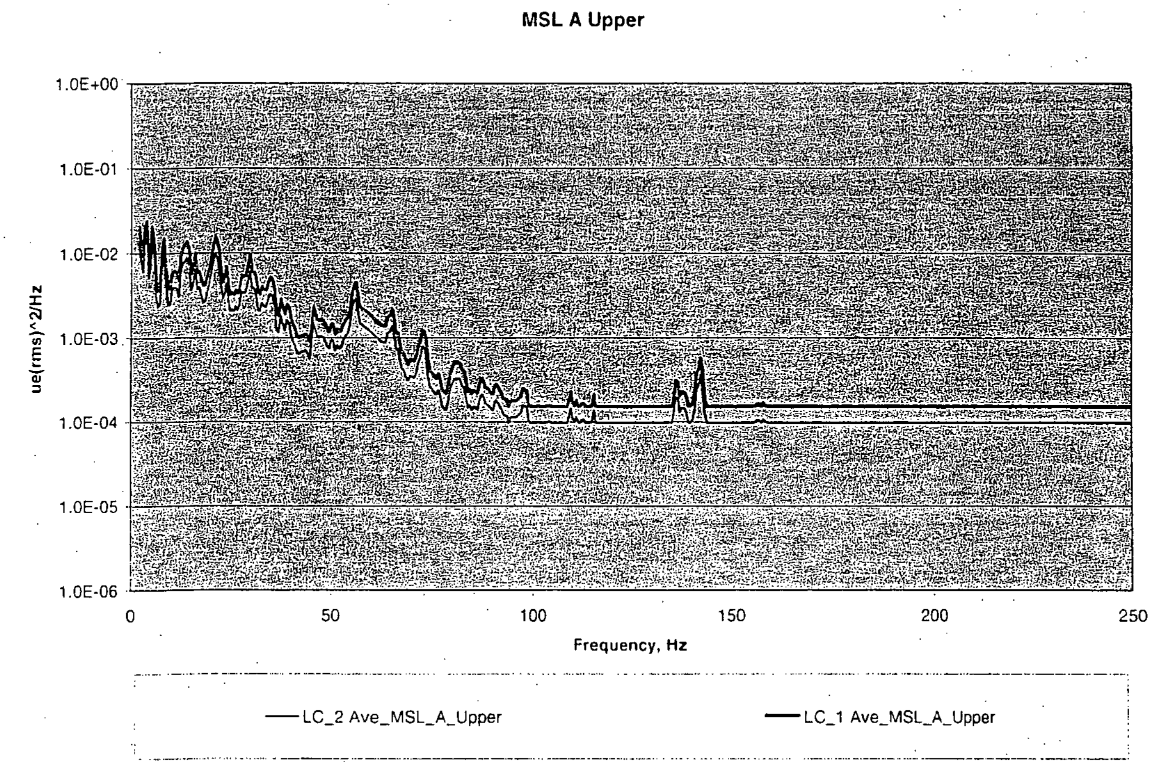

Figure 1: Steam Dryer Stress Limit Curve – MSL 'A' Upper

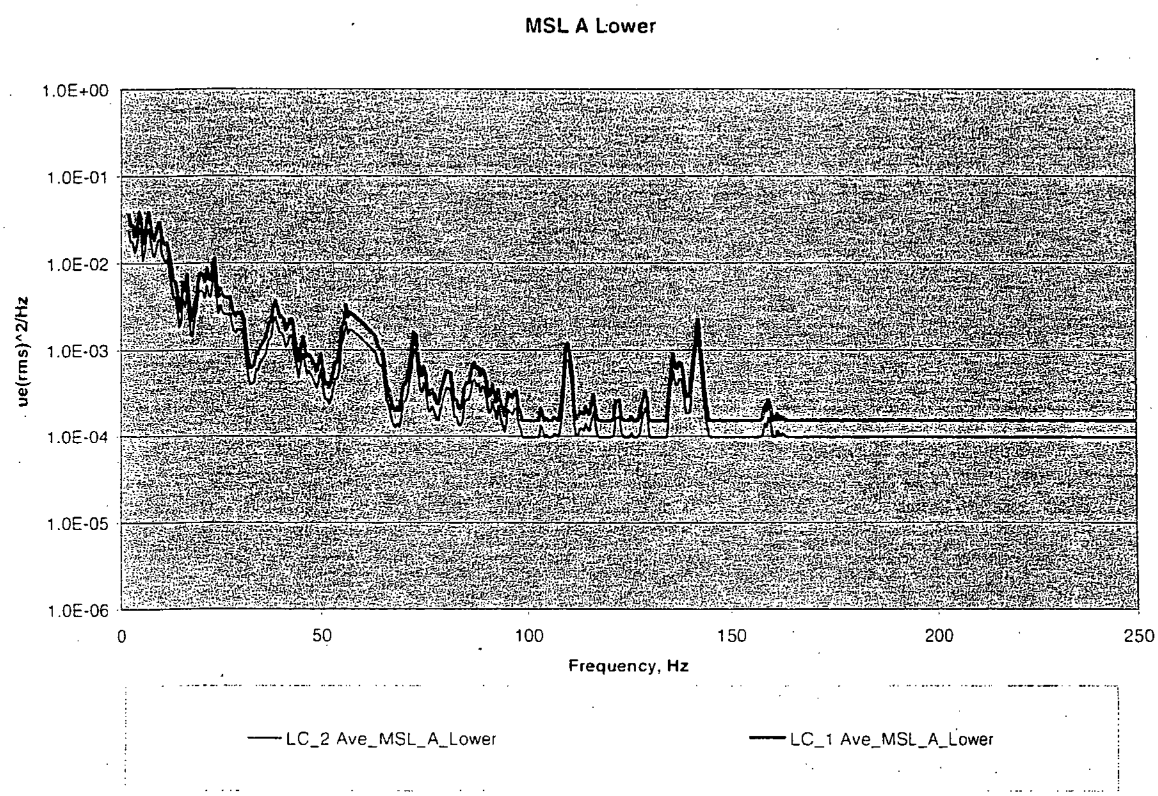

Figure 2: Steam Dryer Stress Limit Curve – MSL 'A' Lower

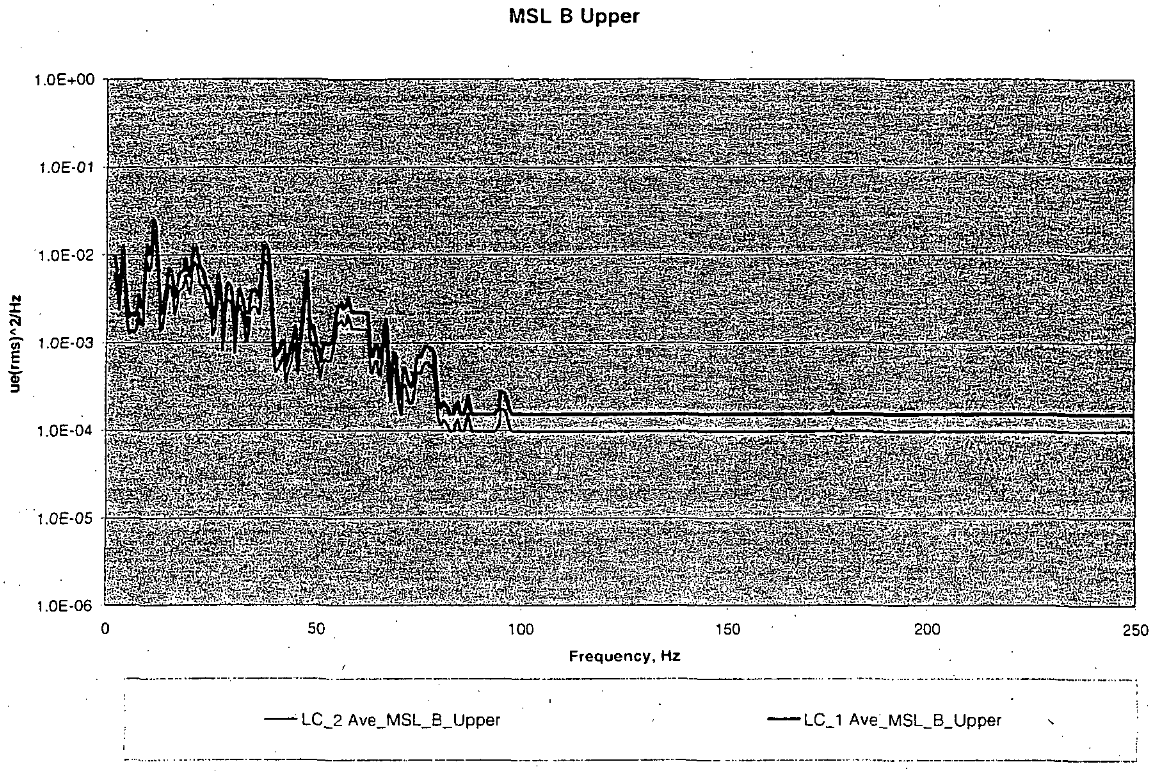

Figure 3: Steam Dryer Stress Limit Curve – MSL 'B' Upper

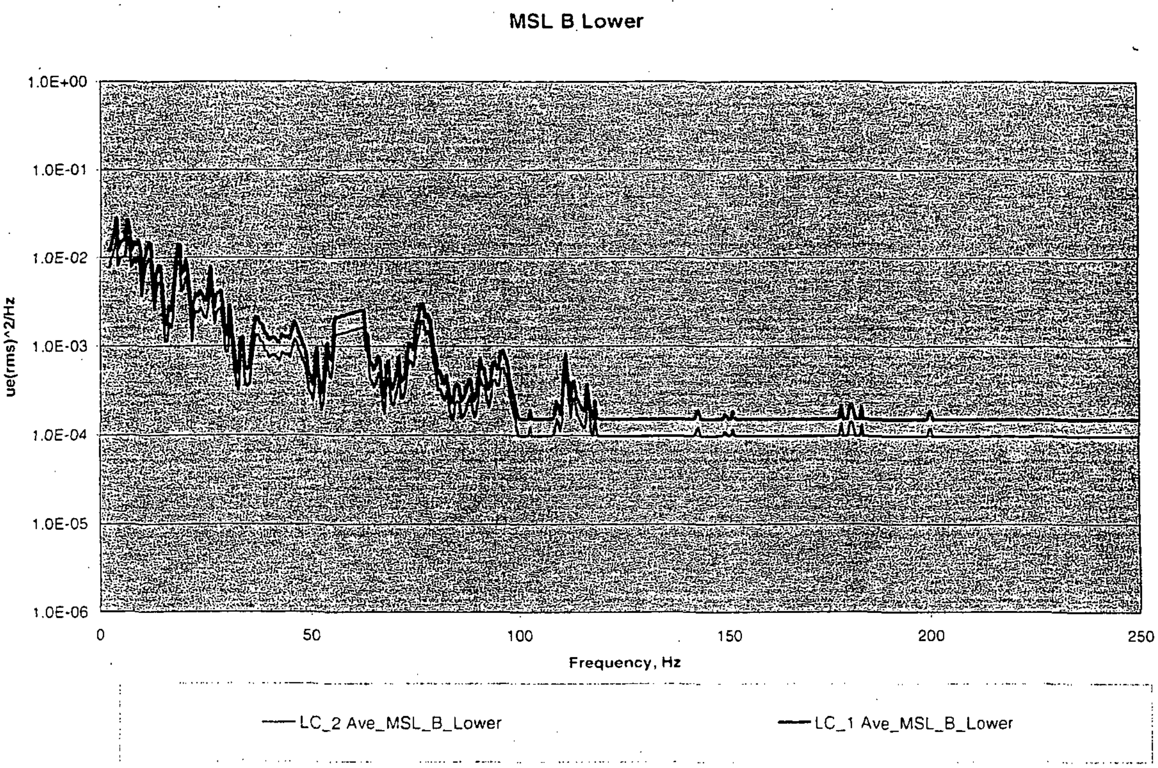

Figure 4: Steam Dryer Stress Limit Curve – MSL 'B' Lower

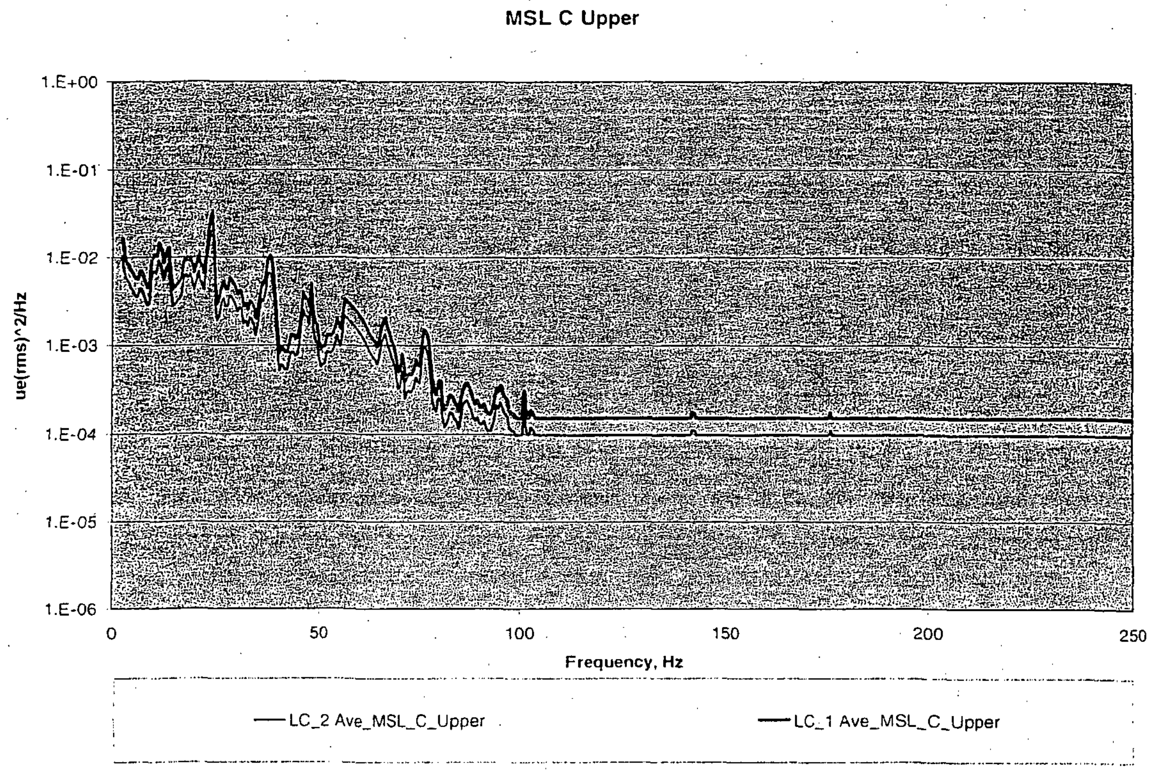

Figure 5: Steam Dryer Stress Limit Curve – MSL 'C' Upper

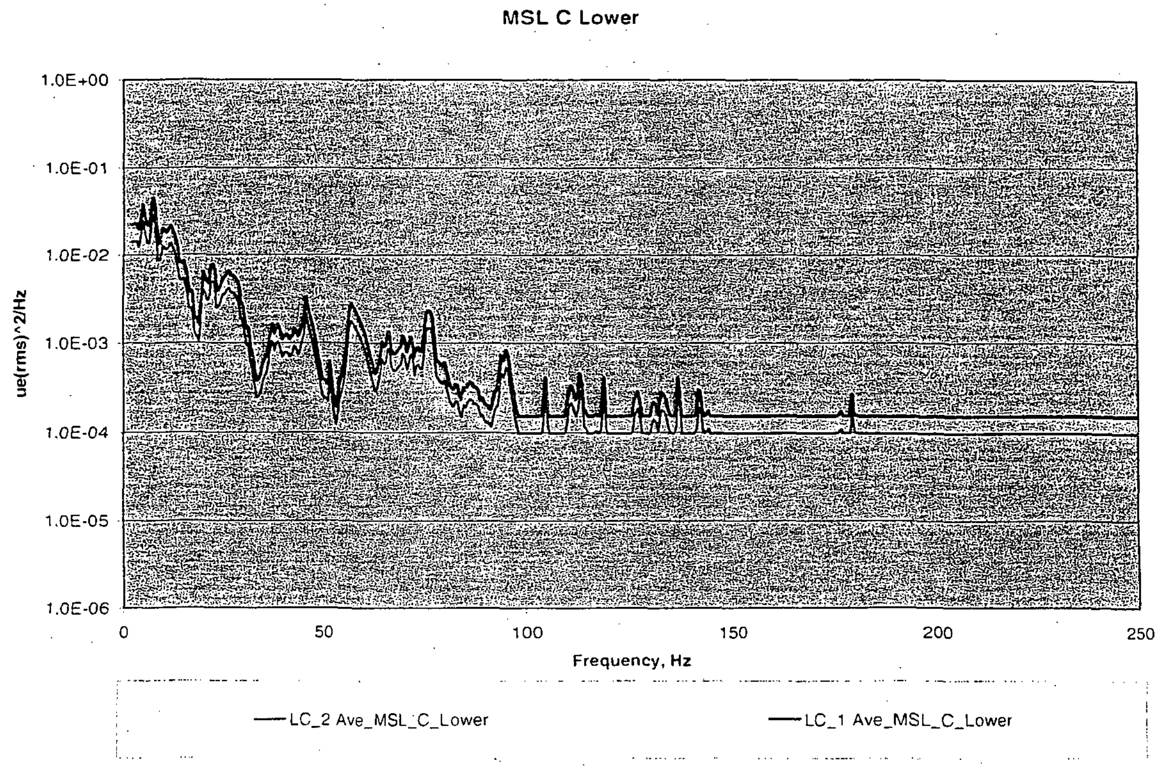

Figure 6: Steam Dryer Stress Limit Curve – MSL 'C' Lower

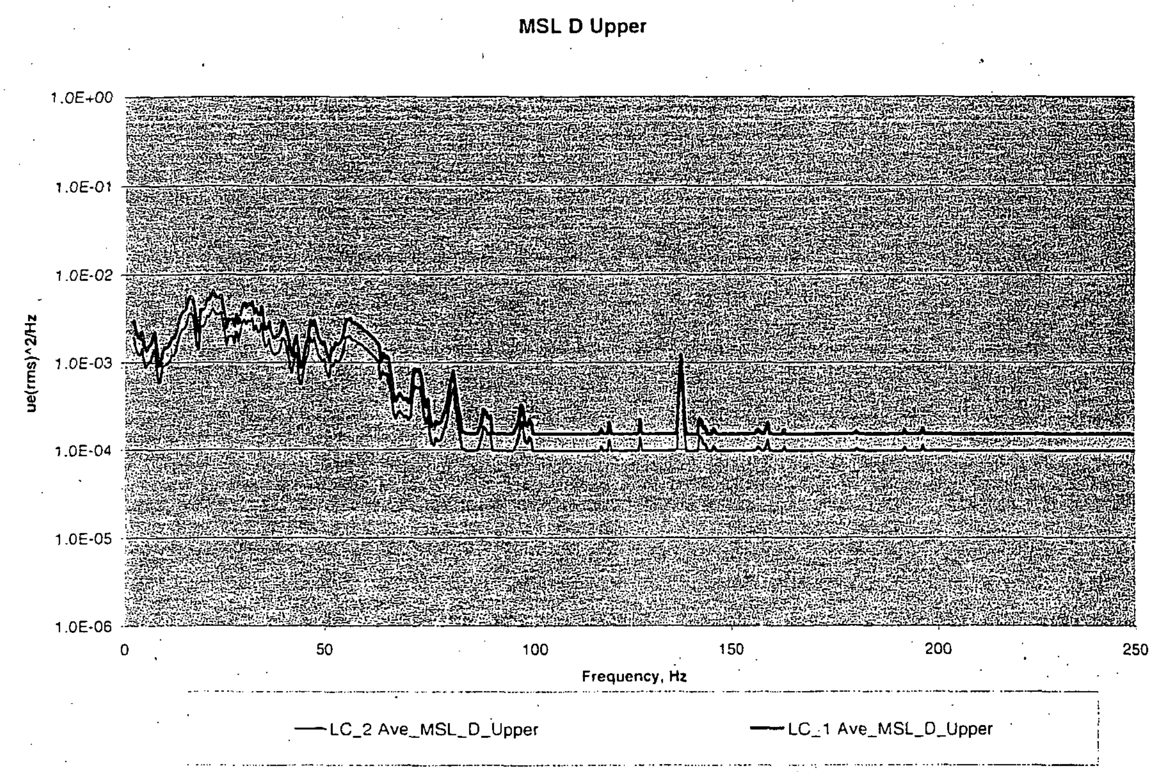

Figure 7: Steam Dryer Stress Limit Curve – MSL 'D' Upper

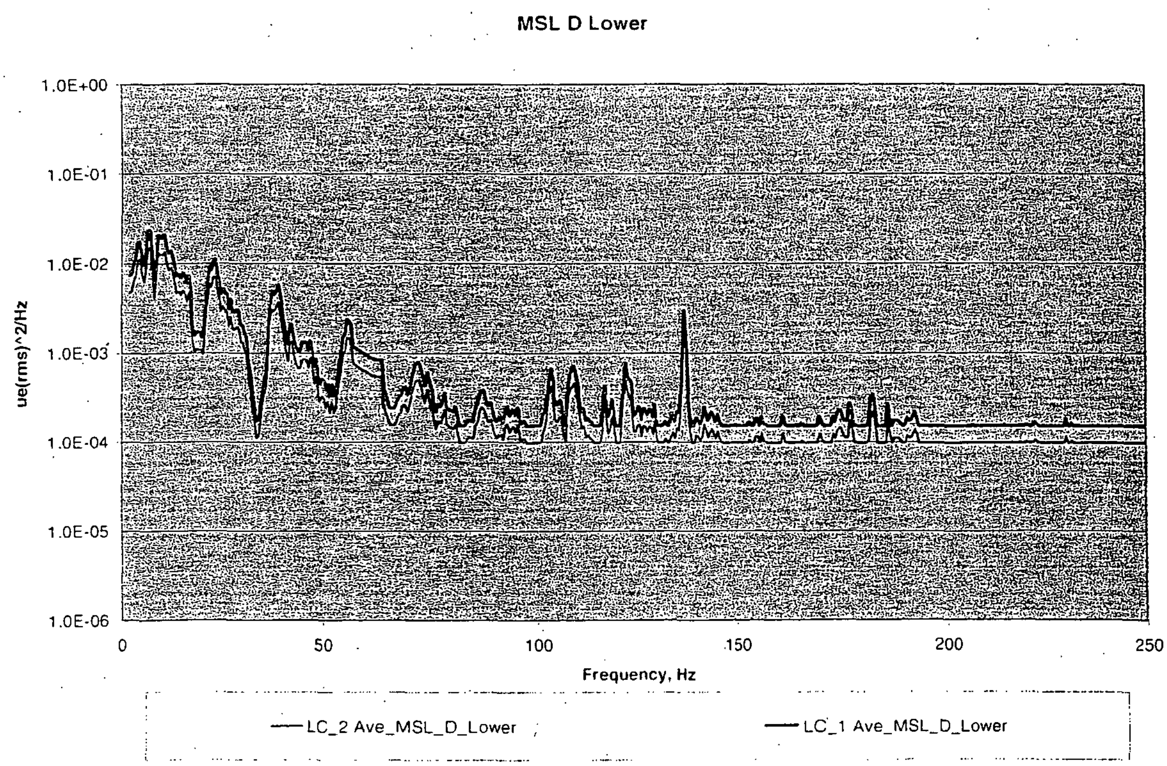

Figure 8: Steam Dryer Stress Limit Curve – MSL 'D' Lower

Entergy

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May 4, 2006

Docket No. 50-271
BVY 06-042
TAC No. MC0761

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Vermont Yankee Nuclear Power Station**
Revision 3 to Steam Dryer Monitoring Plan

References:
1) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, License No. DPR-28 (Docket No. 50-271), Technical Specification Proposed Change No. 263, Extended Power Uprate," BVY 03-80, September 10, 2003
2) Entergy letter to U.S. Nuclear Regulatory Commission, "Vermont Yankee Nuclear Power Station, Revision 2 to Steam Dryer Monitoring Plan," BVY 06-039, April 20, 2006

This letter provides updated information pursuant to a regulatory commitment made in connection with the application by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy) for a license amendment (Reference 1, as supplemented) to increase the maximum authorized power level of the Vermont Yankee Nuclear Power Station (VYNPS) from 1593 megawatts thermal (MWt) to 1912 MWt.

Attachment 1 includes a revision (Revision 3) to the Steam Dryer Monitoring Plan (SDMP) that was previously provided in Reference 2. The SDMP will remain in effect until License Condition 3.M expires. The SDMP, together with the Extended Power Uprate (EPU) Power Ascension Test Procedure (PATP), provides for monitoring, inspecting, evaluating, and prompt action in response to potential adverse flow effects on the steam dryer as a result of power uprate operation. These actions provide assurance of the continued structural integrity of the steam dryer under EPU conditions. Attachment 2 provides the basis, consistent with License Condition 3.M.4, for why this change does not require prior NRC approval. Entergy has performed necessary calculations and evaluations to ensure for safe operation at the 1912 MWt power level.

Docket No. 7195
Attachment 13-4
27 Pages

There are no new regulatory commitments contained in this submittal.

If you have any questions or require additional information, please contact Mr. James DeVincentis at (802) 258-4236.

Sincerely,

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

Attachments (2)

cc: Mr. Samuel J. Collins (w/o attachments)
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VT Department of Public Service
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BVY 06-042

Attachment 1

Vermont Yankee Nuclear Power Station

Steam Dryer Monitoring Plan

Revision 3

Entergy Vermont Yankee
Steam Dryer Monitoring Plan

Revision 3
May 4, 2006

Prepared By _____________________ / 5/4/06
Craig J. Nichols   Date

Reviewed By _____________________ / 5/4/06
James Callaghan   Date

Approved By _____________________ / 5-4-06
John Dreyfuss   Date

Entergy Vermont Yankee
Steam Dryer Monitoring Plan

List of Revisions

Revision	Date	Changes
Original	February 26, 2006	Original Issue
1	March 25, 2006	Incorporated new ACM. Incorporated revisions to FEM. Updated uncertainty evaluation and Limit Curves based on updated models and strain gage data evaluation at 1671 MWt.
2	April 20, 2006	Updated uncertainty evaluation and Limit Curves based on updated strain gage data evaluation at 1792 MWt.
3	May 4, 2006	Incorporated allowance for use of FEM/Strain Gage Evaluation (F-factor). Provided allowance for up to 1Hz shift in limit curve peak frequencies. Updated Limit Curves Based on 1872 MWt Data Clarified schedule for completion of final Full Power Steam Dryer Load Analysis

VERMONT YANKEE NUCLEAR POWER STATION
STEAM DRYER MONITORING PLAN

Introduction and Purpose

The Vermont Yankee Steam Dryer Monitoring Plan (SDMP) 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. The SDMP also addresses long-term actions necessary to implement proposed License Condition 3.M. Through operating limits, periodic surveillances, and required actions, the impact of potentially adverse flow effects on the structural integrity of the steam dryer will be minimized.

The SDMP also provides information about the equipment and computer analysis methodologies used to monitor Steam Dryer performance.

Unacceptable steam dryer performance is a condition that could challenge steam dryer structural integrity and result in the generation of loose parts, cracks or tears in the steam dryer that result in excessive moisture carryover. During reactor power operation, performance is demonstrated through the measurement of a combination of plant parameters.

Scope

The SDMP is primarily an initial power ascension test plan designed to assess steam dryer performance from 100% OLTP (i.e., 1593 MWt) to 120% OLTP (i.e., 1912 MWt) and to perform confirmatory inspections for a period of time following initial and continued operation at uprated power levels. Power ascension to 120% OLTP will be achieved in a series of power step increases and holds at plateaus corresponding to 80 MWt increments above OLTP. Elements of this plan will be implemented before EPU power ascension testing, and others may continue after power ascension testing.

There are three main elements of the SDMP:

1. Slow and deliberate power ascension with defined hold points and durations, allowing time for monitoring and analysis;

2. A detailed power ascension monitoring and analysis program to trend steam dryer performance (primarily through the monitoring of steam dryer load signals and moisture carryover); and

3. A long term inspection program to verify steam dryer performance at EPU operating conditions.

Several elements of the SDMP also provide for completion of the necessary actions to satisfy the requirements of license conditions associated with the EPU license amendment. A complete tabulation of the provisions of the license condition and the implementing strategy to complete them is contained in Table 3.

Power Ascension

VYNPS procedure ERSTI-04-VY1-1409-000, "Power Ascension Test Procedure for Extended Power Conditions 1593 to 1912 MWth," (PATP) will provide controls during power ascension testing and confirm acceptable plant performance. Other procedures may be entered to conduct specialized testing, such as condensate and feedwater testing. The VYNPS power ascension will occur over an extended period with gradual increases in power, hold periods, and engineering analyses of monitored data that must be approved by station management. Relevant data and evaluations will be transmitted to the NRC staff in accordance with the provisions of the license condition. The PATP includes:

1. Power ascension rate of 16 MWt/hr;

2. Hourly monitoring of steam dryer performance during power ascension (required by License Condition 3.M);

3. Four hour holds at each 40 MWt; and

4. Minimum 96 hour holds at each 80 MWt power plateau to perform steam dryer analysis allowing for NRC review, as appropriate (required by License Condition 3.M).

Monitoring Plans

Table 1 outlines the steam dryer surveillance requirements during reactor power ascension testing for EPU. The monitoring of moisture carryover and main steam line (MSL) pressure data provide measures for ensuring acceptable performance of the steam dryer. Frequent monitoring of these parameters will provide early detection capability of off-normal performance.

Proposed License Condition 3.M will require that steam dryer performance criteria are met and prompt action is taken if unacceptable performance is detected. Entergy has established two performance levels (Level 1 criteria and Level 2 criteria) as described in Table 2 for evaluating steam dryer performance during EPU power ascension testing. The Level 1 criteria correspond to the limits specified in the proposed license condition, while the Level 2 criteria are operating action levels that may indicate reductions in margin.

The comparison of measured plant data against defined criteria derived from the steam dryer analyses described below provide a means to assess continued steam dryer structural integrity under EPU conditions.

Main Steam Fluctuating Pressure Monitoring System (Details contained in VYC-3001)

- Main Steam Line Strain Gages
  Entergy has installed strain gages at two locations on each of the four MSLs in the primary containment and a data acquisition system (DAS) designed to reduce uncertainties in the evaluation of steam dryer loads. These strain gages and the associated data acquisition system have been selected and configured to maximize sensitivity and reliability while reducing data uncertainty.
- Acoustic Circuit Model (ACM)
  The CDI Acoustic Model has been improved based on results of the instrumented Steam Dryer at Exelon's Quad Cities Station. The revision has resulted in reduced uncertainty and a more conservative representation of the peak frequencies.

- Finite Element Model (FEM)
  In response to industry operating experience with steam dryer cover plate cracking, the ANSYS FEM has been updated to include more refined analysis of key dryer structural components such as the lower cover plate, the gussets, gusset shoes, and associated welds.

  Since Entergy/GE started using the FEM to evaluate stresses on the VY dryer during power ascension, the contribution of the key in-plant forcing frequencies has been calculated. By understanding the impact on stress due to increases in each of the key in-plant forcing frequencies, the change in steam dryer stress with changes in strain gage signal can be determined directly. Use of these frequency contributions (known as 'F' factors) allows the relationship of the strain gages, ACM, and FEM to be more directly determined based on the plant-specific assessment of ACM/FEM results.

  In addition, the Steam Dryer Strain Gage Monitoring and FEM frequency assessments have determined that in-plant acoustic signal frequencies have been shown to change slightly with increased stream flow. While the observed changes (<1Hz) have negligible impact to the dryer structure, they can result in an unnecessary challenge to the limit curve. To address the shifts of in-plant acoustic frequencies, the limit curve may be shifted to the right or to the left less than or equal to 1Hz. The limit curve criteria is considered satisfied as long as the acoustic signal from the shifted peak falls under the shifted limit curve.

- Acoustic Circuit Analysis (ACA) System Uncertainty Evaluation
  The VY Acoustic Circuit Model (ACM) has been updated. The revised ACM was developed to bound maximum pressure loads from three sets of test data from the instrumented QC2 dryer testing performed in 2005. This updated ACM uncertainty assessment is based on the enhanced VY strain gage and data acquisition system and the revised CDI Bounding Pressure model parameters. The Scale Model Test (SMT) benchmark evaluation and previous 790 MWe QC2 benchmark assessment that provided the uncertainty bases for the prior ACM have been accordingly deleted from this calculation.

The overall system uncertainty is based on the combination of the uncertainties of each of the elements. The uncertainty in the ACM loads is derived from the following sources:
  - Uncertainty of the ACM to conservatively predict pressure response at the significant frequencies
  - Uncertainty introduced by differences in sensor locations between QC2 and VY
  - Uncertainty introduced as a result of the ability of the ACM or Structural Model to match load and structural frequencies
  - Uncertainty resulting from strain gage and measure uncertainties.

These uncertainties will then be combined by the square root sum of the squares (SRSS) method to assess the ACM load uncertainty.

As calculated in VYC-3001 the overall system uncertainty is 43%. This value is used in the determination of the reduction of the limit curve factor resulting in the final limit curve, shown as Figures 1 through 8 of the SDMP. The contribution of each of the factors noted above is as follows:

Maximum Uncertainty of the ACA Methodology (per VYC 3001 Rev. 2)

ACM ability to conservatively match peak response at the highest frequencies:	32%
Difference in Sensor Locations from QC2 to VY	7%
Ability of ACM or Structural Model to match response frequencies:	25%
SG and DAS ability to measure pressure in Pipe	11%
Uncertainty of Dryer Pressure data Measurements at QC2	3%
Combined Uncertainty by Square Root Sum of the Squares	43%

The uncertainty of the ACM to predict peak response at observed dryer acoustic frequencies is the largest contributor to overall ACA load uncertainty. The other uncertainties including the sensor location uncertainty, frequency uncertainty, pipe pressure measurement uncertainty, and QC2 dryer pressure measurement uncertainty are independent elements of uncertainty because they are derived from unrelated variables such as location, frequency, independent benchmark assessment, and detection equipment. Therefore the SRSS combination methodology is appropriate.

- CFD Load Uncertainty (Remains unchanged from Revision 0 of VYC 3001)
  The CFD predictions using the Large Eddy Simulation runs for VY are on average 118% above the RMS values of in-plant data with a standard deviation of 82%. Therefore a conservative estimate of uncertainty is 118% - 82% = +36%. This would support 0% uncertainty for the CFD load. Conservatively, VY has maintained a 15% CFD load uncertainty in the Limit Curve Factor assessment.

  The CFD analysis with the +/-10% change in load step had an impact on the limiting stress by 4%. Therefore the CFD frequency uncertainty is determined to be 4%. The total CFD uncertainty; uncCFD= sqrt(15^2 + 4^2) = 16%.

- System Monitoring Requirements
  - During power ascension, steam dryer performance will be monitored hourly through the evaluation of pressure fluctuation data collected from strain gages installed on the MSLs.
  - The strain gage data collected hourly during power ascension will be compared against the stress limit curve that is provided as Figures 1 - 8 of the SDMP and is based on Entergy Calculation VYC-3001. If any frequency peak from the MSL strain gage data exceeds the stress limit curve (Level 1), Entergy will reduce the reactor power to a level at which the stress limit curve is not exceeded.
  - Additionally, Entergy will monitor data collected from accelerometers mounted to the main steam piping inside the drywell to provide additional insights into the strain gage signals.
  - During hold points at each 80 MWt power level above current licensed thermal power, the collected data, along with a comparison to the steam dryer limit curve, will be transmitted to the NRC staff.
  - For any circumstance requiring a revision to the steam dryer limit curve, Entergy will resolve uncertainties in the steam dryer analysis and provide the results of that evaluation to the NRC staff prior to further increases in reactor power.
  - Entergy will resolve uncertainties in the steam dryer analysis with the NRC staff within 90 days of issuance of the EPU license amendment. If resolution is not made within this time interval, reactor operation will not exceed 1593 MWt. These planned actions are in compliance with proposed License Condition 3.M.

Moisture Carryover

- Moisture carryover trending provides an indicator of steam dryer integrity. At each 40 MWt step, moisture carryover data will be taken and compared to the predetermined acceptance criteria (Table 2).
- Level 1 criterion (0.35%) is based on the maximum analyzed value.
- The data taken at each 80 MWt plateau will be evaluated and documented in the assessment sent to the NRC for information.

Other Monitoring

- Plant data that may be indicative of off-normal steam dryer performance will be monitored during power ascension (e.g., reactor water level, steam flow, feed flow, steam flow distribution between the individual steam lines). Plant data can provide an early indication of unacceptable steam dryer performance. The enhanced monitoring of selected plant parameters will be controlled by the PATP and other plant procedures.

NRC Notifications

- In accordance with proposed License Condition 3.M., at discrete power levels, and if the steam dryer stress limit curve (i.e., Level 1 criterion) is exceeded, Entergy will provide notifications to the NRC staff consisting of data and evaluations performed during EPU power ascension testing above 1593 MWt. Detailed discussions regarding new plant data, inspections, and evaluations will be held with NRC staff upon request. The designated NRC point of contact for such information is the NRC Project Manager for the VYNPS EPU.
- The results of the SDMP will be submitted to the NRC staff in a report within 60 days following the completion of all EPU power ascension testing. This will include the final full EPU power performance criteria spectra (i.e., steam dryer stress limit curve). In accordance with License Condition 3.M the uncertainty questions associated with the ACM will be resolved and submitted to the NRC staff within 90 days of license amendment issuance. Contemporary data and results from steam 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 steam 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 steam dryer structural integrity monitoring.

Long Term Monitoring

The long-term monitoring of plant parameters potentially indicative of steam dryer failure will be conducted, as recommended by General Electric Service Information Letter 644, Rev. 1 and consistent with License Condition 3.M.

Moisture Carryover

Per VYNPS station operating procedure OP-0631, "Radiochemistry," moisture carryover is periodically monitored for moisture carryover during normal plant operations. VYNPS off-normal procedure ON-3178, "Increased Moisture Carryover," provides guidance to evaluate any elevated moisture carryover results including that resulting from potential vessel internals damage. This monitoring will also provide insight into changes in moisture carryover values during changing reactor core configurations (control rod patterns)

Strain Gage Monitoring

As the strain gages will remain operational and can provide for future data collection, additional strain gage monitoring will be performed as determined appropriate during the remainder of the operating cycle following EPU implementation.

Inspections

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

Reporting to NRC

Steam Dryer Visual Inspections: The results of the visual inspections of the steam dryer conducted during the next three refueling outages shall be reported to the NRC staff within 60 days following startup from the respective refueling outage.

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 40 MWt (nominal) power step above 100% OLTP (Note 3)
3. Main steam line data from accelerometers	At least once at every 40 MWt (nominal) power step above 100% OLTP (Note 3) AND Within one hour after achieving every 40 MWt (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 an 80 MWt 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 40 MWt, 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 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 MSL pressure data is also required to be performed once at each 40 MWt power step above 1593 MWt and within one hour of achieving each 40 MWt 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 (i.e., 1593 MWt). If the surveillance is met at a given power level, additional surveillances do not need to be performed at a 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 40 MWt power step from at least three of the four MSLs, 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
Level 2: • Moisture carryover exceeds 0.1% OR • Moisture carryover exceeds 0.1% and increases by > 50% over the average of the three previous measurements taken at > 1593 MWt OR • Pressure data exceed Level 2 Spectra[1]	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.
Level 1: • Moisture carryover exceeds 0.35% OR • Pressure data exceed Level 1 Spectra[1]	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 steam 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 20 MWt and 40 MWt, 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).

Table 3
Steam Dryer License Conditions

License Condition	Requirement	Implementing Actions
3.M.1.a	Entergy shall monitor hourly the 32 main steam line (MSL) strain gages during power ascension above 1593 MWt for increasing pressure fluctuations in the steam lines.	During initial power ascension above 1593 MWt, data from at least 32 strain gages will be collected and evaluated by Entergy's power ascension test team to verify that acoustic signals indicative of increasing pressure fluctuations in the steam lines are not challenging the steam dryer stress limit curve. Monitoring will be conducted hourly during any power ascension above a previously attained power level. (Reference ERSTI-04-VY1-1409-000) (Reference PCRS tracking item WT-VTY-2005-00000-01803)
3.M.1.b	Entergy shall hold the facility for 24 hours at 105%, 110%, and 115% of OLTP (i.e., 1593 MWt) to collect data from the 32 MSL strain gages required by License Condition 3.M.1.a, conduct plant inspections and walkdowns, and evaluate steam dryer performance based on these data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.	The PATP has established test plateau increments of approximately 80 MWt (corresponding to 105%, 110%, and 115% of 1593 MWt). Reactor power will not be increased above the plateau for a minimum of 96 hours. During the first 24 hours of steady state operation at each plateau, strain gage data will be collected from all available strain gages (minimum of 32) and evaluated to demonstrate acceptable steam dryer performance. Additionally, moisture carryover measurements will be made at each plateau and every 24 hours during power ascension testing. At the 80 MWt plateau hold points, Entergy will conduct plant walkdowns and inspections of plant equipment, including piping and components identified as potentially vulnerable to flow-induced vibration (FIV) in accordance with the PATP and other plant procedures. Steam dryer performance will be evaluated based on these data. The 24-hour period and the 96-hour period may overlap once the transmittal is provided to the NRC staff. The evaluations of steam dryer performance, based on the data collected during each of the 80 MWt plateaus, as well as the results of walkdowns and other measurements of FIV for various piping and plant components, will be provided to the NRC staff. Arrangements have been made for electronic transmission through email and/or uploading to a designated website. Upon the NRC Project Manager confirming receipt of the steam dryer data and performance evaluation, the 96 hours of hold

License Condition	Requirement	Implementing Actions
	above OLTP, Entergy Nuclear Operations, Inc. shall evaluate steam dryer loads and re-establish the limit curve based on the new strain gage data, and shall perform a frequency-specific assessment of ACM uncertainty at the acoustic signal frequency.	association with the benchmarking of the new ACM a frequency specific assessment of the ACM uncertainty was performed and is contained in Calculation VYC-3001, Rev. 1. (Reference ERSTI-04-VY1-1409-000) (Reference VYC-3001 Rev. 1)
3.M.2.c	After reaching 120% of OLTP, Entergy Nuclear Operations, Inc. shall obtain measurements from the MSL strain gages and establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the steam dryer monitoring plan (SDMP) limit curve with the updated ACM load definition and revised instrument uncertainty, which will be provided to the NRC staff.	After collecting strain gage data at approximately the EPU full power level, Entergy will establish the steam dryer flow-induced vibration load fatigue margin for the facility, update the steam dryer stress report, and re-establish the stress limit curve with the updated ACM load definition and revised instrument uncertainty. This information will be included in the report to the NRC staff being made in accordance with License Condition 3.M.1.e. (Reference PCRS tracking item WT-VTY-2006-00000-00249)
3.M.2.d	During power ascension above OLTP, if an engineering evaluation is required in accordance with the SDMP, Entergy Nuclear Operations, Inc. shall perform the structural analysis to address frequency uncertainties up to ±10% and assure that peak responses that fall within this uncertainty band are addressed.	COMPLETE - As part of the evaluation performed at 1673MWt Entergy Vermont Yankee completed revisions to the VY Steam Dryer model used in the Finite Element Model (FEM). Additional analysis of the FEM output was performed to assess the frequency uncertainties. The results of this assessment are contained in Calculation VYC-3001, Rev. 1. (Reference ERSTI-04-VY1-1409-000)
3.M.2.e	Entergy Nuclear Operations, Inc. shall revise the SDMP to reflect long-term monitoring of plant parameters potentially indicative of steam dryer failure; to reflect consistency of the facility's steam dryer inspection program with General Electric Services Information Letter 644, Revision 1; and to identify the NRC Project Manager for the facility as the point of contact for providing SDMP information during power ascension.	The revised SDMP provides long-term monitoring of steam dryer performance in accordance with GE SIL 644 Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00250) COMPLETE - The SDMP and the PATP identify the NRC Project Manager for the VYNPS EPU as the point of contact for providing SDMP information during power ascension. (Reference ERSTI-04-VY1-1409-000) COMPLETE - For moisture carryover, procedures OP-0631 and ON-3178 provide for long-term monitoring and controls.

License Condition	Requirement	Implementing Actions
3.M.2.f	Entergy Nuclear Operations, Inc. shall submit the final extended power uprate (EPU) steam dryer load definition for the facility to the NRC upon completion of the power ascension test program.	The final EPU steam dryer load definition will be included in the report provided to the NRC staff in accordance with License Conditions 3.M.1.e. and 3.M.2.c. (Reference PCRS tracking item WT-VTY-2006-00000-00251)
3.M.2.g	Entergy Nuclear Operations, Inc. shall submit the flow-induced vibration related portions of the EPU startup test procedure to the NRC, including methodology for updating the limit curve, prior to initial power ascension above OLTP.	COMPLETE - Entergy letter BVY 06-019 forwards the FIV-related portions of the EPU power ascension test procedure to the NRC. (Reference ERSTI-04-VY1-1409-000) The methodology for updating the steam dryer stress limit curve is as follows: Prerequisite: Generate report resolving uncertainties in the steam dryer analysis. 1. Collect representative data from 32 strain gages at eight MSL locations. 2. Using a plant-specific ACM, analyze strain gage data to determine steam dryer loads. 3. Input ACM loads into a finite element model to determine dryer stresses. 4. Perform an updated uncertainty evaluation. 5. Generate revised steam dryer stress limit curve(s). (Reference PCRS tracking item WT-VTY-2006-00000-00252)
3.M.3(a)	Entergy shall prepare the EPU startup test procedure to include the stress limit curve to be applied for evaluating steam dryer performance.	COMPLETE - The steam dryer stress limit curve to be applied for evaluating steam dryer performance during power ascension is provided herewith. The limit curve was developed on the basis of calculation VYC-3001, which is incorporated by reference into the EPU PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(b)	Entergy shall prepare the EPU startup test procedure to include specific hold points and their duration during EPU power ascension.	COMPLETE - Specific hold points and durations are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(c)	Entergy shall prepare the EPU startup test procedure to include activities to be accomplished during hold points.	COMPLETE - Activities to be accomplished during hold points are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

License Condition	Requirement	Implementing Actions
3.M.3(d)	Entergy shall prepare the EPU startup test procedure to include plant parameters to be monitored.	COMPLETE - Plant parameters to be monitored are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(e)	Entergy shall prepare the EPU startup test procedure to include inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during the hold points.	COMPLETE - Inspections and walkdowns to be conducted for steam, feedwater, and condensate systems and components during hold points are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(f)	Entergy shall prepare the EPU startup test procedure to include methods to be used to trend plant parameters.	COMPLETE - Methods to be used to trend plant parameters are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(g)	Entergy shall prepare the EPU startup test procedure to include acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections.	COMPLETE - Acceptance criteria for monitoring and trending plant parameters, and conducting the walkdowns and inspections are specified in Attachment 9 to the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(h)	Entergy shall prepare the EPU startup test procedure to include actions to be taken if acceptance criteria are not satisfied.	COMPLETE - Actions to be taken if acceptance criteria are not satisfied are specified in the PATP. (Reference ERSTI-04-VY1-1409-000)
3.M.3(i)	Entergy shall prepare the EPU startup test procedure to include verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer.	COMPLETE - Verification of the completion of commitments and planned actions specified in the license amendment application and all supplements to the application in support of the EPU license amendment request pertaining to the steam dryer is specified in the PATP. (Reference ERSTI-04-VY1-1409-000)

3.M.4	When operating above OLTP, the operating limits, required actions, and surveillances specified in the 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 OLTP, 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 99-04.	These restrictions are provided in the PATP and/or the SDMP. (Reference ERSTI-04-VY1-1409-000)
3.M.5	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. (Reference PCRS tracking item WT-VTY-2006-00000-00253) (Reference PCRS tracking item WT-VTY-2006-00000-00254) (Reference PCRS tracking item WT-VTY-2006-00000-00255)

3.M.6	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.	The VYNPS steam dryer will be inspected during the refueling outages scheduled for the Spring 2007, Fall 2008, and Spring 2010. The inspections conducted after power uprate implementation will be comparable to the inspections conducted during the Spring 2004 and Fall 2005 refueling outages and will be in accordance with the guidance in SIL 644, Rev. 1. The results will be documented in a report and submitted to the NRC within 60 days following completion of all EPU power ascension testing. (Reference PCRS tracking item WT-VTY-2006-00000-00256) (Reference PCRS tracking item WT-VTY-2006-00000-00257) (Reference PCRS tracking item WT-VTY-2006-00000-00258)
3.M.7	The requirements of paragraph 3.M.4 above for meeting the SDMP 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 paragraph 4 shall extend another full operating cycle until the visual inspection standard of no new flaws/flaw growth based on visual inspection is satisfied.	When operating above 1593 MWt, the operating limits, required actions, and surveillances specified in the SDMP will be met. Those key attributes of the SDMP specified in License Condition 3.M.4 will not be made less restrictive without prior NRC approval. (Reference PCRS tracking item WT-VTY-2006-00000-00259)
3.M.8	This license condition shall expire upon satisfaction of the requirements in paragraphs 5, 6, and 7 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.	(Reference PCRS tracking item WT-VTY-2006-00000-00260)

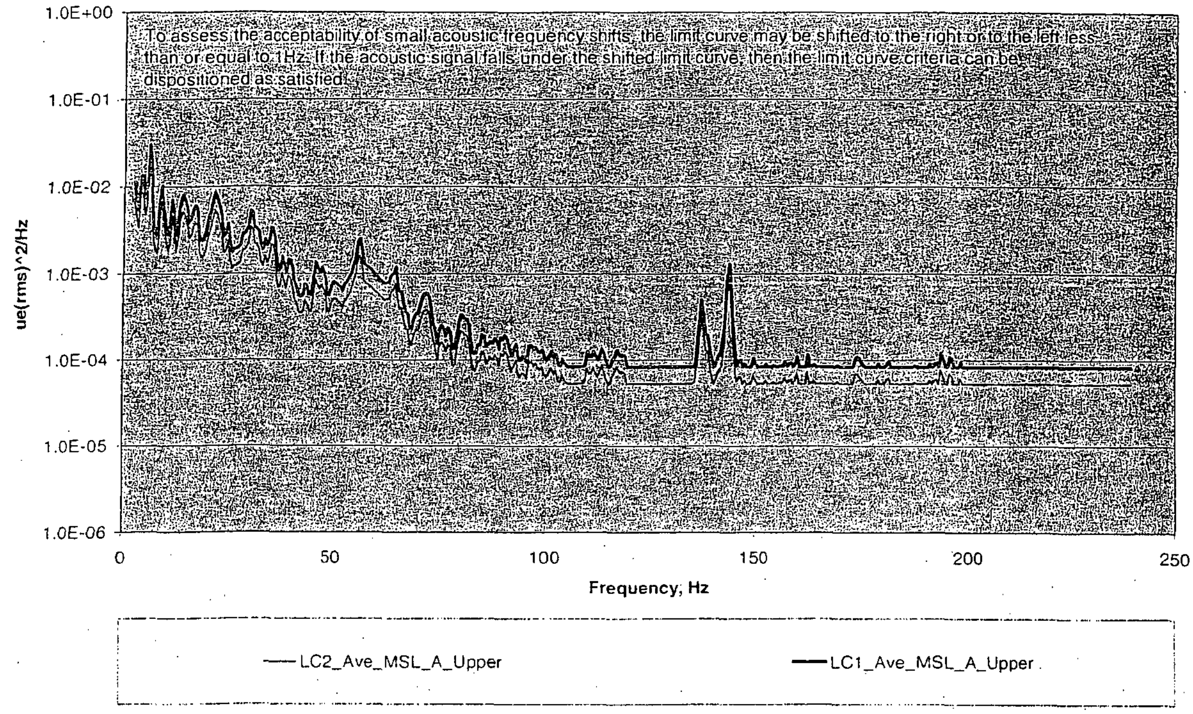

Figure 1: Steam Dryer Stress Limit Curve – MSL 'A' Upper

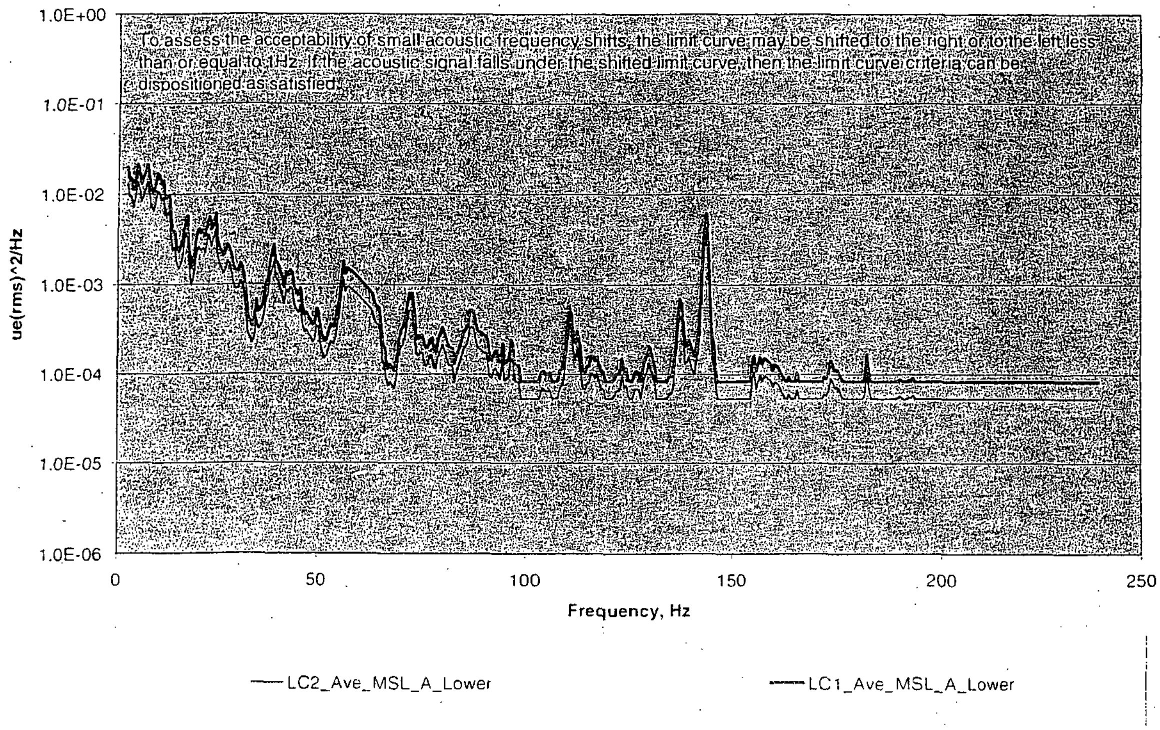

Figure 2: Steam Dryer Stress Limit Curve – MSL 'A' Lower

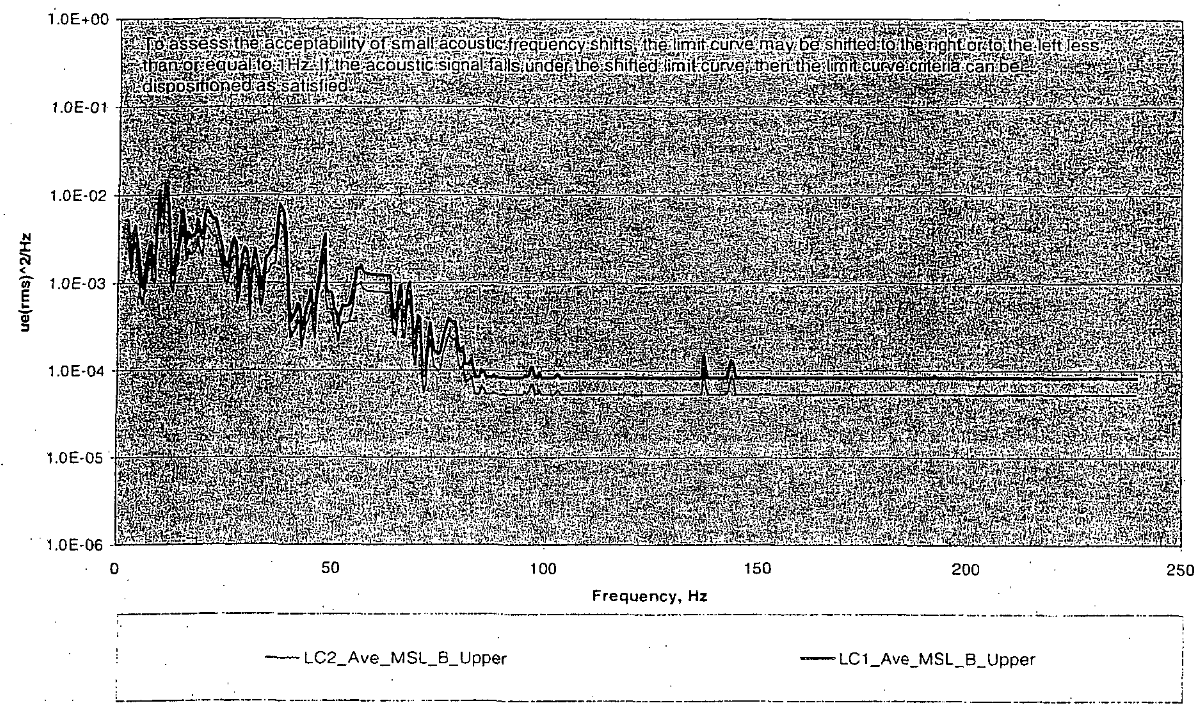

Figure 3: Steam Dryer Stress Limit Curve – MSL 'B' Upper

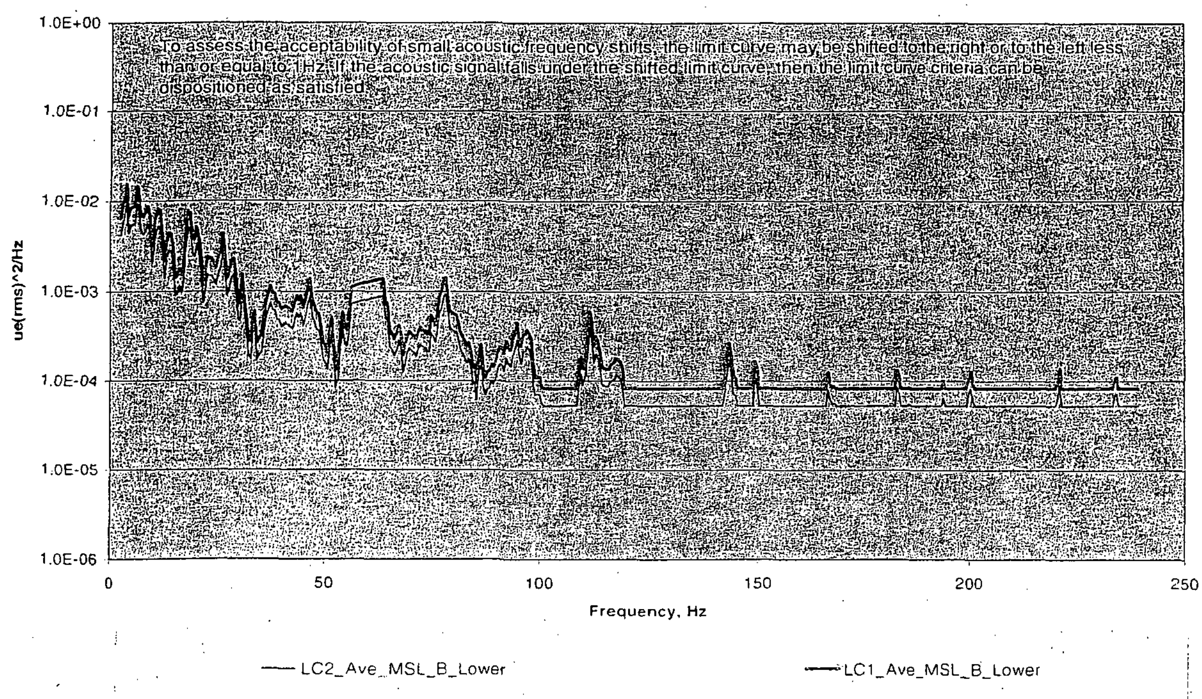

Figure 4: Steam Dryer Stress Limit Curve – MSL 'B' Lower

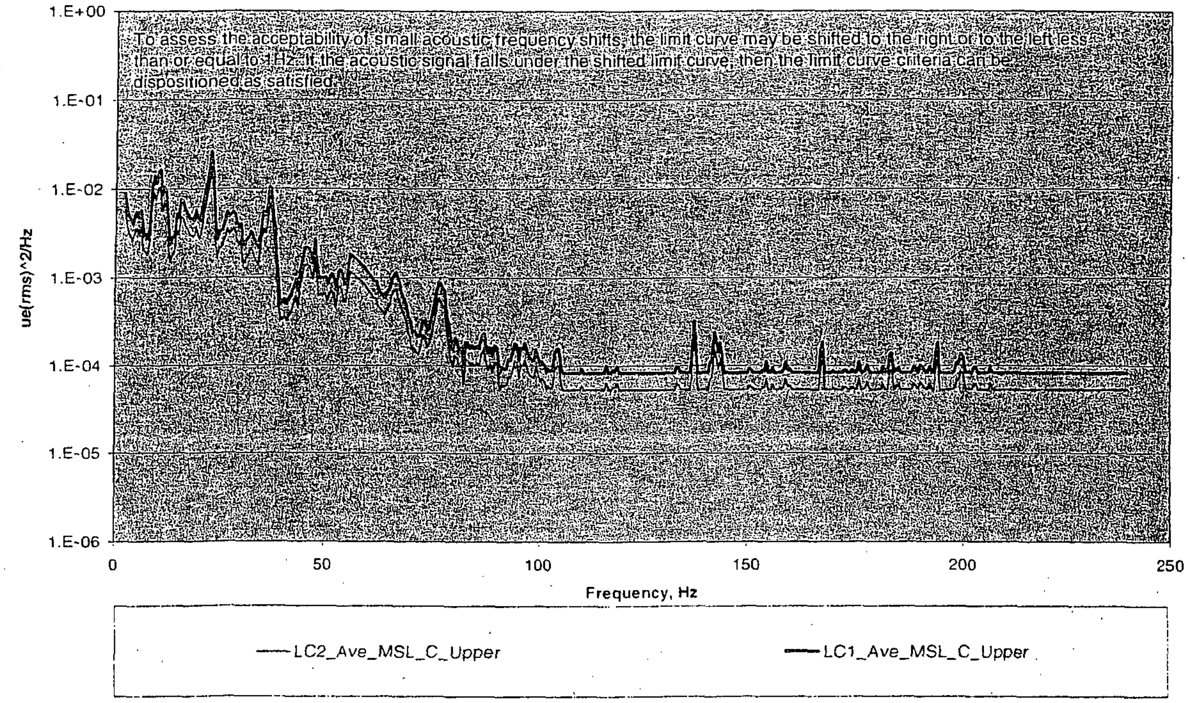

Figure 5: Steam Dryer Stress Limit Curve – MSL 'C' Upper

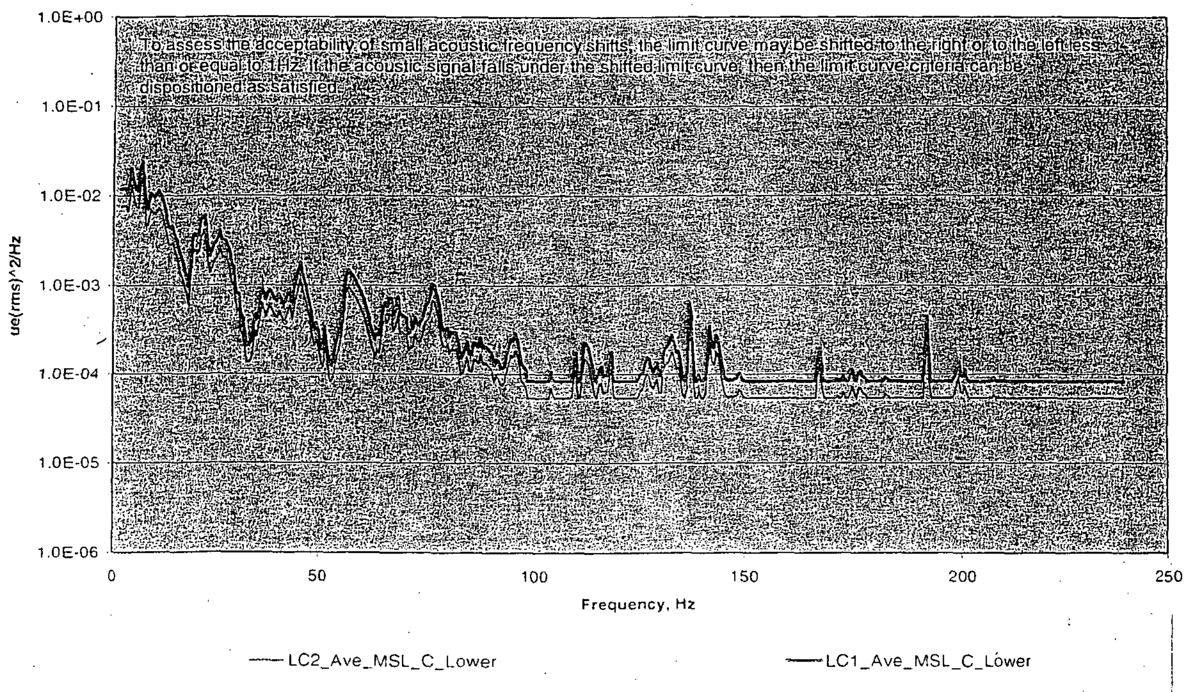

Figure 6: Steam Dryer Stress Limit Curve – MSL 'C' Lower

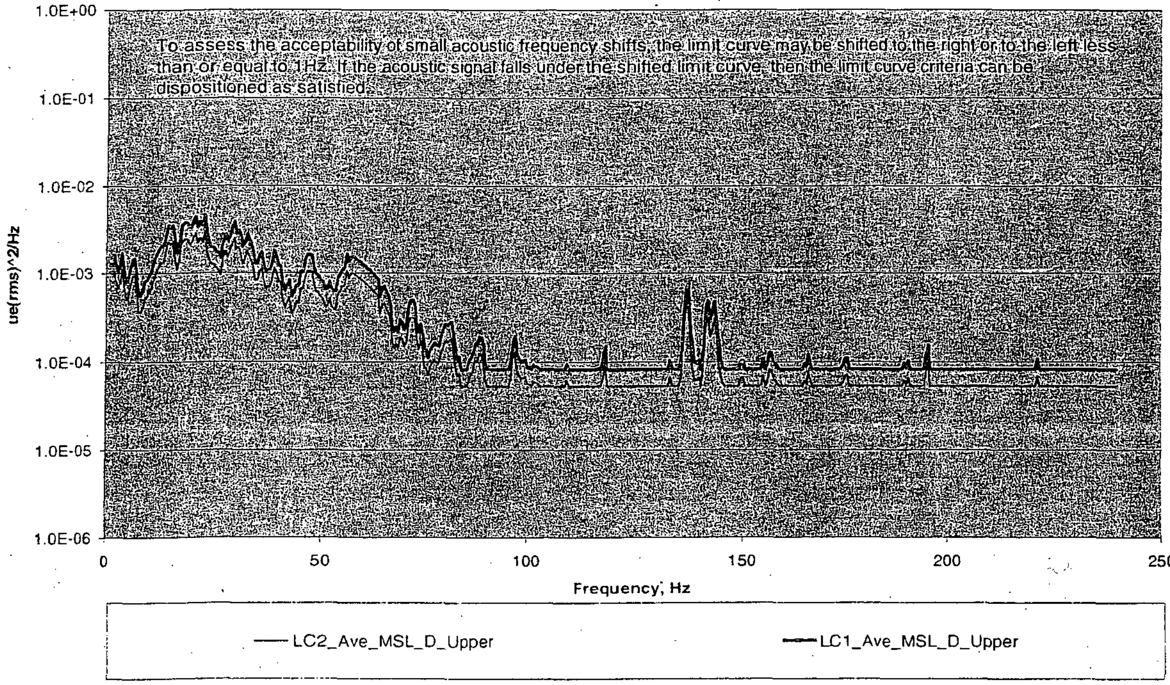

Figure 7: Steam Dryer Stress Limit Curve – MSL 'D' Upper

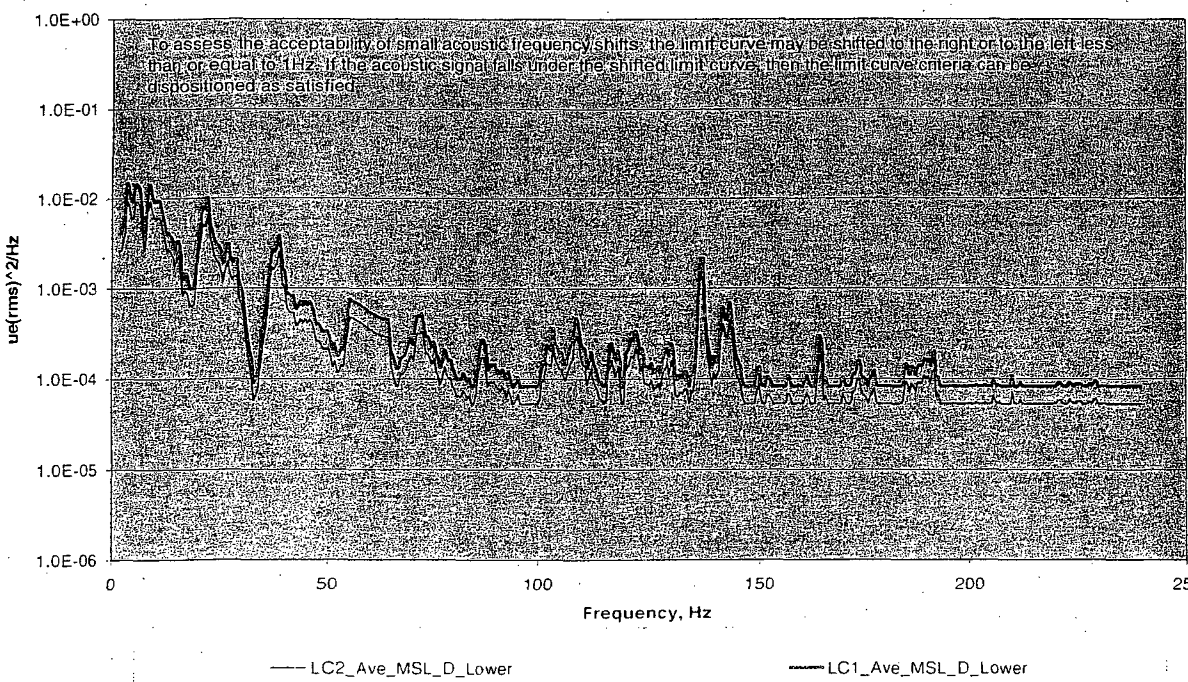

Figure 8: Steam Dryer Stress Limit Curve – MSL 'D' Lower