



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

August 5, 2020

Mr. Thomas A. Conboy  
Site Vice President  
Northern States Power Company - Minnesota  
Monticello Nuclear Generating Plant  
2807 West County Road 75  
Monticello, MN 55362

**SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT – APPROVAL OF THE  
LONG-TERM STEAM DRYER INSPECTION PLAN AS REQUIRED BY  
RENEWED FACILITY OPERATING LICENSE CONDITION 2.C.15(H)  
(EPID L-2019-LLL-0035)**

Dear Mr. Conboy:

By letter dated November 22, 2019, as supplemented by letter dated June 8, 2020, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (NSPM) submitted the “Monticello Nuclear Generating Plant [Monticello] Long-Term Steam Dryer Inspection Plan” (the plan). The plan was submitted pursuant to Monticello Renewed Facility Operating License Condition 2.C.15(h) which requires that:

At the end of the second refueling outage, following the implementation of the EPU [extended power uprate], the licensee shall submit a long-term steam dryer inspection plan based on industry operating experience along with the baseline inspection results for NRC review and approval.

The NRC staff has determined, as documented in the enclosed review summary, that the plan is based on industry operating experience and baseline inspection results. Therefore, the NRC staff has determined that NSPM has satisfied the requirements of Monticello Renewed

Facility Operating License Condition 2.C.15(h). If you have any questions, please contact me at 301-415-3733 or by e-mail at [Robert.Kuntz@nrc.gov](mailto:Robert.Kuntz@nrc.gov).

Sincerely,

**/RA/**

Robert F. Kuntz, Senior Project Manager  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-263

Enclosure: Review of the Long-Term  
Steam Dryer Inspection Plan

cc: Listserv

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT – APPROVAL OF LONG-TERM STEAM DRYER INSPECTION PLAN AS REQUIRED BY RENEWED FACILITY OPERATING LICENSE CONDITION 2.C.15(h)  
(EPID L-2019-LLL-0035) DATED AUGUST 5, 2020

**DISTRIBUTION:**

PUBLIC

PM File Copy

RidsACRS\_MailCTR Resource

RidsNrrDorlLpl3 Resource

RidsNrrLASRohrer Resource

RidsNrrLAJBurkhardt Resource

RidsNrrPMMonticello Resource

RidsRgn3MailCenter Resource

**ADAMS Accession No.: ML20202A230**

OFFICE	NRR/DORL/LPL3/PM	NRR/DORL/LPL3/LA	NRR/DEX/EMIB/BC
NAME	RKuntz	SRohrer	ABuford
DATE	7/22/2020	7/22/2020	7/2/20
OFFICE	NRR/DNRL/NVIB/BC	NRR/DORL/LPL3/BC	NRR/DORL/LPL3/PM
NAME	HGonzalez	NSalgado	RKuntz
DATE	6/30/2020	8/5/20	8/5/20

**OFFICIAL RECORD COPY**

REVIEW OF THE LONG-TERM STEAM DRYER INSPECTION PLAN

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

1.0 INTRODUCTION

By letter dated November 20, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19324F851), as supplemented by letter dated June 8, 2020 (ADAMS Accession No. ML20160A144), Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (NSPM, the licensee), submitted "Monticello Nuclear Generating Plant [Monticello] Long-Term Steam Dryer Inspection Plan" (the plan) for NRC review and approval. The submittal of the plan is required in accordance with Monticello Renewed Facility Operating License Condition 2.C.15(h) that was included as part of extended power uprate (EPU) approval.

The U.S. Nuclear Regulatory Commission (NRC) approved an EPU amendment for Monticello by letter dated December 9, 2013 (ADAMS Accession No. ML13316B298). NRC's authorization of the EPU included license conditions for steam dryer and other items. As a part of the EPU modifications, NSPM elected to replace the original parallel vane bank square hood type steam dryer of General Electric (GE) design with an octagonal shaped three ring vane bank type steam dryer of Westinghouse design.

Monticello Renewed Operating License Condition 2.C.15(h) states that:

At the end of the second refueling outage, following the implementation of the EPU, the licensee shall submit a long-term steam dryer inspection plan based on industry operating experience along with the baseline inspection results for NRC review and approval.

The plan noted that no relevant indications were identified on the replacement steam dryer (RSD) during the 2007 outage (refueling outage (RFO) 28). However, in the 2009 outage (RFO 29), one location of the steam dryer was identified having two relevant indications.

2.0 SUMMARY OF NRC REVIEW

2.1 Baseline Inspection Results

The Monticello RSD visual inspection results for the first complete operating cycle at full EPU conditions were provided in the enclosure entitled "RFO 28 Steam Dryer Inspection Summary Report" to the letter from NSPM dated August 10, 2017 (ADAMS Accession No. ML17223A092).

The Monticello RSD visual inspection results for the second complete operating cycle at full EPU conditions were provided in the Enclosure 2 entitled "IVVI Steam Dryer Inspection Results (RFO29)" to the letter from NSPM dated August 9, 2019 (ADAMS Accession No. ML19221B714).

The visual inspection results from the first two scheduled refueling outages (RFO 28 and RFO 29) after reaching full EPU conditions represent the baseline inspection results for the Monticello RSD. The licensee conducted visual inspections of all accessible locations of the steam dryer using general principles and guidance in Boiling Water Reactor Vessel and Internals Project (BWRVIP) BWRVIP-139-A "BWR Vessel and Internals Project, Steam Dryer Inspection Flaw Evaluation Guidelines," (ADAMS Accession No. ML101270122). By letter dated March 23, 2011 (ADAMS Accession No. ML110820755), the NRC staff found BWRVIP-139-A an acceptable technical justification for planning comprehensive baseline visual inspections of steam dryer assemblies. BWRVIP-139-A was developed for parallel vane bank GE designed steam dryers. However, use of general principles from BWRVIP-139-A as guidance for Westinghouse designed octagonal vane bank steam dryers coupled with steam dryer operating experience of steam dryers is considered a reasonable approach.

#### 2.1.1 RFO 28 Steam Dryer Inspection Summary Report

The Monticello RSD was inspected in accordance with the inspection recommendations described in "Westinghouse Recommendations for the Monticello Replacement Steam Dryer Inspections," Revision 1 (ADAMS Accession No. ML12298A033) which was included as an enclosure to the NSPM letter dated October 22, 2012 (ADAMS Accession No. ML12298A032). The examinations performed in RFO 28 and the results of inspections are included in Table 1 of Enclosure to the August 10, 2017, letter.

The examinations included VT-3 and VT-1-89 visual inspection type techniques. VT-1-89 is a visual examination using VT-1 resolution, distance, and angle of view requirements as described in ASME Section XI, Subparagraph IWA-2211(b), 1989 Edition. VT-1-89 is the recommended technique for steam dryer inspections and was used to the extent practical per BWRVIP-139-A. Since the Monticello RSD is of Westinghouse design, the general guidelines for the steam dryer inspections are based on the general principles found within BWRVIP-139-A. The inspection results provided show that no indications were found in the Monticello RSD. There were a total 149 dryer locations examined out of which nine (9) weld locations were inaccessible for inspection. No relevant indications were identified on the replacement steam dryer during RFO 28 inspections

#### 2.1.2 RFO 29 Steam Dryer Inspection Summary Report

The examinations performed in RFO 29 and the results of inspections are included in Table 1 of Enclosure to the letter dated August 9, 2019. The examinations included VT-3 and VT-1-89 visual inspection type techniques. There were a total 149 dryer locations examined out of which nine (9) weld locations were inaccessible for inspection. One weld location (Stiffener Weld RSD-1D-C1-S1) was identified as having relevant indication and was evaluated to be acceptable by the licensee for the next two refueling cycles prior to the next visual examination. The NRC requested for additional details on whether the indication is a fatigue crack or Inter granular stress corrosion crack.

In response to the NRC request for additional information, the licensee provided additional details regarding the indications. Based on their appearance and location, the indications were

determined to be transgranular stress corrosion cracking (TGSCC) type attributed to local cold-work due to grinding during manufacturing. The observed indications were in the base metal parallel to the weld but somewhat away from the weld. The indications are straight with no branching, which is consistent with TGSCC type. The indications are not of fatigue type or intergranular stress corrosion cracking type.

Industry operating history of the dryer design, which is installed in seven nuclear power outside the United States and three in the United States, indicates no operating experience for susceptibility to high cycle fatigue cracking. The only operating experience with cracking in another plant was determined to be TGSCC related to surface grinding. The Monticello indications are consistent with the prior observation of TGSCC related to grinding.

The indications were determined to be acceptable for the next two cycles following the 2019 inspection based on a structural evaluation, structural redundancy analysis, and fracture mechanics evaluation performed by the original equipment manufacturer. Reexamination of the indications will be performed by the licensee after two cycles. If any crack extension is found, additional evaluation will be performed at that time.

## 2.2 Steam Dryer Long-Term Inspection Plan

The plan was submitted to the NRC as required by Renewed Facility Operating License Condition 2.C.15(h). The plan provides recommendations for long-term or future inspections of the RSD.

The plan is based on the following considerations.

- recommendations from the manufacturer of the RSD (Westinghouse). No additional inspection locations are recommended outside of the reexaminations after the next two refueling cycles of the two indications found in 2019 (RFO 29).
- recent industry operating experience. The licensee contacted Westinghouse regarding current operating experience of Westinghouse designed steam dryers. None of the industry operating experience resulted in a change to inspection recommendations for Monticello. No additional inspections are necessary due to recent operating experience

The plan includes inspection of the various locations over ten-year periods. This frequency is consistent with the re-inspection frequency of BWRVIP-139 and Westinghouse recommendations.

Over the ten-year periods, the plan requires inspection of:

- all inspection locations in accordance "Westinghouse Recommendations for Inspections of the Monticello Replacement Steam Dryer," Revision1,
- all flaws found during inspections in accordance with BWRVIP-139-1A re-inspection recommendations, and
- the maximum stress location in accordance with Westinghouse recommendations.

The plan also provides subsequent re-inspection guidelines.

Based on its review, the NRC staff finds that the plan provides necessary details on inspection frequencies, re-inspection guidelines, and inspection scope expansion based on dryer experience and dryer stress analysis results.

### 3.0 CONCLUSION

Based on its review as summarized above, the NRC staff concludes that the licensee has adequately performed steam baseline dryer inspections during two refueling outages succeeding implementation of EPU. The licensee prepared an acceptable long-term steam dryer inspection plan in accordance with "Westinghouse Recommendations for Inspections of the Monticello Replacement Steam Dryer," Revision 1, and guidance from BWRVIP-139A to satisfy the license condition 2.C.15(h).

The plan provides necessary details on inspection frequencies, and re-inspection guidelines. The staff finds that Monticello RSD baseline inspection results and the plan submitted in accordance with license condition 2.C.15(h) are acceptable because they are in accordance with BWR dryer experience, Westinghouse recommendations, and BWRVIP-139A guidance.

Based on its review the NRC finds the plan acceptable. Therefore, the NRC concludes that the licensee has satisfactorily met the requirements of Monticello Renewed Facility Operating License Condition 2.C.15(h).

Primary Reviewers: C. Basavaraju, NRR  
D. Widrevitz, NRR  
G. Cheruvenki