



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001

ACRSR-2150

September 22, 2005

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

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL  
APPLICATIONS FOR THE MILLSTONE POWER STATION, UNITS 2 AND 3

Dear Chairman Diaz:

During the 525<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards (ACRS), September 8-10, 2005, we completed our review of the license renewal applications for the Millstone Power Station (MPS), Units 2 and 3 and the final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during a meeting on April 6, 2005. During these reviews, we had the benefit of discussions with the staff, Dominion Nuclear Connecticut, Inc. (DNC), and a member of the public representing the Connecticut Coalition Against Millstone. We also had the benefit of the documents referenced. This report fulfills the requirements of 10 CFR 54.25, which requires that the ACRS review and report on all license renewal applications.

#### CONCLUSION AND RECOMMENDATION

1. The programs committed to and established by the applicant to manage age-related degradation provide reasonable assurance that MPS, Units 2 and 3 can be operated in accordance with their current licensing basis for the period of extended operation without undue risk to the health and safety of the public.
2. DNC's applications for renewal of the operating licenses for MPS, Units 2 and 3 should be approved.

#### BACKGROUND AND DISCUSSION

Millstone Power Station consists of three nuclear units on a 500-acre site on the north shore of Long Island Sound in the town of Waterford, Connecticut. Each of the three Millstone units was supplied by a different nuclear steam supply system vendor. Unit 1, a Mark 1 boiling water reactor which was shut down in the late 1990s, is not the subject of the license renewal applications being considered here. Unit 2 is a 2700 MWt (895 MWe) 4-loop (two steam generators) Combustion Engineering pressurized water reactor (PWR). Unit 3 is a 3411 MWt (1195 MWe) 4-loop Westinghouse PWR. The applicant has requested renewal of the current operating licenses for Units 2 and 3 for an additional 20 years beyond their current terms, which expire on July 31, 2015, and November 25, 2025, respectively.

Those long-lived passive structures, systems, and components (SSCs) from Unit 1 that service Units 2 and 3 fall within the scope of this license renewal. Although DNC submitted separate license renewal applications for Unit 2 and Unit 3, the staff consolidated its SER to address both applications. Since the applicant will apply identical aging management programs (AMPs) to both units, the staff's consolidation of the SER is appropriate.

In the final SER, the staff documented its review of the DNC's license renewal applications and other information submitted by the applicant or obtained during the staff's audits and inspections at the plant site. The staff reviewed the completeness of the applicant's identification of SSCs that are within the scope of license renewal; the integrated plant

assessment process; the applicant's identification of plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's aging management programs; and the identification and assessment of time-limited aging analyses (TLAAs).

The DNC applications demonstrate consistency with, or justify deviations from, the approaches specified in the Generic Aging Lessons Learned Report.

In its draft SER the staff identified a number of issues requiring further definition, analysis, or modification by the applicant to satisfy the requirements of the license renewal rule. Among these issues were the following:

The staff questioned the applicant's definition of the "first equivalent anchor point" for determining the endpoint of nonsafety-related piping attached to safety-related systems to be included within the scope of the rule. The applicant resolved this issue by changing the definition of the "first equivalent anchor point" to be consistent with the current licensing basis.

The staff questioned the applicant's neglect of effects other than thermal cycling, such as vibration, that could lead to age-related loss of preload of bolting. The applicant modified its Bolting Integrity Program to reflect such aging effects.

The staff questioned the exclusion of the reactor vessel flange leak detection lines in Units 2 and 3 from the scope of license renewal. The applicant initially argued that the break flow through a failed leak detection line would be limited by a restriction in the reactor vessel flange geometry to a flow less than the makeup capability of the chemical and volume control system. However, the applicant finally decided to include the reactor vessel flange leak detection lines within the scope of aging management, satisfying the staff's concern.

The staff questioned the adequacy of the leak-before-break (LBB) analyses for Units 2 and 3 for the period of extended operation. The applicant submitted additional information on the methods and assumptions used to update these analyses for the period of extended operation. The current LBB analyses are for the reactor coolant system loop piping and components, the pressurizer surge line, and portions of the safety injection and shutdown cooling lines of Unit 2, and for the reactor coolant system loop piping and components of Unit 3. The analyzed systems and components were constructed of carbon and low-alloy steel, stainless steel [including cast austenitic stainless steel (CASS)], and nickel-based alloys. TLAAs were performed that account for fatigue crack growth, the thermal aging of CASS, and the corrosion of nickel-based alloys. DNC demonstrated that the analyses for fatigue crack growth and thermal aging of CASS, assuming fully aged materials, are adequate for the period of extended operation. The corrosion of nickel-based alloys will be managed by the use of the Inservice Inspection Program. In addition, DNC has committed to follow the industry recommendations regarding the aging effects and appropriate aging management of nickel-based alloys for Units 2 and 3 and to submit an aging management program at least 24 months prior to entering the period of extended operation. These commitments are documented in the SER.

Analyses of reactor vessel neutron embrittlement (upper shelf energy, pressurized thermal shock screening criterion, and pressure-temperature limits) performed by the applicant and independently verified by the staff demonstrate that the limiting reactor vessel beltline welds and plate materials will satisfy the acceptance criteria for the period of extended operation.

Both the applicant and the staff chose to use a conservative lifetime capacity factor of 90 percent for determining neutron fluence. We agree.

The staff requested confirmatory analyses or other technically justifiable responses to six confirmatory issues. DNC has supplied information regarding these confirmatory items and the staff has determined that the applicant's responses are satisfactory to close these confirmatory items.

We agree with the resolution of all open items identified in the draft SER. DNC has made appropriate commitments to carry out the tasks identified by the staff and agreed to by DNC to satisfy outstanding issues related to these applications. The staff has included appropriate license conditions in the SER to satisfy remaining documentation issues and action items.

DNC's applications for renewal of the licenses for MPS, Units 2 and 3 are of high quality and DNC's responses to the staff's requests for additional information are thorough, timely, and complete. The staff's evaluation is technically comprehensive and well documented in the SER. The inspections and audits performed by the NRC staff for evaluating the applicant's proposed and existing programs and analyses are effective. They reduce the amount of paperwork and staff and applicant time needed to prepare and respond to written requests for additional information.

No issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) preclude renewal of the operating licenses for MPS, Units 2 and 3. The programs committed to and established by the applicant provide reasonable assurance that MPS, Units 2 and 3 can be operated in accordance with their current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The applications for renewal of the operating licenses for MPS, Units 2 and 3 should be approved.

Drs. Mario Bonaca and George Apostolakis did not participate in the Committee's deliberations regarding this matter.

Sincerely,

/RA/

Graham B. Wallis  
Chairman

References:

3. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the License Renewal of the Millstone Power Station, Units 2 and 3," August 2005
4. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report with Open Items Related to the License Renewal of the Millstone Power Station, Units 2 and 3," February 2005
5. Dominion Nuclear Connecticut, Inc., "Millstone Power Station Unit 2 Application for Renewed Operating License Technical and Administrative Information," January 2004
6. Dominion Nuclear Connecticut, Inc., "Millstone Power Station Unit 3 Application for Renewed Operating License Technical and Administrative Information," January 2004
7. U.S. Nuclear Regulatory Commission, "Millstone Power Station Unit 2 and Unit 3 - License Renewal Application Inspection Report Nos. 05000336/2004009, 05000423/2004009," December 3, 2004
8. U.S. Nuclear Regulatory Commission, "Millstone Power Station Unit 2 and Unit 3 - License Renewal Application Inspection Report Nos. 05000336/2004010, 05000423/2004010," December 3, 2004

9. Information Systems Laboratories, Inc., "Audit and Review Report for Plant Aging Management Reviews and Programs, Millstone Power Station - Units 2 & 3," February 2, 2005
10. Letter to Graham Wallis, Chairman, Advisory Committee on Reactor Safeguards, from Nancy Burton, Connecticut Coalition Against Millstone, Subject: Millstone Nuclear Power Station, September 7, 2005
11. Letter to the Advisory Committee on Reactor Safeguards from Nancy Burton, Connecticut Coalition Against Millstone, Subject: Millstone Nuclear Power Station Application for License Renewal, April 5, 2005
12. Letter to Paul G. Kroh, Chief Inspector, Region I, U.S. Nuclear Regulatory Commission, from Nancy Burton, Connecticut Coalition Against Millstone, Subject: Millstone Nuclear Power Station, April 1, 2005

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**References:**

13. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the License Renewal of the Millstone Power Station, Units 2 and 3," August 2005
14. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report with Open Items Related to the License Renewal of the Millstone Power Station, Units 2 and 3," February 2005
15. Dominion Nuclear Connecticut, Inc., "Millstone Power Station Unit 2 Application for Renewed Operating License Technical and Administrative Information," January 2004
16. Dominion Nuclear Connecticut, Inc., "Millstone Power Station Unit 3 Application for Renewed Operating License Technical and Administrative Information," January 2004
17. U.S. Nuclear Regulatory Commission, "Millstone Power Station Unit 2 and Unit 3 - License Renewal Application Inspection Report Nos. 05000336/2004009, 05000423/2004009," December 3, 2004
18. U.S. Nuclear Regulatory Commission, "Millstone Power Station Unit 2 and Unit 3 - License Renewal Application Inspection Report Nos. 05000336/2004010, 05000423/2004010," December 3, 2004

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