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

October 7, 2014

Vice President, Operations
Entergy Nuclear Operations, Inc.
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES NUCLEAR PLANT – RELIEF REQUEST NUMBER 4-17, PROPOSED ALTERNATIVE, REQUEST FOR RELIEF FROM IMMEDIATE ASME CODE FLAW REPAIR OF SERVICE WATER SYSTEM MANUAL VALVE MV-SW135 (TAC NO. MF3192)

Dear Sir:

By letter dated December 3, 2013 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML13339A740), as supplemented by letter dated July 30, 2014 (ADAMS Accession No. ML14211A380), Entergy Nuclear Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) requesting relief from the requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV Code), regarding the repair of a service water manual valve at Palisades Nuclear Plant (PNP).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested to use a proposed alternative to the requirements of Article IWD-3000 of Section XI of the 2001 Edition through 2003 Addenda, of the ASME Code. The proposed alternative included use of Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Section XI, Division I," to temporarily accept a through-wall flaw in a moderate energy Class 3 valve. Relief Request RR 4-17 was requested on the basis that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The purpose of the licensee's request was to delay Code repair or replacement activities of the degraded valve MV-SW135 to either during the next refueling outage, scheduled to begin January 2014, or when the predicted flaw size exceeds acceptance criteria, whichever occurs first. As stated by the licensee, the valve was replaced as scheduled during refueling outage 1R23.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that Entergy Nuclear Operations, Inc. has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii) and is in compliance with the requirements of the ASME Code, Section XI for which relief was not requested. Therefore, the NRC staff authorizes the use of Relief Request RR 4-17 at the PNP, effective between when the leakage was identified on October 25, 2013, and when the degraded valve was replaced during refueling outage 1R23.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the Project Manager, Jennivine Rankin at 301-415-1530 or via e-mail at Jennivine.Rankin@nrc.gov.

Sincerely,

David Pelton, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Safety Evaluation

cc w/encl: Distribution via ListServ

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NUMBER RR 4-17

REGARDING REPAIR OF THE SERVICE WATER MANUAL VALVE

PALISADES NUCLEAR PLANT

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-255

1.0 INTRODUCTION

By letter dated December 3, 2013 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML13339A740), as supplemented by letter dated July 30, 2014 (ADAMS Accession No. ML14211A380), Entergy Nuclear Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) requesting relief from the requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV Code), regarding the repair of a service water manual valve at Palisades Nuclear Plant (PNP).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested to use a proposed alternative to the requirements of Article IWD-3000 of Section XI of the 2001 Edition through 2003 Addenda, of the ASME Code. The proposed alternative included use of Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Section XI, Division I," to temporarily accept a through-wall flaw in a moderate energy Class 3 valve. Relief Request RR 4-17 was requested on the basis that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The purpose of the licensee's request was to delay Code repair or replacement activities of the degraded valve MV-SW135 to either during the next refueling outage, scheduled to begin January 2014, or when the predicted flaw size exceeds acceptance criteria, whichever occurs first. As stated by the licensee, the valve was replaced as scheduled during refueling outage 1R23.

2.0 REGULATORY EVALUATION

In Relief Request RR 4-17, the licensee requested authorization of an alternative to the requirements in Article IWD-3000 of Section XI of the ASME Code pursuant to 10 CFR 50.55a(a)(3)(ii).

Enclosure

10 CFR 50.55a(g)(4) states, in part, that ASME Code class 1, 2, and 3 components (including supports) must meet the requirements, except the design and assess provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for In-service Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(a)(3), alternatives to the ASME Code requirements may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternative provides an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the following technical evaluation, the NRC staff concludes that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the alternative proposed by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Relief Request RR 4-17

3.1.1 Description

The affected service water valve is the ASME Code Class 3 four inch manually operated gate valve, MV-SW135, which is part of the Component Cooling Water (CCW) Heat Exchanger E-54A Service Water Outlet CV-0823 Bypass piping. The valve is located on the discharge side of the CCW Heat Exchanger.

By letter dated December 3, 2014, the licensee described the design of the affected component:

> The valve is on a four inch diameter bypass line that connects upstream to a 16 inch diameter service water discharge line from the CCW heat exchanger E-54A and connects downstream to a 24 inch service water line that flows directly to Lake Michigan. The bypass line contains CCW heat exchanger E-54A temperature control valve CV-0821, which is maintained in a throttled position to regulate flow through the CCW heat exchanger E-54A during normal operation. Valve MV-SW135 provides an isolation function for the upstream CV-0821. Since MV-SW135 discharges directly to Lake Michigan, leakage from the valve has no effect on the supply of service water to required loads. The valve is not part of the containment isolation system and is not part of the primary coolant system pressure boundary. The valve does not have a safety function to close. It is normally open and is closed only to support maintenance activities involving CV-0821.
>
> System maximum operating pressure is 125 psig [pounds per square inch gage] and the maximum operating temperature is 170 degrees F.

3.1.2 Licensee's Proposed Alternative and Bases for Use

PNP is in its fourth 10-year inservice inspection interval (ISI). The applicable Code of Record for the current 10-Year ISI program is the ASME Code, Section XI, 2001 Edition through 2003 Addenda. The ASME Code, Section XI, paragraph IWD-3000 provides analytical evaluation criteria for flaws identified during performance of in-service inspections and tests.

ASME Code Case N-513-3 provides requirements for temporary acceptance of flaws, including through-wall flaws, in moderate energy ASME Class 2 or 3 piping, without performing a repair/replacement activity. The use of N-513-3 is conditionally approved for use by the NRC in Regulatory Guide 1.147, Revision 16. Code Case N-513-3 does not apply to through wall flaws located in the pressure retaining base material of a valve.

The licensee stated that periodic ultrasonic testing (UT) inspections of no more than 30-day intervals around the valve will be performed to identify wall loss propagating outside the encompassed area. The licensee also stated that the valve will be repaired or replaced no later than when either the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria, or during the next scheduled outage, in accordance with Code Case N-513-3, whichever occurs first. The next scheduled outage was the refueling outage planned to begin in early 2014.

The licensee stated that on October 25, 2013, a through-wall leak was identified in the valve body of a 4 inch manual valve, MV-SW135, which is part of the service water system. The area was identified by discovery of a slow (several drops per minute) leak coming from a pin hole in the valve body. The leak was located on the inlet side near the weld connecting the valve to the upstream tapered flange, and was measured to be approximately 3.5 mL/min. The licensee performed UT to characterize the affected area and prepared an evaluation. Ultrasonic testing of the valve body was completed in the inlet and outlet areas of the valve including the area surrounding the pin hole leak. A thinned area was detected near the weld connecting the valve and upstream tapered flange. The licensee concluded that the leakage was a result of wall-thinning due to localized cavitation/corrosion on the inside of the pipe. In accordance with ASME Code Case N-513-3, the licensee also examined the entire circumference of the valve and piping at the through-wall leak location and did not identify any other defects.

By letter dated December 3, 2014, the licensee stated the following regarding the extent of condition examinations:

> ENO performed an extent of condition UT examination at a minimum of five of the most susceptible and assessable locations within 30 days in accordance with Section 5(a) of Code Case N-513-3.
>
> The UT examinations did not identify any evidence of wall thinning at the locations examined.

In Attachment 3 of the submittal dated December 3, 2014, the licensee detailed their significant operating experience with the MV-SW135 valve and surrounding piping. The operating experience dated back to October 2000 and includes issues experienced with cavitation/corrosion damage.

By letter dated December 3, 2014, the licensee stated the following regarding the flooding analysis of for the CCW room.

> The flooding analysis for the CCW room postulates failure of an 18 inch pipeline within the room, and concludes that no equipment required for safe plant shutdown would be affected by the maximum flood levels within the room from the piping failure. Any leakage from the four-inch MV-SW135 would be bounded by the discharge from the postulated 18 inch pipe break.

3.1.3 Hardship

By letter dated December 3, 2014, the licensee stated the following when describing the hardship of performing the repair replacement. The valve would need to be removed from service in order to complete a code compliant repair/replacement.

> The valve can be isolated from the upstream portion of the service water system but not from the downstream portion of the system, which discharges to Lake Michigan [, and thus prevents the valve from being isolable]. Performing a Code repair/replacement activity now to correct the flaw discovered in MV-SW135 [that has such a minor leak rate (3.5 mL/min)] would create a hardship based on the potential risk associated with unit cycling and emergent equipment issues incurred during shutdown and startup evolutions. No compensating increase in the level of quality and safety would be gained by immediate repair of the flaw.

3.2 NRC Staff Evaluation

The NRC staff evaluated the technical aspects of this request against the criteria contained in 10 CFR 50.55a(3)(ii) (i.e., the existence of a hardship or unusual difficulty without a compensating increase in quality or safety).

In Attachment 3 of the submittal dated December 3, 2014, the licensee performed a predicted end-of-evaluation thickness calculation based on the operating experience with the MV-SW135 valve and associated piping. The MV-SW135 valve was last replaced in March 2012. The replacement of the valve was attributed to the cavitation due to being downstream of the constantly throttled valve, CV-0821. The maximum thickness of 0.426 inches was assumed to be representative of the as-installed thickness, and then the apparent metal loss rate, using the minimum thickness of 0.102 inches, was approximately 17 mills per month. Based on this rate, operating experience, and the known mechanism of cavitation/corrosion damage (constantly throttled valve), the minimum measured thickness in the weld was predicted to be reduced to 0.051 inches for the 3-month evaluation period ending in January 2014. In order to determine the operability of the component, the degradation mechanism must be visually discernible or there must be substantial operating experience with the identified degradation mechanism in the affected system. The NRC staff concludes that the licensee has demonstrated the mechanism for cavitation/corrosion damage of the valve is known and provided reasonable assurance that the metal loss rate would not affect the structural integrity of the valve prior to the next scheduled outage for replacement.

There is not an ASME Code Case to evaluate flaws in a valve body. Therefore, the licensee used ASME Code Case N-513-3 as a guide to perform the flaw evaluations. The licensee

modeled the valve body neck as a pipe and using a flaw depth to wall thickness ratio of unity that is similar to the approach of ASME Code Case N-513-3. The analyses conservatively assume uniformly thinned components, thereby not including the additional strength provided by the remaining wall around the thinned region.

The licensee's extent of condition examinations did not identify any evidence of wall thinning at the additional locations examined. The NRC staff notes that the licensee performed extent of condition exams in accordance with Code Case N-513-3 and concludes that is acceptable. Thus, the staff concludes the licensee met the requirements of the code case for the extent of condition examination and that this is an isolated incident.

The licensee performed an operability evaluation to provide the basis for the requested relief from the code case requirements. The licensee concluded that there is sufficient base pipe metal such that further corrosion will not affect the integrity of the valve. The operability evaluation of the through-wall flaw determined that the affected manual valve would continue to be capable of performing its required safety functions and is not susceptible to sudden or catastrophic failure. The NRC staff verified that the valve will have sufficient wall thickness to maintain its structural integrity during the effective period of the relief request. The staff, therefore, concludes the licensee's proposed alternative to use Code Case N-513-3 to temporarily accept a through-wall flaw in a moderate energy Class 3 valve to be acceptable, that the structural integrity will be maintained, and failure due to corrosion is unlikely.

The NRC staff viewed the potential for flooding due to the failure of the valve to be a significant concern. The licensee's flooding analysis postulates a failure of an 18 inch pipeline within the room, and concludes that no equipment required for safe plant shutdown would be affected by the maximum flood levels from the piping failure. Any leakage from the four-inch MV-SW135 would be bounded by the discharge from the postulated 18 inch pipe break. Thus, the staff concludes the licensee's flooding evaluations to be acceptable and no equipment would be affected by the flood levels possibly experienced from the four inch MV-SW135 valve.

As part of the proposed alternative to use Code Case N-513-3 to temporarily accept a through-wall flaw in a moderate energy Class 3 valve, the licensee will conduct periodic monitoring and inspections of the valve. The licensee will perform a daily visual walkdown of manual valve MV-SW135, monthly leak rate measurements, and monthly UT examinations to confirm the analysis from the ultrasonic examinations remain valid. These walkdowns and inspections are in accordance with Code Case N-513-3 and will take place until the valve is replaced.

The NRC staff concludes that analyses which are conducted in accordance with an accepted code case, and are conducted to the satisfaction of the NRC, are sufficient to demonstrate reasonable assurance of structural integrity of the subject components. In considering a compensating increase in the level of quality and safety, the NRC staff used guidance provided in ASME Code Case N-513-3. The licensee appropriately modified the code case guidelines to reflect the valve geometry for this relief request. The staff concludes that the licensee's proposed alternative was consistent with each requirement contained in Code Case N-513-3. Based on the consistency between the Code Case and the technical content of the licensee's proposal, the NRC staff finds that the licensee's proposed alternative will provide reasonable assurance of structural integrity of the subject components and that requiring the licensee to make a code compliant repair, will not result in a compensating increase in the level of quality and safety.

By a request for additional information (RAI) dated June 9, 2014 (ADAMS Accession No. ML14160A915), the NRC staff requested information regarding whether a plan to detect cavitation through UT examinations and replace components with wall thinning, as necessary, has been developed and implemented. The licensee stated the following in the RAI response dated July 30, 2014:

> The cavitation inspection and replacement plan has been developed and implemented. Cavitation damage will be identified by conducting UT inspections to detect localized wall thinning at locations designated as cavitation-susceptible by a component cavitation risk ranking plan. Susceptible locations include locations downstream of throttle valves and orifices, locations where there is significant differential pressure, and locations where there is high velocity. Inspections will be prioritized based on the relative susceptibility of locations to cavitation degradation, and will take into account plant operating experience, input from system hydraulic analytical models, and risk of component failure. Inspection frequencies will be based on inspection results and aforementioned factors, and will be conservatively chosen.

As stated by the licensee in lieu of eliminating the source of cavitation, the subject carbon steel valve was replaced with a stainless steel valve in February 2014 during a scheduled refueling outage.

In considering hardship or unusual difficulty, the NRC staff concludes the licensee's assessment that a permanent, code compliant repair could not be made without removing the affected valve from service, to be reasonable. Thus, shutting the plant down in mid-cycle creates undue and unnecessary stress on plant systems, structures, and components. The staff further concludes that making code compliant repairs to the subject valve would require a plant shutdown and would therefore constitute a hardship.

Based on the above, the NRC staff concludes that the licensee's proposed alternative provides adequate technical basis for both criteria contained in the 10 CFR 50.55a(a)(3)(ii) and that there is reasonable assurance of structural integrity of the subject components.

4.0 REGULATORY COMMITMENT

In its submittal dated December 3, 2014, the licensee made the following commitments:

COMMITMENT	SCHEDULED COMPLETION DATE
ENO will perform a daily visual walkdown of manual valve MV-SW135 to confirm that the analysis from ultrasonic testing (UT) examinations remains valid (i.e., no new significant leakage) in accordance with Section 2(f) of Code Case N-513-3.	The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to begin in January 2014.
ENO will perform a monthly measurement of the MV-SW135 leak rate	The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to

	begin in January 2014.
ENO will perform a monthly UT examination that bounds the two thinned locations (i.e., the valve body pin hole leak and the weld between the MV-SW135 valve body and the upstream tapered flange) to validate the flaw analysis completed in support of the operatbility evaluation in accordance with Section 2(e) of ASME code Case N-513-3.	The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to begin in January 2014.
ENO will repair or replace manual valve MV-SW135 no later than when either (1) the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria, in accordance with Section 2(h) of Code Case N-513-3, or (2) during the next scheduled outage, in accordance with Section 2(h) of Code Case N-513-3, whichever occurs first. The next scheduled outage is the refueling outage planned to begin in January 2014.	The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to begin in January 2014.

The NRC staff has reviewed the above regulatory commitments and concludes they are acceptable.

5.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides reasonable assurance of structural integrity of the subject service water piping. The staff concludes that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the staff authorizes the use of Relief Request RR 4-17 at Palisades Nuclear Plant, effective between when the leakage was identified on October 25, 2013 and when the degraded valve was replaced during Refueling outage 1R23.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Steven Vitto

Date: October 7, 2014

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the Project Manager, Jennivine Rankin at 301-415-1530 or via e-mail at Jennivine.Rankin@nrc.gov.

Sincerely,

/RA/

David Pelton, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Safety Evaluation

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ADAMS Accession No.: ML14279A209 *via memorandum

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