Entergy

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PNP 2014-075

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response to Request for Additional Information - Palisades - RR 4-17, Proposed Alternative, Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW135 - MF3192

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

REFERENCES:
1. Entergy Nuclear Operations, Inc. letter, PNP 2013-082, *Relief Request Number 4-17, Proposed Alternative, Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW135*, dated December 3, 2013 (ADAMS Accession No. ML13339A740)

2. NRC e-mail, *Request for Additional Information - Palisades – RR 4-17, Proposed Alternative, Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW135 - MF3192,* dated June 9, 2014 (ADAMS Accession No. ML14160A915)

Dear Sir or Madam:

In Reference 1, Entergy Nuclear Operations, Inc. (ENO) requested Nuclear Regulatory Commission (NRC) approval of the Request for Relief for a Proposed Alternative for the Palisades Nuclear Plant (PNP). This Request for Relief was submitted because a through-wall flaw was discovered in a service water system, 4-inch cast carbon steel valve body within an ASME Class 3 system.

In Reference 2, the Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI). The response to the RAI is provided in the attachment.

This submittal contains no proprietary information.

This submittal makes no new commitments or revisions to previous commitments.

Sincerely,

ajv/jse

Attachment: 1. Response to Request for Additional Information - Palisades - RR 4-17, Proposed Alternative, Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW135 - MF3192

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ATTACHMENT 1

Response to Request for Additional Information - Palisades - RR 4-17, Proposed Alternative, Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW135 - MF3192

By letter dated December 3, 2013 (Reference 1), Entergy Nuclear Operations, Inc. (ENO) requested relief from certain requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWD-3000 which established flaw size acceptance standards and provides analytical evaluation criteria. ENO proposed an alternative to the NRC conditionally approved Code Case N-513-3 to temporarily accept a through wall flaw in a moderate energy Class 3 valve.

In order to complete the review, the Nuclear Regulatory Commission (NRC) requested additional information as identified in the following request for additional information (RAI) questions (Reference 2).

1. Entergy Nuclear Operations, Inc. letter, PNP 2013-082, *Relief Request Number 4-17, Proposed Alternative, Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW135*, dated December 3, 2013 (ADAMS Accession No. ML13339A740)

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Nuclear Regulatory Commission (NRC) Request

1. Discuss the actual size of the pin hole in the MV-SW135 valve. Discuss the wall thickness at and around the pin hole.

Entergy Nuclear Operations, Inc (ENO) Response

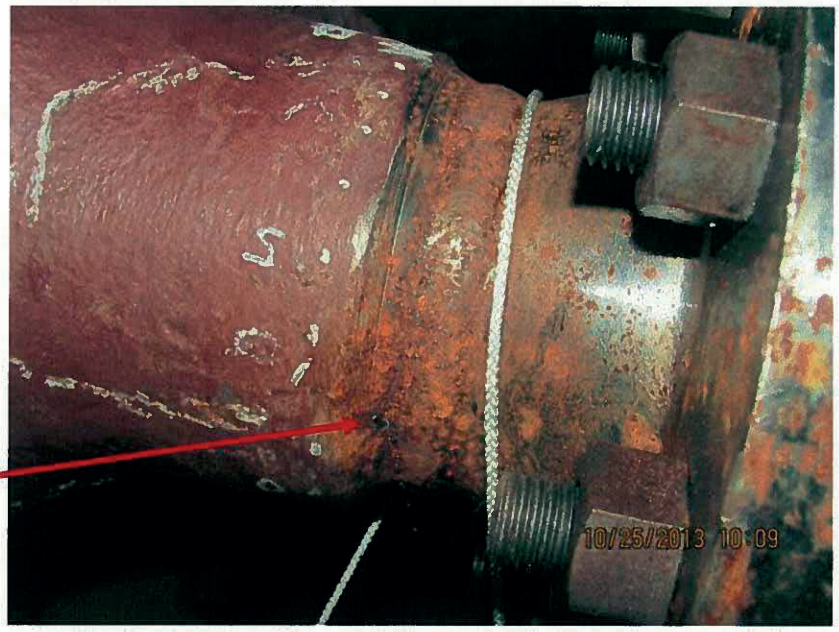
1. The size of the pin hole in service water system manual valve MV-SW135 was not measured or calculated, although, judging from its measured leak rate of 3.5 mL per minute, it was very small. The wall thickness in the vicinity of the leak was measured by ultrasonic testing (UT) at the time the leak was discovered on October 25, 2013. The pin hole was encompassed by weld inspection points AP01 and AQ01 and valve body inspection points AP02 and AQ02 (see UT examination records for the weld and the valve body in the operability evaluation in Attachment 3 of the relief request). The measured wall thicknesses at weld inspection points AP01 and AQ01 were 0.256 inches and 0.215 inches, respectively. The measured wall thicknesses at valve body inspection points AP02 and AQ02 were 0.672 inches and 0.692 inches, respectively. The minimum wall thickness measured in the vicinity of the pin hole was at weld

inspection point AO01, which was 0.102 inches (see UT examination records for the weld in the operability evaluation in Attachment 3 of the relief request).

UT thickness measurements were taken again on November 21, 2013 and on December 19, 2013. The table below provides the thickness measurements taken for these inspection points on these dates.

Table –Inspection Point Thickness Measurements (inches)

Date	Weld Inspection Point AP01	Weld Inspection Point AQ01	Valve Body Inspection Point AP02	Valve Body Inspection Point AQ02	Weld Inspection Point AO01
10/25/13	0.256	0.215	0.672	0.692	0.102
11/21/13	0.251	0.211	0.675	0.699	0.109
12/19/13	0.224	0.208	0.710	0.710	0.104



NRC Request

2. *Section 5 of the relief request states that "...the requested Code relief shall be used until Code repair/replacement activities are performed on the valve body either during the next scheduled outage or when the predicted flaw size exceeds acceptance criteria..." (a) Clarify exactly what is meant by "Code repair/replacement activities are performed on the valve body". Does this mean that a new valve will replace the degraded valve or repair only the original valve body? If only the valve body is repaired, discuss how this can be performed per the ASME Code, Section XI. (b) Discuss the flaw size that would exceed the acceptance criteria.*

ENO Response

2. a) As discussed in the ENO relief request, the "Code repair/replacement activity" was to replace the valve. The valve was replaced in February 2014 during refueling outage 1R23, as planned.

   b) The flaw size that would exceed the acceptance criteria would be a flaw length greater than the allowable flaw lengths provided in Section 4.0 in Structural Integrity Associates, Inc. Report Number 1301385.401, "Flaw Tolerance Evaluation of Leaking MV-SW135 Service Water Valve Body," which is contained within Attachment 3 of Reference 1. See additional discussion under RAI question #5 below.

NRC Request

3. *Page 5 of the Operability Evaluation report in the December 3, 2013 submittal states that "... As a result of this Condition Report, a plan to detect cavitation through UT examinations and replace components with identified wall thinning as necessary is being developed..." (a) Discuss whether this plan has been developed. If yes, provide the detail of how the cavitation will be detected and what is the inspection frequency. If not, when will the plan will be complete. (b) Discuss the compensatory measures to mitigate the cavitation at the subject valve to prevent future degradation. (c) Page 14 of the Operability Evaluation report states that under Long Term Actions, "Work Order 365955-01 will replace MV-SW135 in the next refueling outage (1R23)..." Discuss how cavitation will be mitigated in the subject valve and associated piping system as a long term action because the valve replacement does not mitigate the root cause of the degradation (i.e. cavitation).*

ENO Response

3. a) 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.

b) Compensatory measures to mitigate the effect of cavitation-induced erosion until the valve was replaced were not taken based on the expected material loss rate and the short time duration remaining until valve replacement. In lieu of mitigating actions, daily visual inspections and monthly UT inspections were conducted to validate the flaw analysis until valve replacement.

c) 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. Stainless steel is less susceptible to cavitation-induced erosion than carbon steel. Elsewhere, carbon steel components that have been designated for replacement per the cavitation plan will be replaced with stainless steel components as well. Components replaced under this plan will continue to be monitored, via UT inspections, for cavitation degradation under the site inspection program. Replacement of carbon steel components with stainless steel components is a common industry practice to mitigate the erosion of components due to cavitation.

NRC Request

4. *Page 11 of the Operability Evaluation report states that "...Per section 3.2(b) [of code case N-513-3] the minimum wall thickness (tmin) to maintain design requirements was calculated to be 0.020 inches..." The NRC staff finds that the tmin equation in Section 3.2(b) of Code Case N-513-3 may not be adequate and applicable to a valve that experiences known cavitation. The corrosion rate of cavitation can be unpredictable and aggressive. Discuss whether 0.020 inches was used as an acceptable criterion to permit the valve to remain in service.*

ENO Response

4. The 0.020 inches minimum wall thickness was not used as an acceptance criterion for valve operability. Wall thickness was an input assumption in the evaluation that developed the through-wall flaw size acceptance criteria in Section 4.0 in Structural Integrity Associates, Inc. Report Number 1301385.401, "Flaw Tolerance Evaluation of Leaking MV-SW135 Service Water Valve Body,"

which is contained within Attachment 3 of Reference 1. Since wall thickness was an input assumption in the flaw size acceptance criteria evaluation, UT wall thickness measurements were used to validate conformance with evaluation assumptions.

The relief request states that replacement of MV-SW135 shall be performed no later than when the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the flaw size acceptance criteria, or the next refueling outage, whichever comes first.

As noted in the operability evaluation and the report, even if the actual wear rate exceeded the predicted wear rate, the ASME Code margins for MV-SW135 are maintained as long as the degraded area with thickness below 0.102 inches is bounded by the corresponding allowable through-wall flaw lengths described in Section 4.0.

NRC Request

5. *In the flaw evaluation by Structural Integrity Associates, Inc, Table 3 (page 9 of 11) presents the allowable and critical flaw lengths with respect to the three valve uniform thickness. Based on Table 3 data, if the valve uniform thickness is reduced to 0.051 inches, the allowable circumference and axial flaw length are 0.41 inches and 0.96 inches, respectively. It is not clear to the NRC staff how these acceptance criteria will be used to disposition the pin hole in the subject valve. (a) If the valve thickness is not less than 0.051 inches but the pin hole extends to more than 0.41 inches, would the pin hole exceed the acceptance criteria? (b) If the valve thickness is reduced to below 0.051 inches but the pin hole diameter is not more than 0.41 inches, would the valve be acceptable for service? (c) Where should the valve thickness be measured to meet the 0.051 inch criteria, i.e., at the pin hole or anywhere in the valve body? (d) Section 4 of the flaw evaluation states that "...In addition, an allowable throughwall circular opening of 1.5 inches resulted from a branch reinforcement evaluation..." How can this allowable through wall circular opening of 1.5 inches be used to disposition any pin hole expansion with respect to the allowable flaw length listed in Table 3. That is, which allowable flaw length dominates or governs for the disposition of the pin hole in the valve?*

ENO Response

5. a) If the valve thickness is 0.051 inches or greater and the pin hole diameter exceeds 0.41 inches in the circumferential direction, then the ASME Code structural margin would not be met.

   b) If the valve thickness is below 0.051 inches, then the evaluation would not be applicable. Valve thicknesses below 0.051 inches were not evaluated. In this

situation, either a new evaluation to support continued valve service would be required or the valve would have to be removed from service.

c) The valve thickness should be measured to meet the 0.051 inch criteria in areas known to be thinned due to cavitation-induced erosion, such as near the pin hole leak.

d) The minimum flaw length given governs. The allowable through-wall opening of 1.5 inches is based on a branch reinforcement evaluation for a valve body that is 0.102 inches thick. So, this length would govern for the axial direction (i.e., 1.5 inches versus the 2.11 inches allowable calculated using the planar approach). For the circumferential direction, the 1.23 inches allowable flaw length that was calculated using the planar approach would govern.