Millstone Power Station Unit 2 (MPS2) Temporary Non-Code Compliant Condition of the Class 3 SW System 10-Inch EDG Supply Piping Flange Relief Request RAI Responses

NRC Question 1

1. Provide the thickness of the flange (the face and hub), the wall thickness of the pipe, and operating temperature and pressure of the subject piping system.

Response:

The flange face nominal thickness is 11/16" and the nominal flange hub thickness is 5/8" (reference Crane Catalog 61, page 106). The pipe stress analysis calculation used an operating temperature range of 33°F to 80°F (Refer to pages 38 and 39 of Calculation MP58B-00138EM, Revision 4 contained in Attachment 2 to Letter Serial No. 11-476, dated August 19, 2011, node point 580 (the degraded flange location is modeled as NOP No. 1)) and an operating and design pressure of 150 psig for line 10"-JGD-4 (the line that contains the degraded flange: see page 21 of Calculation MP58B-00138EM, Revision 4, contained in Attachment 2 to Letter Serial No. 11-476, dated August 19, 2011). Note: Per Note 7 on page 14 of Calculation MP58B-00138EM, Revision 4, contained in Attachment 2 to Letter Serial No. 11-476, dated August 19, 2011 the system design pressure is actually 100 psig at the flaw location, but 150 psig was conservatively used for the pipe stress analysis qualification calculation.

NRC Question 2

2. Section 5.3. Provide the normal flow rate through the pipe at the flange location. Confirm that if the leak rate at the flange is 50 gpm, the service water supply to the associated diesel generator heat exchanger is still considered operable.

Response:

The flow rate through the pipe at the leaking flange location is dependent on conditions. During the summer months, with the diesel generator not running, there is no flow. In the winter with low system flow demand, when the diesel generator bypass valve is open to provide extra system flow, there is approximately 1500 gpm flow. At any time with the diesel running, there is approximately 800 gpm flow. The statement that with a leak rate of 50 gpm at the flange, the service water supply to the associated diesel generator heat exchanger is still operable is confirmed.

NRC Question 3

3. Section 5.5 discusses a flooding analysis based on a 2 gpm leak rate instead of 1 gpm leak rate. Discuss why 2 gpm is assumed instead of 1 gpm.

Response:

Two gpm allows for potential leakage increase from the action level of one gpm over the 30 day mission time for the service water system post accident. This conservatively assumes that the leakage increases to 1 gpm just prior to the limiting design basis event occurring (large break loss of coolant accident) and that the leakage increases to an average of two gpm (or increases by one gpm) over the 30 day mission time.

NRC Question 4(a)

4. Section 5.6, Extent of Condition. (a) DNC states that "[n]o other SW system flange leaks are present in the MPS2 SW system." What inspections were done to ensure no other leaks are present? When were these inspections done? Was the entire SW system at MPS2 inspected?

Response:

MPS history has demonstrated that operator walkdowns is an effective method of detecting SW leaks. This leak was discovered in this way. Since the observations continue to be accomplished shiftly, no additional inspections were done.

NRC Question 4(b)

(b) Has the Millstone Power Station, Unit No. 3 (MPS 3) SW system been inspected for leaks?

Response:

The SW system on MPS3 uses corrosion resistant piping materials and does not utilize coated piping. Since the SW leak on MPS2 is believed to have been caused by damaged coating on the flange internals and MPS3 uses corrosion resistant piping materials, and does not use internal piping coatings, no inspections were performed at MPS3 for similar leaks.

NRC Question 4(c)

(c) DNC states that "the current condition is presumed to be damage to the coating system upon reinstallation into the system" after inspection of the pressure boundary during a refueling outage. DNC also states that one train of SW is inspected each refueling outage. Therefore it appears to the NRC staff that other areas of the SW system are susceptible to this sort of degradation. Discuss whether the entire MPS2 and MPS3 SW system piping has been inspected to identify the potential for the subject degradation occurring in other parts of the service water piping system. If not, provide justification.

Response:

As stated above MPS history has demonstrated that operator walkdowns is an effective method of detecting SW leaks. This leak was discovered in this way. Since the observations continue to be accomplished shiftly, no additional inspections were done.

The SW system on MPS3 uses corrosion resistant piping materials and does not utilize coated piping. Since the SW leak on MPS2 is believed to have been caused by damaged coating on the flange internals and MPS3 uses corrosion resistant piping materials, and does not use internal piping coatings, no inspections were performed at MPS3 for similar leaks.

NRC Question 5(A) (a) and (b)

5. Section 5.7 states that "…Operations will qualitatively monitor leakage once per shift…"

(A) Discuss in detail how the leakage will be monitored when the operator performs the walkdown every shift. Include the following information in your discussion:

- ***(a) The degraded flange is located close to the ceiling in the room. How will the operator observe the leak rate from the floor of the room during the walkdown.***
- ***(b) Provide the required distance between the operator and the leaking flange location during the walkdown (i.e., the operator cannot exceed this required distance to observe the leakage).***

Response:

(a) Scaffolding has been built allowing the operator direct access to the leak location.

(b) The operator will be within an arms length of the leak. The operator will access this scaffolding and perform a visual inspection of the leakage to determine if it has degraded. With the scaffolding, the operator is able to put hands on to the flange. Since the leak is on the east side of the flange between the piping and the wall, a mirror will be available to assist with inspection.

NRC Question 5(B)

(B) Confirm that 1 shift is 12 hours.

Response:

It is confirmed 1 shift is 12 hours.

NRC Question 5(C)

(C) Discuss if there will be a leakage catcher/container situated at the vicinity of the flange to catch the leaking fluid.

Response:

There is currently a leakage catcher collecting the water that is leaking off of the flange. This is being directed to a catch container (currently a 55 gallon drum) on the floor level.

NRC Question 5(D)

(D) Discuss whether the affected flange area will be without insulation until the flange is repaired.

Response:

The flange area will be without insulation until the flange is repaired or replaced.

NRC Question 5(E)

(E) Section 5.3 of the relief request states that the current leak rate is approximately 10 drops/minute. Discuss whether the operator can observe 10 drops/min during his walkdown of the subject pipe.

Response:

The operator can observe 10 drops/minute during his walkdown of the subject pipe and will assess the leakage via a graduated cylinder measured over time to determine a leak rate.

NRC Question 5(F)

(F) Discuss whether the leak rate will be recorded after each walkdown to observe any adverse trend. How will consistency in leak rate observations be ensured between shifts?

Response:

Initially the monitoring will be directed by a Compensatory Actions/Temporary Logs in accordance with station procedure SP2669A. This data can be evaluated for trends.

This Compensatory Actions/Temporary Log will then be incorporated into the PEO Shiftly Rounds SP2669A-002, UNIT 2 AUX BUILDING ROUNDS. When incorporated into the PEO Rounds, the data is recorded on an electronic handheld device which is downloaded to the LAN (Local Area Network). The data can then be able to be trended.

Consistency in leak rate observations will be ensured by recording measured values for the leak rate rather than using a qualitative assessment of leak rate.

NRC Question 5(G)

(G) Describe in detail how the 1 gpm leak rate will be determined at the degraded location, when and if the leak rate reaches 1 gpm.

Response:

The leak will be locally measured with a graduated cylinder (currently a 25ml cylinder) over a measured time period to determine the leak rate. The leak will be directed to the graduated cylinder via an installed hose between the catch device and the catch container. It has been calculated that if the 25ml cylinder fills in 2.5 seconds the leak rate is 1 gpm.

If the measured leak rate exceeds 0.25 gpm, the unit will enter the structural integrity action statement for Technical Requirements Manual (TRM) Technical Requirement 3.4.10. This will prompt increased monitoring and evaluation and may lead to entering the service water action

statement for Technical Specification (TS) 3.7.4.1. Exceeding 1 gpm will lead directly to the TS 3.7.4.1 action statement.

The TRM Technical Requirement action statement 3.4.10 reads:

a) With one or more ASME Code Class 1, 2 and 3 component(s) in a degraded or nonconforming condition(s), perform the following ACTIONS within 72 hours:
    1. Determine that structural integrity is still maintained in the degraded or nonconforming condition;

       Or

    2. Isolate the affected component(s) from service.

b) If the above ACTION is not completed within 72 hours, immediately declare the affected component(s) nonfunctional.

The TS 3.7.4.1 action statement reads:

With one service water loop inoperable, restore the inoperable loop to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 36 hours.

NRC Question 5(H)

(H) Discuss how many hours before a 1 gpm leak rate can be determined once the leak rate increases.

Response:

Although logs are typically consistently taken at approximate 12 hour intervals, the worst case postulated length of time would be 18 hours and is within the TS AOT of 72hrs. This time is based on the requirement for log to be completed during the first half of the watch.

NRC Question 5(I)

(I) How is DNC going to correlate the leak rate to the level of degradation of the flaw?

Response:

If the measured leak rate exceeds 0.25 gpm, the unit will enter the structural integrity (TRM 3.4.10) action statement. This will prompt increased monitoring and evaluation and may lead to entering the service water (TS 3.7.4.1) action statement. Exceeding 1 gpm will lead directly to the TS 3.7.4.1 action statement.

NRC Question 5(J)

(J) Describe why the weekly trending, given the 72 hour action statement, and qualitative analysis is adequate.

Response:

The leak rate will be trended daily.

NRC Question 5(K)

(K) Are administrative controls in place at certain leakage rates below the 1 gpm? What are these controls and at what leak rates are they administered?

Response:

If the measured leak rate exceeds 0.25 gpm, the unit will enter the structural integrity (TRM 3.4.10) action statement. This will prompt increased monitoring and evaluation and may lead to entering the service water (TS 3.7.4.1) action statement. Exceeding 1 gpm will lead directly to the TS 3.7.4.1 action statement.

NRC Question 6

6. Section 5.7 states that if the flaw size reaches 33% of the original flange inside circumference, the 'A' Train SW system will be declared inoperable. (a) Provide the flange inside circumference measurement. (b) For this flaw, what is its depth limitation if the length is limited to 33% of the flange inside circumference? (c) The pipe at the flange location may be susceptible to the same corrosion, therefore should a limit also be applied to the reduction of wall thickness of the pipe close to the flange.

Response:

(a) The flange inside circumference dimension is 33.77 inches (i.e., π x flange ID (10.75 inches).

(b) The structural analysis assumed that 1/3 of the entire flange is lost. This is conservative for the structural analysis. It is noted that the even a loss of a portion of the flange perimeter would likely result in exceeding the leakage action level limit of 1 gpm.

(c) If degradation develops at the flange to pipe interface on the pipe section, the pipe will be evaluated in accordance with Code Case N-513, Revision 3 or other similar NRC approved methodology. Any wall thickness reduction limit will be in accordance with Code Case N-513, Revision 3 or other similar NRC approved methodology.

NRC Question 7

7. Section 5.7 discusses two limits beyond which the 'A' train SW system will be declared inoperable: a leak rate of 1 gpm and flaw size of 33% of the flange inside circumference. (a) Discuss if there are any other limits being applied. The NRC staff has concerns regarding the flange thickness and believes that a limitation on the flange thickness beyond which the SW system should be declared inoperable would be prudent. Please provide such a limitation and how it will be monitored or discuss why it is not necessary (b) Confirm that when either the 1 gpm limit or the flaw size limit is reached the affected piping system is declared inoperable. (c) If the pipe at the flange location develops a leak rate of 1 gpm, will the 'A' train SW system will also be declared inoperable. If not, why not?

Response:

(a) Millstone proposes to use the following criteria for determining acceptable pressure retaining capability. An average wall thickness of less than 0.040 inches as measured by the periodic ultrasonic inspections previously discussed between any two bolts (the accessible area) would require declaring Facility 1 (Train A) service water as inoperable. 0.040 inches is the minimum required wall thickness for pressure per ASME Section III, NC 3641.1, 1989 Edition as shown below:

tm = P x Do / [2 x (S + Py)]

where:

P =	100	psi, internal design pressure
Do =	12	in. outside diameter of pipe (in this case flange hub)
S =	15000	psi, allowable stress for ASTM A181, Grade 1
y =	0.4	a coefficient having a value of 0.4 except when Do / tm < 6

(b) Millstone confirms that when either the 1 gpm limit or the flaw size limit [described above in (a)] is reached the affected piping system (service water Facility 1 (Train A) is declared inoperable.

(c) The combined leak discharge from the pipe (not currently leaking) and the flange (currently leaking) would be compared to the acceptance criteria of 1 gpm. If the combined leakage rate reaches 1 gpm, then the 'A' train SW system (Facility 1 service water) will also be declared inoperable.

NRC Question 8

8. For the compensatory UT inspection, discuss exactly the areas of the flange and pipe that will be examined, the transducer that will be used, and what will be recorded.

Response:

Each of the 12 segments between the bolt holes around the circumference of the subject flange (as depicted in Enclosure 1 (of Attachment 1)) will be UT inspected. Specific measurements will be recorded for each of the four dimensions depicted in Enclosure 1 (page 16 typical). Transducers will be as identified in section 5.3 of Enclosure 2 (of Attachment 1 - Dominion procedure ER-AA-NDE-UT-701). Inspection results will be recorded on exam data sheets as depicted in Enclosure 1 (of Attachment 1).

NRC Question 9

9. If MPS2 enters MODE 5 prior to the next refueling outage, currently scheduled to start October 2012, will the flange be replaced at this earlier time?

Response:

If MPS2 enters MODE 5 prior to the next refueling outage the flange will be replaced.

Additionally DNC requests an initial relief for 4 months rather than to the next refueling outage. This will allow DNC the opportunity to more accurately determine corrosion rates, prepare for flange repair, and explore other technologies for more accurate assessment of the boundaries of the degraded area.

NRC Question 10

10. Once in Mode 5, how long will it take to complete the work activities for the flange replacement? Can the affected flange be isolated from the SW system to perform these repairs? If isolation is possible, why not isolate and replace the flange?

Response:

The flange replacement is expected to take five (5) days to complete. The SW system cannot be isolated at the affected flange location.

The planned repair will replace the degraded 10” slip on flange with a new 10” carbon steel weld neck flange. Since this portion of the SW system cannot be isolated, the Facility 1 SW header will be tagged out and drained by Operations. Once the system is drained, an adjoining pipe elbow spool above the degraded flange will be unbolted, removed, and rigged to the floor. The affected flange will be cut off and the pipe end prepared for installing the new weld neck flange. The new carbon steel flange and exposed carbon steel piping will require coating after installation. The tagging, draining, and repair time is 6 shifts (72 hours). An additional 48 hours is required for coating cure time. Therefore, the work activities required for flange replacement have a 5 day duration.