NRR-PMDAPEm Resource

From: Jack Gadzala [jack.gadzala@dom.com]
Sent: Thursday, May 03, 2012 6:06 PM
To: Feintuch, Karl
Cc: Jandovitz, John; Krsek, Robert; Barclay, Kevin
Subject: Kewaunee 10 CFR 50.55a Request RR-2-4
Attachments: RR-2-4 Cover & Att 1&2.pdf; Encl to Att 2 - OPERXK-100-18 BH cooldown lineup.pdf; Encl to Att 2 - OPERXK-100-18 BH injection lineup.pdf; Encl to Att 2 - OPERXK-100-18 BH split train lineup.pdf

Karl,

Attached is Kewaunee 10 CFR 50.55a Request RR-2-4 for NRC staff review and approval. This includes three 11x17 color drawings that are enclosures to Attachment 2 of the Request.

The two modification packages (Enclosures 1 and 2) will be transmitted separately due to email size limitations.

Jack
Dominion KPS Licensing
920-388-8604

Hearing Identifier: NRR_PMDA
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May 3, 2012

ATTN: Document Control Desk
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Serial No. 12-324
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Docket No.: 50-305
License No.: DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
INSERVICE INSPECTION PROGRAM FOURTH TEN-YEAR INTERVAL
10 CFR 50.55a REQUEST NO. RR-2-4

Pursuant to the provisions of 10 CFR 50.55a(a)(3)(ii), Dominion Energy Kewaunee, Inc. (DEK) hereby requests NRC approval of the attached proposed 10 CFR 50.55a request (RR-2-4) for the Fourth Ten-year Interval of the Inservice Inspection Program for Kewaunee Power Station (KPS). This 10 CFR 50.55a request proposes a temporary deviation from the requirements of ASME Section XI, Appendix IX, Article IX-1000, Paragraph (c)(2), which prohibits the use of clamping devices on "... portions of a piping system that forms the containment boundary" and ASME Section XI, Appendix IX, Article IX-6000(a), which states that the area immediately adjacent to the clamping device shall be examined using a volumetric method.

KPS is currently in a refueling outage. The reactor has been refueled and the reactor vessel has been reassembled. The plant is currently in MODE 5 – Cold Shutdown with the residual heat removal system in operation. Per KPS Technical Specification (TS) 3.4.7, "RCS Loops – MODE 5, Loops Filled," one residual heat removal (RHR) loop is required to be operable and in operation; and either one additional RHR loop shall be operable, or the secondary side water level of at least one steam generator shall be greater than or equal to 5%. Recently, a leak was discovered at a socket weld in a 3/4-inch line that is common to both RHR loops rendering both loops of RHR inoperable. During activities to install a leak-limiting device over this leak, a welder inadvertently created a very small through-wall perforation of the 3/4-inch line. Both leaks exist in a 3/4-inch line that is common to both RHR loops. Neither leak can be repaired without removing both RHR loops from service.

DEK is proposing to perform a temporary alternate repair of the RHR piping by maintaining the installed leak-limiting device over the socket weld leak (and its associated structural restraint, which serves as an added measure of safety to prevent a catastrophic separation of the 3/4-inch line above the leaking sockolet); and installing a second (similar) leak-limiting device on the newly created through-wall perforation. These activities will ensure that containment integrity and structural integrity of the RHR system is maintained prior to proceeding from MODE 5 to MODE 4. This temporary alternate repair will remain in place until the section of pipe containing the leaks is repaired. Repairs will be pursued expeditiously. Once in MODE 4, isolating and repairing the portion of the RHR system with the leaks will take approximately 24 hours, thereby eliminating the need for the leak-limiting devices.

To verify that the newly created through-wall perforation caused by the welder was not exacerbated by service related degradation (e.g., erosion or thinning), the accessible piping surrounding this through-wall perforation in the 3/4-inch line has been evaluated and found to be structurally sound. The 3/4–inch piping surrounding the through-wall perforation has been inspected using straight beam UT techniques and determined to be at or near nominal thickness (0.113 inches).

There is no acceptable alternative to performing the temporary repair since the affected RHR line cannot be isolated in the current plant condition. Permanent repair of the piping leaks would first require transitioning to a different mode. MODE 4 would be the optimal mode as it ensures two trains of decay heat removal and one train of ECCS injection while maximizing RCS water inventory. The alternative to going to MODE 4, is to return the plant to the refueling mode (MODE 6), remove the reactor head, remove the upper core internals, and offload the core into the spent fuel pool. This option would result in an undue hardship and unusual difficulty without a compensating increase in the level of quality and safety, and is therefore justified under 10 CFR 50.55a(a)(3)(ii).

Since the piping remains seismically qualified, system leakage will be maintained within the current licensing basis; and since the clamp is structurally equivalent to the piping, there is no expected additional risk of pipe failure.

The details of 10 CFR 50.55a Request No. RR-2-4 are provided in Attachment 1 to this letter. Information on maneuvering the plant, isolating the leaks and performing the permanent repair (along with contingency measures) is provided in Attachment 2. The two temporary modification packages that will be used to perform the alternate repair are provided in Enclosures 1 and 2.

If you have questions or require additional information, please feel free to contact Mr. Craig Sly at 804-273-2784.

Very truly yours,

A. J. Jordan
Site Vice President – Kewaunee Power Station

Attachment:

1. Kewaunee Power Station Fourth Ten-year Interval Inservice Inspection Program 10 CFR 50.55a Request No. RR-2-4
2. Repair Activities and Contingency Actions Description, RHR Piping Flaws

Enclosure:

1. Temporary Modification Package 2012-11 (Revision 4)
2. Temporary Modification Package 2012-12 (Revision 1)

Commitments made by this letter:

1. Following installation of the devices and until the system is isolated, a VT-2 examination will be performed and repeated a minimum of once every twelve hours, and leakage observed from the devices will be evaluated.
2. The sealant injection pressure and volume will be controlled by work instructions and procedures to ensure the sealant is not injected into the RHR system piping.
3. DEK will implement the contingencies described in Attachment 2 of this letter (in the section titled "Contingency Actions During Repair Activities"), while in MODE 4, until ASME Code repairs to the affected piping are completed.

cc: Regional Administrator, Region III
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NRC Senior Resident Inspector
Kewaunee Power Station

ATTACHMENT 1

FOURTH TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM
10 CFR 50.55a REQUEST NO. RR-2-4

KEWAUNEE POWER STATION
DOMINION ENERGY KEWAUNEE, INC.

Kewaunee Power Station
Fourth Ten-Year Interval Inservice Inspection Program
10 CFR 50.55a Request No. RR-2-4

Proposed Alternative
In Accordance with 10 CFR 50.55a(a)(3)(ii)

Hardship or Unusual Difficulty
Without Compensating Increase in Level of Quality or Safety

1. ASME CODE COMPONENTS AFFECTED

ASME Code, Section XI Code Class 2 Residual Heat Removal (RHR) system 3/4-inch Sockolet to Valve RHR-600. Pipe is 3/4-inch schedule 40, ASTM A312, type 304 sample line. Fitting is 0.750-inch on 10-inch Sockolet, 3000 lb, ASTM A182 F 304. Code of record is USAS B31.1 – 1967.

RHR design temperature and pressure: 400 °F and 600 psig.

2. APPLICABLE CODE EDITION AND ADDENDA

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition, 2000 Addenda

3. APPLICABLE CODE REQUIREMENTS

- ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition, 2000 Addenda, IWA-4133 states that mechanical clamping devices used to replace piping pressure boundary shall meet the requirements of ASME Section XI, Appendix IX.
    - ASME Section XI, Appendix IX, Article IX-1000(c)(2) states that clamping devices shall not be used on portions of a piping system that forms the containment boundary.
    - ASME Section XI, Appendix IX, Article IX-6000(a) requires a plan for monitoring defect growth in the area immediately adjacent to the clamping device.

4. REASON FOR REQUEST

Currently, Kewaunee Power Station (KPS) is in MODE 5 - Cold Shutdown, and has declared both trains of residual heat removal (RHR) inoperable due to two through-wall leaks. One leak is on a 3/4-inch socket weld connection of ASME Code Class 2 piping in the common RHR pump A and B discharge piping (Note: Installation of a leak limiting device on this leak had successfully isolated leakage through this flaw). While completing installation of the leak limiting device on this leak, a newly created through-wall perforation on a section of this 3/4-inch RHR sample line was created when attempting to create a fillet weld as an added measure of safety to prevent a catastrophic separation of the 3/4-inch line above the leaking sockolet.

Although considered inoperable for purposes of Technical Specifications (TS) compliance, the RHR system is currently providing decay heat removal for the reactor coolant system (RCS).

TS 3.4.7, "RCS Loops - MODE 5, Loops Filled," is applicable during MODE 5 with the RCS loops filled. TS LCO 3.4.7 requires one RHR loop to be Operable and in operation. In addition, TS LCO 3.4.7 requires one additional RHR loop be operable (but not necessarily in operation) or the secondary side water level of at least one steam generator shall be greater than or equal to 5%. Currently both loops of RHR are declared inoperable due to the through-wall leak at the 3/4-inch socket weld and due to the newly created through-wall perforation on a section of this 3/4-inch piping. Both loops of RHR are available to provide decay heat removal. Additionally, if both RHR loops become unavailable, two SGs are available to provide decay heat removal as well as feed and bleed with the Safety Injection system (SI).

In order to implement a permanent weld repair (ASME Code repair) for the 3/4-inch socket weld and for the newly created through-wall perforation on a section of this 3/4-inch piping, both RHR cooldown loops must be removed from service and isolated from the RCS. In order to remove both RHR cooldown loops from service, one of two options must be performed.

Option one is to return the plant to the refueling mode, remove the reactor head, remove the upper core internals, and offload the core into the spent fuel pool. Then, the RHR system could be isolated and drained to allow repair of the affected piping. This option would require maneuvering the plant from its current operating condition in MODE 5 with two steam generators (SG) available to provide an alternate method for decay heat removal to a "no-MODE" condition. This option would result in an undue hardship and unusual difficulty without a compensating increase in the level of quality and safety of the plant. This first option would require the following actions/conditions:

- RCS cooldown from current plant conditions, thus losing the SG decay heat removal capability, and entry to MODE 6 - Refueling.
- The RCS would have to be drained to 6-inches below the reactor vessel flange resulting in a reduction in RCS inventory, and a shorter time-to-boil if decay heat removal were lost.*(ICCE)
- The reactor head would have to be disassembled and detensioned.
- The reactor head (heavy load) would have to be removed and the reactor cavity flooded to a level of 23 feet.*(ICCE)
- The reactor vessel upper internals (heavy load) would have to be removed.
- The reactor core would have to be offloaded to the spent fuel pool.*(ICCE)
- The estimated duration of this evolution from the start of cooldown to core offload is approximately 8 days.
- The estimated radiation dose for this overall reactor disassembly, core offload, and subsequent reload and reactor reassembly evolution is approximately 8 Rem based on actual exposure measured during the same activities conducted during the current ongoing refueling outage.

*The above noted items are Infrequently Conducted Complex Evolutions (ICCE)

Option two is to perform a temporary alternate repair of the RHR piping by installing a leak-limiting strong-back device on both the socket weld leak and on the newly created through-wall perforation (caused during welding of the original leak limiting strong-back device). These temporary alternate repairs will ensure structural integrity of the affected piping. This activity is needed to return the RHR system to operable . These temporary alternate repairs will remain in place until the unit achieves MODE 4. After the unit reaches MODE 4, core cooling is provided by the reactor coolant pumps circulating water through the core and to the steam generators. With core cooling being provided by the steam generators, both loops of RHR cooling can be secured, the affected piping isolated, and the piping repaired.

Once in MODE 4, TS 3.6.1, “Containment,” LCO 3.6.1, requires that the containment is Operable. Containment integrity will be maintained in MODE 4 by the leak-limiting devices until such time that both loops of RHR can be secured and the affected piping isolated. The ASME Code repair will be pursued expeditiously. Once in MODE 4, isolating and repairing the portion of the RHR system with the leak will take approximately 24 hours, eliminating the need for the leak-limiting devices.

A dose of 171 mRem has been accumulated to date during installation of the first leak limiting device and its associated structural restraint. A dose of 120 mRem is estimated for installation of the remaining temporary modifications and subsequent removal of all associated temporary modifications.

The mechanical clamping devices that will be used will comply with the applicable ASME Code requirements outlined in ASME Section XI, Appendix IX, with the exception that they will be located on piping that is considered a containment boundary. ASME Section XI, Appendix IX, Article IX-1000, Paragraph (c)(2) prohibits the use of clamping devices on "... portions of a piping system that forms the containment boundary." Therefore, in order to use the devices, DEK requires approval of an alternative to allow a temporary deviation from the requirements of Appendix IX, Article IX-1000, Paragraph (c)(2) in order to return the RHR system to an operable status for the purpose of performing the ASME Code repair.

Based on the discussion above, DEK requests NRC approval of an alternative to the repair requirements of ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition, 2000 Addenda IWA-4133. Pursuant to 10 CFR 50.55a(a)(3)(ii), DEK is requesting approval to temporarily deviate from the requirements of Appendix IX, Article IX-1000, Paragraph (c)(2) which prohibits the use of clamping devices on "... portions of a piping system that forms the containment boundary" and ASME Section XI, Appendix IX, Article IX-6000(a), which states that the area immediately adjacent to the clamping device shall be examined using a volumetric method. This requested deviation is based on DEKs conclusion that compliance would result in hardship and unusual difficulty without a compensating increase in the level of quality and safety.

5. <u>PROPOSED ALTERNATIVE AND BASIS FOR USE</u>

The proposed alternative would allow use of leak-limiting strong-back devices on a piping system that forms part of the containment boundary. The devices accomplish two functions; limiting the leakage from the defects, and maintaining the structural integrity of the affected piping. The proposed alternative, for both the original socket weld defect and the newly created through-wall perforation, uses a leak-limiting device to ensure containment integrity, since this region of the RHR piping is a portion of the containment boundary. A sealant will be injected into leak-limiting enclosures (one each for the original socket weld defect and the newly created through-wall perforation) to provide a temporary pressure boundary for the RHR system. The sealant, X-36, has a low concentration of halogens/chlorides, therefore it is safe for use on stainless steel. The sealant injection pressure and volume will be controlled by work instructions and procedures to ensure the sealant is not injected into the RHR system piping. The leak-limiting device on the original socket weld defect is mechanically fastened with clamps and bolts to the 10-inch diameter RHR pipe and the 3/4-inch diameter pipe is fastened to the leak sealant enclosure with set screws. As an added measure of safety, a structural restraint has been installed to physically restrain the 3/4-inch line. This restraint will prevent a catastrophic separation of the 3/4-inch line above the leaking sockolet. The leak-limiting device on the newly created through-wall perforation is mechanically fastened to the RHR-600 valve body and the 10-inch RHR pipe.

RHR-600 is an outside containment isolation valve for Containment Penetration 10, a Class 6 penetration. Penetration Class 6 is a system required to operate post-accident. The design and operational criteria for penetration Class 6 isolation valves are governed by the functional requirements of the system. The isolation valves at Penetration 10 are not subject to the requirements of 10 CFR 50, Appendix J (reference 5).

The requirements for containment isolation (on the affected piping) will be satisfied by the leak sealant enclosures. Each enclosure is designed to RHR temperature and pressure requirements and ASME Section XI, Appendix IX, Mechanical Clamping Devices for Class 2 and 3 Piping Pressure Boundary. The piping remains seismically qualified and the enclosures will prevent system leakage.

Application of the leak-limiting strong-back devices to maintain containment integrity and the structural integrity of the 3/4-inch line will ensure that the plant can transition from MODE 5 to MODE 4 and perform an ASME Code repair.

Each leak limiting strong-back device has been designed to accommodate thrust loads resulting from a complete failure of the welded connection of concern. A review of the piping stress analysis has been performed to ensure that the additional mass does not adversely affect the qualification of the existing system.

Following installation of the leak limiting strong-back devices, a VT-2 examination will be performed and repeated a minimum of once every twelve hours until a MODE change from MODE 5 to MODE 4 is satisfactorily completed and the resulting portion of residual heat removal piping needed to facilitate repair is isolated. Prior to making the change from MODE 5 to MODE 4, the situation will be re-evaluated if leakage is identified in the affected piping near RHR-600. No leakage is expected from the affected piping near

RHR-600 with the leak limiting devices installed. If leakage is detected, compliance with TS 3.4.13, "RCS Operational Leakage", shall be evaluated.

Original Socket Weld Defect

ASME Section XI, Appendix IX, Article IX-2000 states that, if the defect size cannot be directly determined, a conservative bound of the size shall be determined and documented. ASME Section XI, Article IX-6000 states that the area immediately adjacent to the clamping device shall be examined using a volumetric method. Visual examination identifies the existing leak size as a pinhole and has placed the defect at the toe of the socket weld to the 3/4-inch branch line to valve RHR-600. There is no other visual indication of degradation to the piping wall thickness. Therefore, DEK is requesting a deviation from Article IX-6000(a) in that no volumetric inspection in the area of the clamp will be performed on the 10-inch pipe or on the 3/4-inch pipe. The installation of the leak-limiting device also precludes volumetric inspection of the defect. Therefore, the defect can be conservatively characterized as residing within the socket weld and any growth would be limited to the weld itself, effectively limiting the impact of the defect to that of a circumferential crack. The proposed alternative, as a conservative measure to account for nondestructive examination limitations of the sockolet, includes two aspects; installation of a leak-limiting strong-back device which includes a restraint on the 3/4-inch diameter pipe, and a VT-2 examination a minimum of once every twelve hours until the system is isolated for repair. The device will conservatively maintain structural integrity of the affected components during the duration of the proposed alternatives.

System operating loads and installation loads from sealing of the newly created through-wall performaton will have inconsequential impact on the original socket weld defect. The strong back device is designed per ASME Section XI Appendix IX to accommodate complete ejection.

Newly Created Through-Wall Perforation

During installation of the leak-limiting strong-back device on the original socket weld defect discussed above, a welder inadvertently created a very small through-wall perforation of the 3/4-inch line.

The accessible portions of piping in the area of the newly created through-wall perforation have been inspected using straight beam ultrasonic testing techniques. These inspections confirmed that the 3/4-inch piping above the leak sealant enclosure to the bottom of valve RHR-600 is structurally sound and that the wall thickness is consistent with the specified nominal piping thickness of 0.113 inches. No anomalies were detected during the ultrasonic inspection. Visual inspection has characterized the newly created through-wall perforation as having an indistinguishable axial length and a circumferential length of approximately 3/64-inch. In this situation, the perforation is known to have been created during maintenance and is not due to aging during operation of the plant. The location of the perforation is on 3/4-inch piping base metal. The estimated length of the attempted weld is 0.25 inches.

The sealant box prohibits straight beam examination and visual examination of the 3/4-inch piping within the box which is on the bottom side of the perforation. An aspect ratio of 6:1 is used to conservatively bound the lower extent of the perforation contained in the sealant box, which is consistent with ASME Section XI, Non Mandatory Appendix L. Using an aspect ratio of 6:1 is equal to 0.678 inches in the axial direction. It is not necessary to assume additional degradation in the circumferential direction because restraining clamps have been manufactured and installed to mitigate the possibility of ejection.

Thus, the size of the perforation is conservatively bounded as follows:

- Depth = 0.113 inches (nominal specified piping thickness)
- Circumferential Length = 0.25 inches (the area of weld in contact with 3/4-inch pipe)
- Axial Length = 0.928 inches (based on the size of the weld in contact with the 3/4-inch pipe and sealant box (0.25 inches) and an aspect ratio in the axial direction of 6:1 (0.678 inches))

It has been determined that a 1.6 inch axial flaw is acceptable to maintain structural integrity.

There are two (2) possible degradation mechanisms that could cause the perforation to grow in size, both of which are related to service time. The first mechanism is fatigue. The second mechanism is stress corrosion cracking. Perforation growth caused by erosion due to leaking water is considered negligible because the pressure is low and stainless steel is resistant to flow accelerated corrosion wastage mechanisms.

Once in MODE 4, isolating and repairing the portion of the RHR system with the leak will take approximately 24 hours. Permanent repair of the affected piping will be performed in an expeditious manner. During this time, the size of the defects will have negligible fatigue crack growth because the number of fatigue cycles that could occur during this time period is low or nonexistent. Similarly, the short duration will be insufficient to initiate flaw growth due to stress corrosion cracking, as the environment will not change significantly. Additionally, there have been no cases of stress corrosion cracking on stainless steel base metal at KPS.

The above described approaches will provide the safest and most expeditious method to complete an ASME Code repair of the affected piping given the current condition of the plant.

6. DURATION OF PROPOSED ALTERNATIVES

This alternative would be applicable for the period of time it takes KPS to return the RHR system to Operable status until entry into MODE 4 and ASME Code repair of the affected piping is completed. Once in MODE 4, isolating and repairing the portion of the RHR system with the leak will take approximately 24 hours, eliminating the need for the leak-limiting devices.

7. PRECEDENTS

Dominion is currently aware of three (3) situations (see references 1, 2, 3 and 4) where similar alternatives have been approved to facilitate repair of ASME Section XI piping that forms the containment boundary.

8. REFERENCES

1. Letter from M. L Marchi (WPSC) to NRC, “Relief Request RR-2-1 to Allow Continued Plant Operation with Two Pin Hole Leaks in a ¾ inch ASME Code Class 2 Chemical Injection Weldment,” dated August 12, 1996. [ADAMS Accession No. ML111810480]
2. NRC SER, “Kewaunee Power Station - Approval of a Relief Request from the requirements of 10CFR50.55a for Repair of 3/4-inch ASME Code Class 2 Chemical Injection Weldment (TAC No. M96273),” dated September 13, 1996.
3. Letter from M. L. Marshall (NRC) to J. A. Stall (Florida Power and Light Co.), “Turkey Point Nuclear Plant, Unit 4 – Safety Evaluation for Relief Request Regarding Mechanical Clamping Device on Pressure Boundary Piping (TAC No. MC7338),” dated August 15, 2005. [ADAMS Accession No. ML052090182]
4. Letter from R. J. Laufer (NRC) to M. Kansler (Entergy), James A. Fitzpatrick Nuclear Power Plant – Relief Request for Temporary Non-Code Repair of a

Shutdown Cooling Pipe (TAC No. MC7544)," dated August 9, 2005. [ADAMS Accession No. ML052070047]

5. Letter from Darrell G. Eisenhut, NRC Director Division of Licensing, to C.W. Giesler, Wisconsin Public Service Corporation, "Exemption to Certain 10 CFR 50 Appendix J Requirements," dated September 30, 1982.

ATTACHMENT 2

REPAIR ACTIVITIES AND CONTINGENCY ACTIONS
REPAIR OF RESIDUAL HEAT REMOVAL PIPING FLAWS

Including three plant drawings:
RHR Cooldown Lineup
RHR Injection Lineup
RHR Split Train Lineup

KEWAUNEE POWER STATION
DOMINION ENERGY KEWAUNEE, INC.

Kewaunee Power Station
Repair Activities and Contingency Actions
Repair of Residual Heat Removal Piping Flaws

BACKGROUND

Current Plant Status

The reactor is in MODE 5, with both residual heat removal (RHR) pumps operating in cooldown mode (see enclosed drawing). The reactor coolant pumps (RCPs) are both operating with steam generator (SG) levels in their normal operating band. Technical Specification (TS) Limiting Condition for Operation (LCO) 3.4.7, "RCS Loops – Mode 5, Loops Filled", is not met. Current reactor coolant system (RCS) temperature is being held below 200°F and RCS pressure is being maintained at < 380 psig.

No leakage is expected from the affected section of piping by valve RHR-600.

System Description

The RHR system can be aligned in any of three configurations:

- Common cooldown lineup;
- Emergency core cooling system (ECCS) injection lineup; or
- Split train lineup (RHR Train A aligned for cooldown and RHR Train B aligned for ECCS injection).

In RHR cooldown lineup, both trains of RHR take suction from a common line connected to the RCS via a parallel set of valves connected to the two RCS loop hot legs. The common line supplies the Train B safety injection (SI) accumulator injection line via valve RHR-11 (see enclosed drawing).

When in the ECCS injection lineup, both trains are 100% independent, with each train taking suction from the refueling water storage tank (RWST) and injecting into the reactor vessel head (see enclosed drawing).

When in split train lineup, RHR Train A is aligned to take suction from the RCS hot legs and inject via the RHR-11 flow path. RHR Train B is aligned to take suction from the RWST and inject into the Reactor Vessel Head (see enclosed drawing). After transitioning into MODE 4, the RHR system will be in the split train lineup prior to initiation of repairs.

Technical Specification Applicability

NRC approval of Request RR-2-4 will allow both trains of RHR to be declared operable but nonconforming, upon acceptance of operability determination OD-481, for operation in MODE 5. At this point, at least one train of RHR will be in the cooldown lineup, with both SGs and RCS loops Operable. This meets the requirements of TS LCO 3.4.7, "RCS Loops – Mode 5, Loops Filled", which requires one RHR Loop Operable and in operation and either one additional RHR loop Operable or secondary side water level of at least one SG greater than 5%.

To transition the unit above 200°F (into MODE 4), applicable Technical Specifications must be met (as directed by mode change checklists). Once in MODE 4, LCO 3.4.6, "RCS Loops – MODE 4", can be met by having two loops of RCS Operable and one in operation. This will be accomplished by having both SGs in their required range and both RCPs operable and at least one operating.

In addition, applicable TS LCOs 3.7.4, 3.7.5 and 3.7.6 will be met as they relate to SG heat sink.

In this configuration, RHR Train B will be aligned for ECCS injection to satisfy LCO 3.5.3, which requires one ECCS train to be operable. This alignment will leave RHR Train A in the cooldown alignment and maintain two RHR suction flow paths Operable for LTOP to satisfy LCO 3.4.12.

Containment integrity, as required by LCO 3.6.1 and 3.6.3, will continue to be met based on the leak sealant enclosures (coupled with NRC approval of Request RR- 2-4).

During maintenance activities in MODE 4 to implement the permanent repair, containment integrity will be ensured following the requirements of LCO 3.6.3.

Pressure and Temperature Range for Proposed Repair

Upon NRC approval of Request RR-2-4 (with the leak limiting strong-back devices installed), the unit will be placed in MODE 4, the affected piping will be depressurized and isolated. RCS leakage will be monitored. No RCS leakage is expected into the affected section of piping and the ASME Code repair will commence.

While in MODE 4, RHR Train A will be cooled down via recirculating the RHR loop after it is isolated per normal operating procedures. RCS temperature will be maintained less than 350°F and RCS pressure will be maintained less than 380 psig via the RCS Loops in operation.

PREVENTING PRESSURE BOUNDARY LEAKAGE

Maintenance operating procedures will be followed to isolate RHR Train A for repair of the affected piping by valve RHR-600.

The initial system isolation will be made at the following valves:

- Discharge of the RHR Train A heat exchanger (RHR-9A, manual isolation);
- RHR train cross connect (RHR-10A and RHR-10B, manual isolation);
- RHR recirculation line (RHR-500A, manual isolation valve);
- Letdown inlet (LD-60, motor operated valve located in containment);
- RCS injection (RHR-11, motor operated valve located in containment); and
- Reactor Vessel Injection (SI-302A, motor operated valve located in containment).

Additional isolation is as follows:

- Check valve SI-22B for the RCS injection line ; and
- Check valves SI-304A and SI-303A for the reactor vessel injection.

Of note is that the drain path for the repair activities by valve RHR-600 is at a high point in the system. This will require evacuating the water at the weld line when repairing the affected piping. This condition also allows a water column of approximately 12 feet between RHR-600 and inside containment valves RHR-11 and SI-302A, which provides additional protection of the containment boundary.

Valve LD-60, letdown line connection, will be closed. This line is within the test boundary for outboard containment isolation valve LD-6 on the letdown line. This line has been leak tested per the Local Leak Rate Testing (LLRT) Program and has successfully passed its test during this current outage.

The affected portion of piping will be depressurized and water level will be monitored. To monitor and minimize potential leakage outside of containment when the RHR system is opened, leakage past SI-22B and SI-304A and SI-303A will be monitored using open vent valves in containment, which are on the downstream side of RHR-11 and SI-302A respectively.

If leakage into the affected section of piping develops while the piping is breached for repair activities, TS LCO 3.4.13 would be evaluated. Although response contingencies are planned, leakage is not expected because of the passive nature of the isolation boundaries and the positive means in place to prevent inadvertent repositioning (tag out, breakers racked out, etc.).

Sequencing of the procedure will ensure that RHR-11 and SI-302A will remain closed.

RHR-600 BOUNDARY ISOLATION VALVES

LD-60 RHR to CVCS Letdown Line

LD-60 isolates the RHR system from CVCS Letdown system. LD-60 is a 2" motor operated globe valve inside containment. This valve is part of the test boundary for the Local Leak Rate Testing (LLRT) of valve LD-6 which has been successfully tested during both the current and previous refueling outages. Although the differential pressure that will exist across LD-60 during the RHR-600 repair efforts will be in the opposite direction of the differential pressure that was present during the LLRT, the LLRT result is still considered to have demonstrated the leak integrity of LD-60.

KPS has historically experienced RWST Inleakage due to seat leakage past LD-60. Following valve repairs on LD-60 during KR-30 and removal of RHR-44 and RHR-45 during KR-31, KPS did not experience RWST Inleakage prior to entering KR-32, indicating that LD-60 is no longer leaking.

Based on the review of operating performance and maintenance history for LD-60, boundary leakage across LD-60 is not expected to occur.

RHR-11 RHR Discharge to RCS
SI-302A RHR Injection to Reactor Vessel

RHR-11 is a 10"X8"X10" double-disc motor operated gate valve inside containment. RHR-11 provides the flow path for Decay Heat Removal during refueling and provides isolation between the RCS and RHR systems, along with check valve SI-22B, during operations. A seat leakage test is not performed for RHR-11. Check valve SI-22B has a history of seat leakage during both testing and operation. RCS leakage past SI-22B and RHR-11 into the RHR system would be evident by RWST Inleakage, similar to that experienced when LD-60 was leaking. As stated above, KPS did not experience RWST Inleakage during the cycle prior to KR-32, indicating that boundary leakage across RHR-11 is not expected.

SI-302A is a 6" flex wedge motor operated gate valve inside containment. SI-302A is open during normal operation and is closed when RHR Train A is aligned for Decay Heat Removal. There are two check valves (SI-303A and SI-304A) downstream of SI-302A, which are leak tested each refueling outage. Test performance for SI-303A and SI-304A has historically shown low leakage values. In addition, SI-302A has successfully performed as a boundary valve for maintenance performed during KR-31 to remove RHR-44 and RHR-45. Based on the combination of two check valves and a closed motor operated valve in series and prior boundary valve performance for SI-302A, leakage across SI-302A is not expected to occur.

Based on 1) review of operating performance and maintenance history for RHR-11 and SI-302A; 2) limiting the acceptable leakage across the upstream check valves to less than 5 gpm; and, 3) if needed, maintaining the vent valves open during the repair to limit the differential pressure across the boundary valves; boundary leakage across these valves is not expected to occur.

RHR-9A RHR Heat Exchanger A Outlet

RHR-9A isolates the RHR system at the outlet of the A RHR Heat Exchanger. RHR-9A is a 8" manual split wedge gate valve outside containment. Past operating history for this valve relative to leakage is good as demonstrated by its isolation performance as the upstream isolation for the RHR system modification work performed in 2011 [removal of RHR-44 and RHR-45]. The modification work performed in 2011 involved the same RHR piping segment (from RHR-9A to RHR-11) as will the RHR-600 repair work. Based on prior boundary valve performance for RHR-9A, leakage across RHR-9A is not expected to occur.

RHR-500A RHR Train A recirculation line

RHR-500A is a 2" manual globe valve outside containment. RHR-500A isolates the RHR system from the recirculation line back to the A RHR pump suction. RHR-500A has successfully performed as a boundary valve for numerous maintenance activities on RHR Train A, most recently during KR-32 when SI-351A and SI-351B were replaced. Based on prior boundary valve performance for RHR-500A, leakage across RHR-500A is not expected to occur.

RHR-10A and RHR-10B - RHR train cross connect

RHR-10A and RHR-10B are 8" manual split wedge gate valves outside containment that separate RHR Trains A and B downstream of the RHR Heat Exchangers and Flow Control Valves (RHR-8A and RHR-8B). RHR-10A and RHR-10B are closed during normal operation and are closed once RHR is aligned for split train mode. Similar to RHR-9A, these valves were boundary valves for the RHR system modification work performed in 2011 [removal of RHR-44 and RHR-45]. Based on prior boundary valve performance for RHR-10A and RHR-10B, leakage across RHR-10A and RHR-10B is not expected to occur.

SEQUENCE FOR PERMANENT REPAIR

Sequence of Activities

The following steps provide the general overall sequence for the ASME Code repair activities once authorization is obtained to start. Specific steps are included in work order instructions.

- Removal of the stainless steel tubing from the downstream side of RHR-600.
- Removal of the leak limiting strong-back device from the piping, including the two leak sealant enclosures.
- Removal of the sealant from the piping in the area of the sockolet.
- Cleaning the pipe in the area of the sockolet (weld preparation).
- Removal of the 3/4-inch pipe from the sockolet by grinding out the fillet weld.
- Preparation of the sockolet for welding and performing QC cleanliness inspection.

- Performing cleanliness inspection and non-destructive examination of the prepared sockolet.
- Fitting up the new piping/valve assembly.
- Welding in the new piping/valve assembly.
- Performing visual and non-destructive examinations of the new fillet weld.
- Reinstalling the stainless steel tubing from the downstream side of valve RHR-600.

Contingency Actions During Repair Activities

To ensure successful completion of the repair activities, various contingency measures will be established and implemented.

- Water level will be monitored during draining and repair activities to ensure weld capabilities.
- Although leakage is not expected, in the unlikely event leakage occurs from the RCS via RHR-11 and SI-302A, the vents in containment downstream of the isolation valve will be opened as described in Maintenance Operating procedures.
- A replacement valve and 3/4-inch piping will be utilized to complete the repairs. The replacement valve and piping will be prefabricated in the shop, including the 3/4-inch pipe to replacement valve weld. This will limit the number of field welds to a single weld (3/4-inch pipe to sockolet), minimizing the time the RHR piping system is open to the local environment.
- A maintenance mockup will be used to allow workers to demonstrate ability to perform the required actions and to validate estimated times for defect excavation, fit-up and welding of new socket welds.
- Plant staff associated with repair activities during the period of time the RHR system is breached, including welders, nondestructive examination (NDE) staff, and quality control (QC) inspectors will be staged in the immediate vicinity to minimize delays. Additionally, radiation protection (RP) personnel will provide continuous coverage during repair activities to minimize delays.
- As an emergency measure, a temporary plugging device will be staged at the work location to mitigate the possibility of any leakage developing of sufficient magnitude to preclude completion of weld repair activities. This material would be of sufficient construction to restrict flow through the open section of affected piping. The temporary plugging device will be test fit utilizing a mockup to ensure proper fit and to orient the workers to its use.

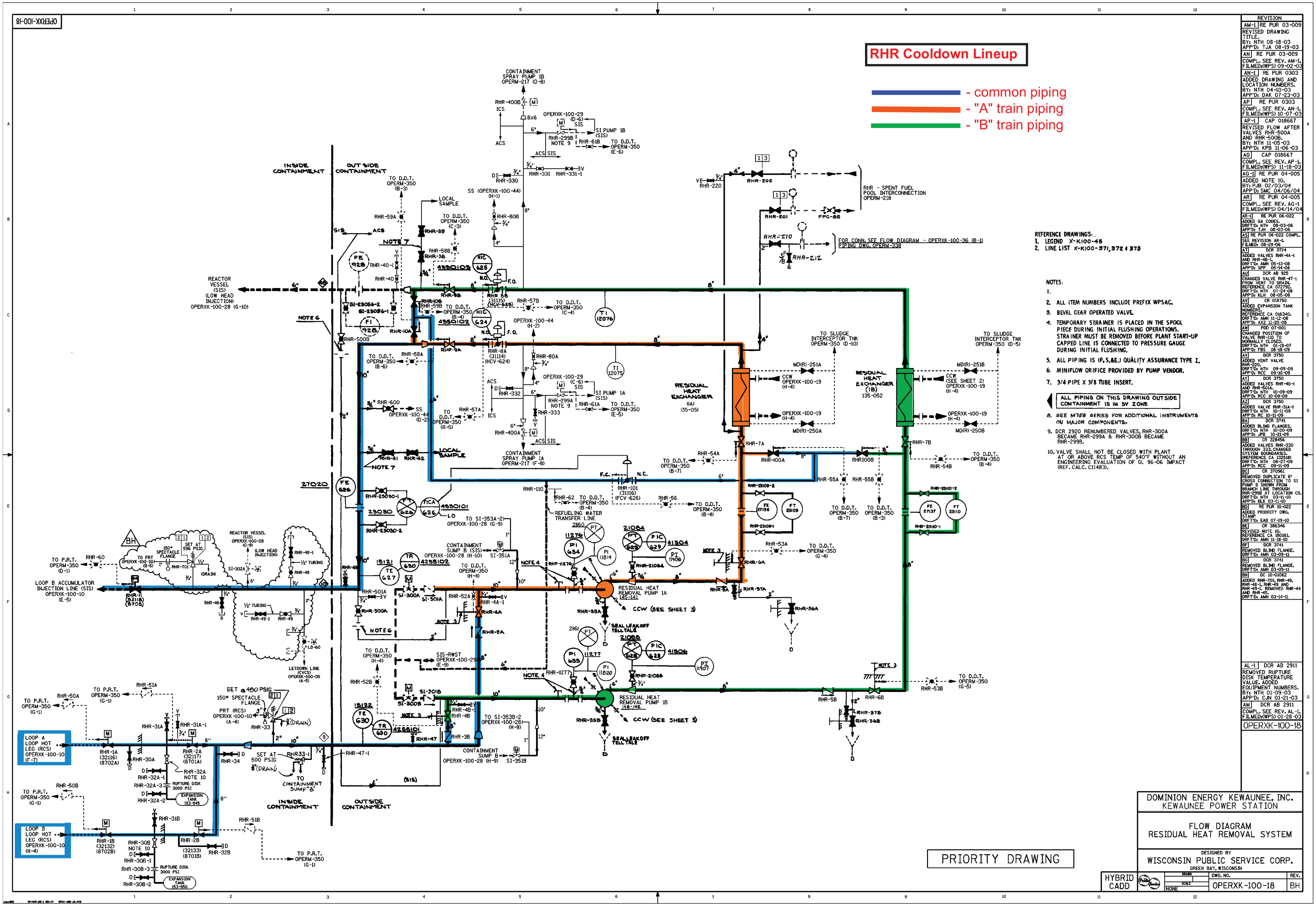
FILLING AND VENTING RHR PIPING AFTER REPAIR

Following completion of the ASME Code repair, filling and venting of the drained piping will be performed in accordance with Procedure MOP-RHR-010. This procedure will initially use the RWST as the fill source. Ultrasonic Testing (UT) will be performed to ensure the system is sufficiently full. An alternate fill and vent method is proceduralized using valve LD-60 and the letdown line.

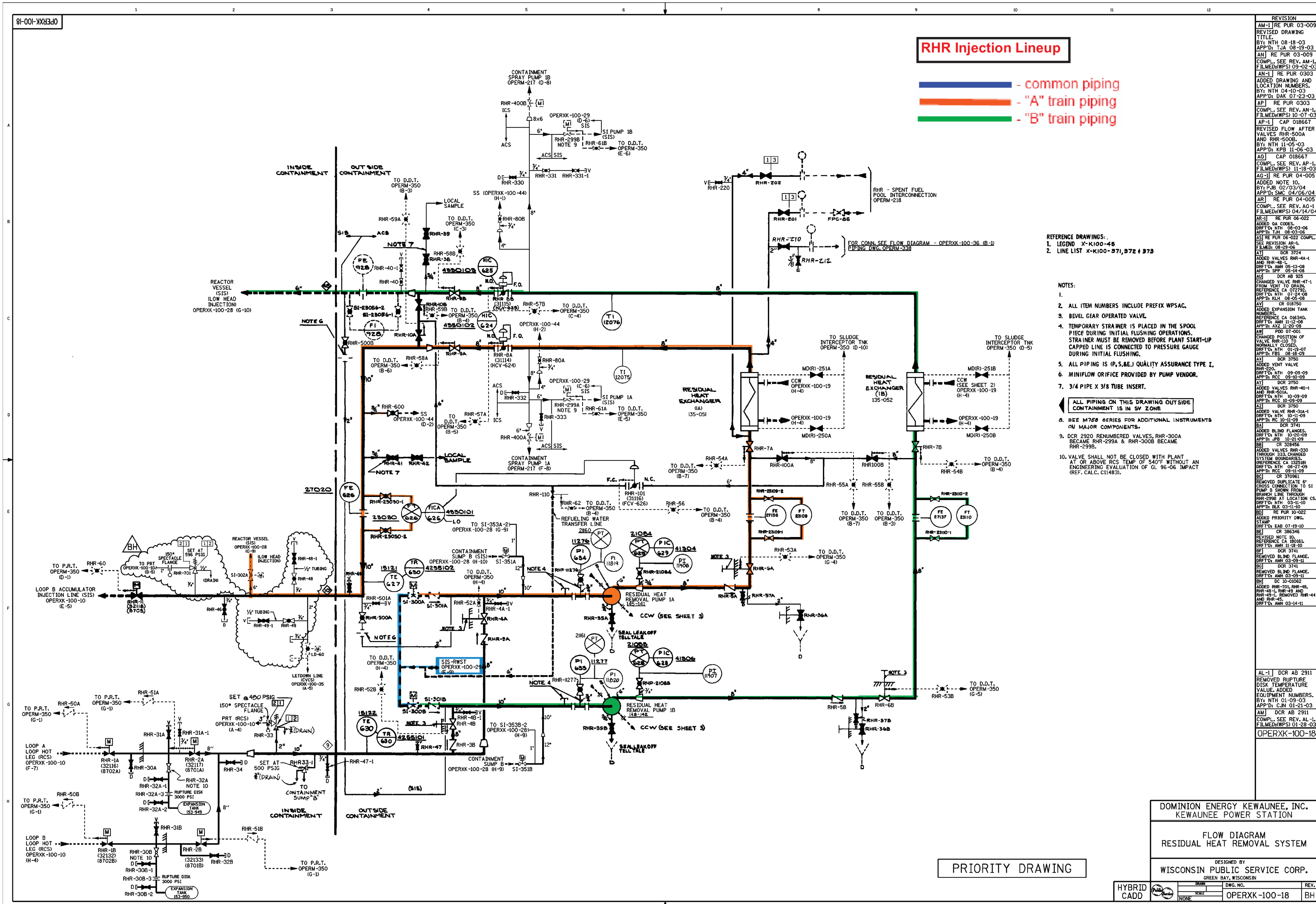
CONTINGENCY ACTIONS FOR ABNORMAILITIES

In the event abnormal conditions were to occur during the performance of these repair activities, operators would respond in accordance with the appropriate response procedures.

Operators are trained in shutdown loss of coolant events and shutdown loss of decay heat removal events. The system alignment during this repair allows operators to readily address both events. RCS makeup capability remains available via the charging system, the safety injection system, or via Train B of the RHR system. Core cooling remains available via both RCS loops and SGs if the RCS remains intact. Containment closure is covered in these abnormal operating procedures, including actuation of containment isolation. These actions are covered in Procedure AOP-RHR-001, Abnormal Residual Heat Removal System Operation, and Procedure AOP-RHR-002, Shutdown Loss of Coolant Accident.



RHR Cooldown Lineup
- common piping
- "A" train piping
- "B" train piping
REFERENCE DRAWINGS:
1. LEGEND X-K100-45
2. LINE LIST X-K100-371, 372 & 373
NOTES:
1.
2. ALL ITEM NUMBERS INCLUDE PREFIX WPSAC.
3. BEVEL GEAR OPERATED VALVE.
4. TEMPORARY STRAINER IS PLACED IN THE SPOOL PIECE DURING INITIAL FLUSHING OPERATIONS. STRAINER MUST BE REMOVED BEFORE PLANT START-UP CAPPED LINE IS CONNECTED TO PRESSURE GAUGE DURING INITIAL FLUSHING.
5. ALL PIPING IS (P,S,&E.) QUALITY ASSURANCE TYPE I.
6. MINIFLOW ORIFICE PROVIDED BY PUMP VENDOR.
7. 3/4 PIPE X 3/8 TUBE INSERT.
ALL PIPING ON THIS DRAWING OUTSIDE CONTAINMENT IS IN SV ZONE
8. SEE M758 SERIES FOR ADDITIONAL INSTRUMENTS ON MAJOR COMPONENTS.
9. DCR 2920 RENUMBERED VALVES, RHR-300A BECAME RHR-299A & RHR-300B BECAME RHR-299B.
10. VALVE SHALL NOT BE CLOSED WITH PLANT AT OR ABOVE RCS TEMP OF 540°F WITHOUT AN ENGINEERING EVALUATION OF GL 96-06 IMPACT (REF. CALC. C11483).
INSIDE CONTAINMENT
OUTSIDE CONTAINMENT
RESIDUAL HEAT EXCHANGER (1A) 135-051
RESIDUAL HEAT EXCHANGER (1B) 135-052
RESIDUAL HEAT REMOVAL PUMP 1A
RESIDUAL HEAT REMOVAL PUMP 1B
LOOP A LOOP HOT LEG (RCS) OPERXK-100-10 (F-7)
LOOP B LOOP HOT LEG (RCS) OPERXK-100-10 (H-4)
LOOP B ACCUMULATOR INJECTION LINE (SIS) OPERXK-100-10 (E-5)
RHR - SPENT FUEL POOL INTERCONNECTION OPERM-218
CONTAINMENT SPRAY PUMP 1B OPERM-217 (D-8)
CONTAINMENT SPRAY PUMP 1A OPERM-217 (F-8)
PRIORITY DRAWING
DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
FLOW DIAGRAM
RESIDUAL HEAT REMOVAL SYSTEM
WISCONSIN PUBLIC SERVICE CORP.
GREEN BAY, WISCONSIN
HYBRID CADD
OPERXK-100-18
BH



RHR Injection Lineup
- common piping
- "A" train piping
- "B" train piping
REFERENCE DRAWINGS:
1. LEGEND X-K100-45
2. LINE LIST X-K100-371, 372 & 373
NOTES:
1.
2. ALL ITEM NUMBERS INCLUDE PREFIX WPSAC.
3. BEVEL GEAR OPERATED VALVE.
4. TEMPORARY STRAINER IS PLACED IN THE SPOOL PIECE DURING INITIAL FLUSHING OPERATIONS. STRAINER MUST BE REMOVED BEFORE PLANT START-UP CAPPED LINE IS CONNECTED TO PRESSURE GAUGE DURING INITIAL FLUSHING.
5. ALL PIPING IS (P.S.&E.) QUALITY ASSURANCE TYPE I.
6. MINIFLOW ORIFICE PROVIDED BY PUMP VENDOR.
7. 3/4 PIPE X 3/8 TUBE INSERT.
ALL PIPING ON THIS DRAWING OUTSIDE CONTAINMENT IS IN SV ZONE
8. SEE M758 SERIES FOR ADDITIONAL INSTRUMENTS ON MAJOR COMPONENTS.
9. DCR 2920 RENUMBERED VALVES, RHR-300A BECAME RHR-299A & RHR-300B BECAME RHR-299B.
10. VALVE SHALL NOT BE CLOSED WITH PLANT AT OR ABOVE RCS TEMP OF 540°F WITHOUT AN ENGINEERING EVALUATION OF GL 96-06 IMPACT (REF. CALC. C11483).
RESIDUAL HEAT EXCHANGER (1A) 135-051
RESIDUAL HEAT EXCHANGER (1B) 135-052
RESIDUAL HEAT REMOVAL PUMP 1A
RESIDUAL HEAT REMOVAL PUMP 1B
INSIDE CONTAINMENT
OUTSIDE CONTAINMENT
PRIORITY DRAWING
DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
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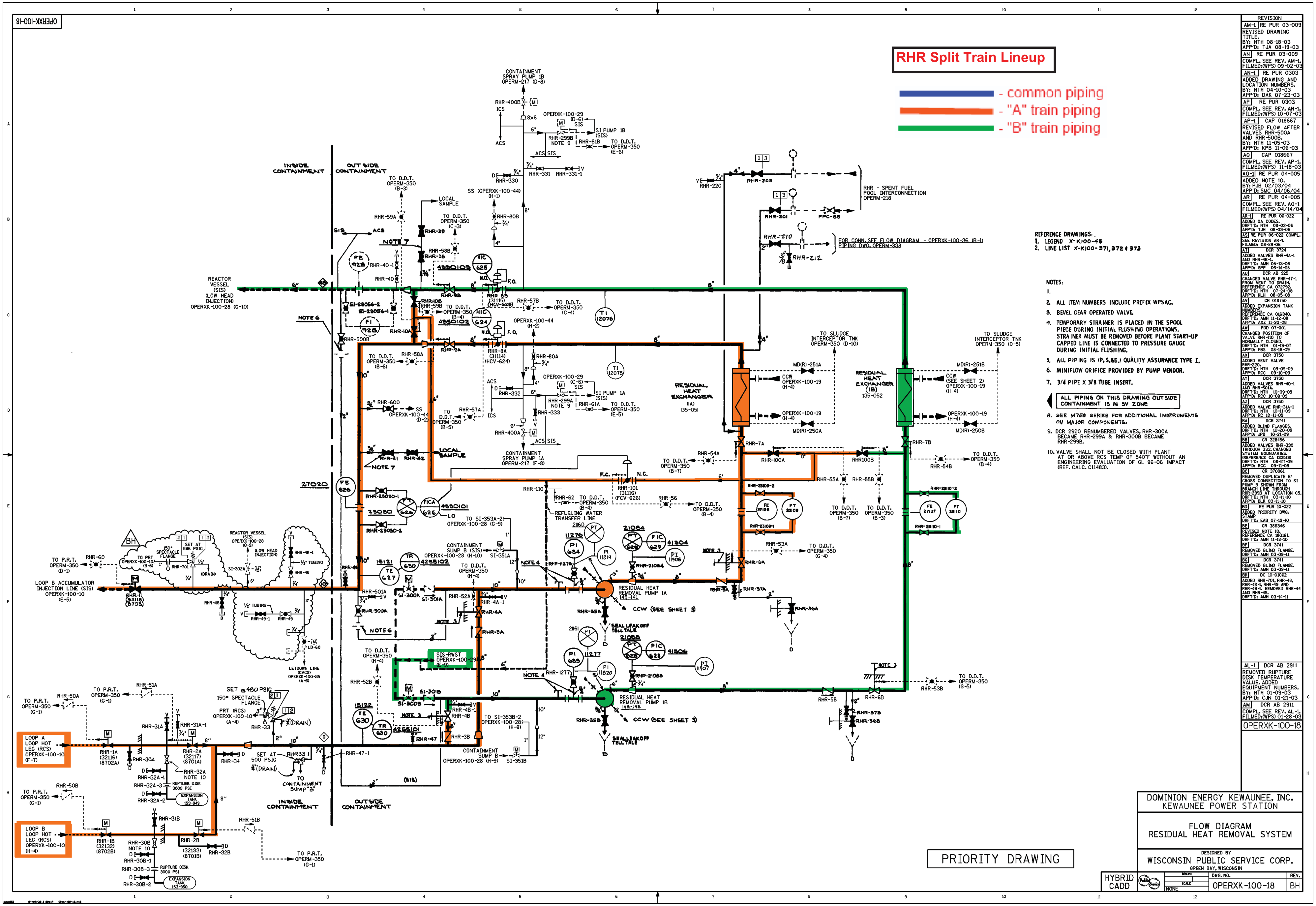
RHR Split Train Lineup
- common piping
- "A" train piping
- "B" train piping
REFERENCE DRAWINGS:
1. LEGEND X-K100-45
2. LINE LIST X-K100-371, 372 & 373
NOTES:
1.
2. ALL ITEM NUMBERS INCLUDE PREFIX WPSAC.
3. BEVEL GEAR OPERATED VALVE.
4. TEMPORARY STRAINER IS PLACED IN THE SPOOL PIECE DURING INITIAL FLUSHING OPERATIONS. STRAINER MUST BE REMOVED BEFORE PLANT START-UP CAPPED LINE IS CONNECTED TO PRESSURE GAUGE DURING INITIAL FLUSHING.
5. ALL PIPING IS (P.S.&E.) QUALITY ASSURANCE TYPE I.
6. MINIFLOW ORIFICE PROVIDED BY PUMP VENDOR.
7. 3/4 PIPE X 3/8 TUBE INSERT.
ALL PIPING ON THIS DRAWING OUTSIDE CONTAINMENT IS IN SV ZONE
8. SEE M758 SERIES FOR ADDITIONAL INSTRUMENTS ON MAJOR COMPONENTS.
9. DCR 2920 RENUMBERED VALVES, RHR-300A BECAME RHR-299A & RHR-300B BECAME RHR-299B.
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RESIDUAL HEAT EXCHANGER (1A) 135-051
RESIDUAL HEAT EXCHANGER (1B) 135-052
RESIDUAL HEAT REMOVAL PUMP 1A
RESIDUAL HEAT REMOVAL PUMP 1B
INSIDE CONTAINMENT
OUTSIDE CONTAINMENT
LOOP A LOOP HOT LEG (RCS) OPERXK-100-10 (F-7)
LOOP B LOOP HOT LEG (RCS) OPERXK-100-10 (H-4)
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