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Our ref: VRA-15-17

March 17, 2015

Mr. Jerry T. Bischof
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North Anna Power Station
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DOMINION GENERATION
NORTH ANNA UNITS 1 AND 2 – SURRY UNITS 1 AND 2
Transmittal of TB-15-1
"Reactor Coolant System Temperature and Pressure Limits for the No. 2 Reactor Coolant Pump Seal"

Gentlemen:

Please find attached Westinghouse Technical Bulletin, TB-15-1: "Reactor Coolant System Temperature and Pressure Limits for the No. 2 Reactor Coolant Pump Seal."

This Technical Bulletin is applicable to North Anna Units 1 & 2 and Surry Units 1 & 2.

Should you have any questions on this information, please contact Josh Hartz at 412-374-5185 or me at 412-374-3366.

Very truly yours,
WESTINGHOUSE ELECTRIC COMPANY

Craig W. Rottenmann for

Thomas M. Haley
Customer Account Manager

/cr
Attachment

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	Renee Giampole	Westinghouse / Cranberry
	Project Letter File	

Technical Bulletin

An advisory of a recent technical development pertaining to the installation or operation of Westinghouse-supplied nuclear plant equipment. Recipients should evaluate the information and recommendation, and initiate action where appropriate.

1000 Westinghouse Drive, Cranberry Township, PA 16066

Subject: **Reactor Coolant System Temperature and Pressure Limits for the No. 2 Reactor Coolant Pump Seal**	Number: **TB-15-1**
System(s): Reactor Coolant Pump Seal Package (No. 2 Seal)	Date: 03/03/2015
Affects Safety-Related Equipment Yes ☒ No ☐	S.O.: NA

SUMMARY

The purpose of this Technical Bulletin (TB) is to inform customers of two issues that may require actions to be implemented to maintain the No. 2 reactor coolant pump (RCP) seal integrity following loss of all seal cooling scenarios. This issue is applicable to the original equipment manufacturer (OEM) RCP seals provided by Westinghouse and only to plants where Westinghouse OEM standard seals are utilized in the RCP.

In plants that have installed the Westinghouse Generation 3 SHIELD® RCP passive thermal shutdown seal or other similar shutdown seal designs, if it can be verified that the shutdown seals for RCPs that have these seals are operating properly following a loss of all seal cooling, the recommendations included are not applicable. Please see the respective seal manufacturer operational guidance for more information.

This TB provides additional clarification to previous transmittals in References 1 and 4.

Additional information, if required, may be obtained from Josh Hartz, (412) 374-5185

Author:	Reviewer:	Manager:
William J. Smoody Regulatory Compliance	John T. Crane Regulatory Compliance	James A. Gresham Regulatory Compliance
Verifier: Josh Hartz Safety Analysis and Licensing	Verifier: Michael A. LaPresti Technology & Innovation	

BACKGROUND

When the Westinghouse OEM RCP seal packages lose their cooling water supply and the back-up cooling system (thermal barrier heat exchangers) is unavailable, the No. 1 seal can experience a thermal transient which causes the seal face gap to open beyond its normal range. This leads to higher flow rates, temperatures, and pressures in the No. 1 seal leak-off line. The Pressurized Water Reactor Owners Group (PWROG) has undertaken programs, both present and past, to quantify No. 1 seal RCP leakage flow rates (and other parameters) for the PWR fleet with Westinghouse RCPs (such as Reference 1). While performing more recent work in this area, a number of questions have arisen from both the industry and also the U.S. Nuclear Regulatory Commission staff relative to the ability of the No. 2 seal to withstand higher than normal pressures and temperatures that can exist in the No. 1 seal leak-off cavity following loss of all seal cooling scenarios.

Based on the results of the recent work, it is concluded that the long-term integrity of the No. 2 seal at the maximum calculated pressures and temperatures cannot be supported by the available analysis or testing results. The main area of limitation is the temperature capability of certain components in the No. 2 seal. In order to remain within the temperature limitations of the components in the No. 2 seal and ensure the integrity of the seal, boundary conditions are provided in the Recommended Actions section. It is noted that Reference 4 provided similar observations relative to the No. 1 seal.

RECOMMENDED ACTIONS

1. In order to ensure the No. 2 seal component temperature limitations are maintained, it is recommended that a reactor coolant system (RCS) cooldown be performed following all loss of all seal cooling events. The cooldown should be initiated within two hours after a loss of seal cooling occurs. The cooldown rate should be the typical emergency response guideline (ERG) rate of 50 to 100°F/hr to a cold leg temperature of less than 450°F (the O.08 or O.11 [Reference 3] setpoint is acceptable) in 4 hours and after 24 hours, an RCS temperature and pressure of less than 350°F and 400 psig should be achieved. The majority of the ERGs that respond to the symptoms of a loss of seal cooling, such as a station blackout (SBO) and an extended loss of AC power (ELAP) currently include such a cooldown. However, it has become apparent that some plant specific abnormal operating procedures (AOPs), such as a response to a complete loss of seal cooling due to fires, may allow the NSSS to remain in a hot stand-by condition. It is recommended that each licensee review all AOPs associated with loss of seal cooling events and confirm that a cooldown is performed within the time and rate discussed above. If no cooldown guidance exists, it is recommended that the procedure be revised to perform the cooldown specified previously. The current practices for ensuring that sufficient negative reactivity exists within the reactor core during and after the cooldown remain valid. The cooldown is recommended even in situations where RCS makeup may be available, including when makeup is provided by the emergency core cooling system (ECCS). Complete RCP seal failure scenarios when the ECCS injects into the RCS are covered in the loss of coolant accident (LOCA) safety analysis. However, in order to maintain defense in depth, a cooldown should be performed for those scenarios as well.

2. During the recent PWROG seal leakage assessment work, several questions were raised regarding the possibility of isolating the No. 1 leak-off line immediately downstream of the No. 1 seal, within the individual leak-off lines, when seal cooling is lost. While this action could reduce the No.1 seal leakage, such an action would result in higher pressures at the inlet of the No. 2 seal. This may be acceptable under low temperature conditions, such as when the thermal barrier heat exchanger is in operation, but not under higher temperature conditions indicative of a complete loss of seal cooling. It is recommended that the No. 1 leak-off line remain open, which is the analyzed configuration, following loss of all seal cooling scenarios, because the No. 2 seal is not qualified for high temperature and high pressure inlet conditions for an extended period. The recommended location

of isolation of the No. 1 seal leak-off line is the containment isolation valve in the No. 1 leak-off line common header (Reference 5). Further, it should be clear in plant specific procedures for response to high No. 1 seal leak-off flow rate that seal cooling should be confirmed prior to closing the No.1 leak-off line immediately downstream of the No.1 seal. If all seal cooling is lost (thermal barrier and seal injection), the downstream containment isolation valve should be closed instead.

It is noted that Reference 4 also establishes a position that if seal cooling is lost, it should not be restored, unless the No. 1 seal has not exceeded the shut-down temperature specified in the plant specific RCP Instruction Book (typically 230°F to 235°F). This position remains valid, as do the other recommendations in Reference 4.

AFFECTED PLANTS

These recommendations apply to plants that use Westinghouse OEM standard seals in the RCP. In plants that have installed the Westinghouse Generation 3 SHIELD RCP passive thermal shutdown seal where credit can be taken for actuation of all shutdown seals or other low-leakage similar shutdown seal designs, if it can be verified that the shutdown seals for all RCPs are operating properly following a loss of all seal cooling, these recommendations are not applicable. Please see the respective seal manufacturer operational guidance for more information. The following list includes all plants where Westinghouse has supplied the affected seals. Some plants listed were not completed or are no longer operational but are included for completeness.

Almaraz 1 & 2	Genkai 1, 3 & 4	Napot Point	Sizewell
Angra 1	Hanbit 1 & 2	North Anna 1 & 2	South Texas 1 & 2
Ascó 1 & 2	H.B. Robinson 2	Oconee 1	Surry 1 & 2
A.W. Vogtle 1 & 2	Indian Point 2 & 3	Ohi 1, 2, 3 & 4	Takahama 1, 2, 3 & 4
Beaver Valley 1 & 2	Ikata 1	Point Beach 1 & 2	Three Mile Island 1
Beznau 1 & 2	J.M. Farley 1 & 2	Prairie Island 1 & 2	Trojan 1
Braidwood 1 & 2	José Cabrera	Qinshan II-1 & II-2	Turkey Point 3 & 4
Byron 1 & 2	Kewaunee	R.E. Ginna	Vandellos 2
Callaway 1 & 2	Kori 1, 2, 3 & 4	Ringhals 2, 3 & 4	V.C. Summer 1
Catawba 1 & 2	Krsko	Salem 1 & 2	Watts Bar 1 & 2
Comanche Peak 1 & 2	Lemóniz 1 & 2	San Onofre 1	W.B McGuire 1 & 2
Connecticut Yankee	Maanshan 1 & 2	Sayago 1	Wolf Creek
D.C Cook 1 & 2	Marble Hill 1 & 2	Seabrook 1 & 2	Zion 1 & 2
Diablo Canyon 1 & 2	Mihama 1, 2 & 3	Sequoyah 1 & 2	
Doel 1, 2, 3 & 4	Millstone 3	Shearon Harris 1, 2, 3 & 4	

REFERENCES

1. Westinghouse Report WCAP-10541, Revision 2, “Westinghouse Owner’s Group Report Reactor Coolant Pump Seal Performance Following a Loss of All AC Power,” November 1986.
2. PWROG Letter OG-00-009, “Transmittal of RCP Operation During Loss of Seal Cooling (MUHP-1063),” February 11, 2000.
3. Emergency Response Guideline ERG-13-002, DW-13-005, August14, 2013
4. Westinghouse Technical Bulletin TB-04-22, Revision 1, “Reactor Coolant Pump Seal Performance – Appendix R Compliance and Loss of All Seal Cooling,” August 9, 2005
5. PWROG Letter WOG-05-163, “Transmittal of 2004 ERG Maintenance Program Update (PA-OSC-0080),” March 30, 2005 (see Direct Work Number DW-04-004 and DW-04-005).