

June 29, 2010

MEMORANDUM TO: Kenneth G. O'Brien, Deputy Director  
Division of Reactor Safety  
Region III

FROM: Thomas B. Blount, Deputy Director **/RA/**  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

SUBJECT: FINAL RESPONSE TO TASK INTERFACE AGREEMENT–  
RELIANCE ON NON-SAFETY-RELATED ATMOSPHERIC DUMP  
VALVES IN FSAR CHAPTER 14 ANALYSIS FOR STEAM  
GENERATOR TUBE RUPTURE ACCIDENT  
(TIA 2009-003)

By letter dated June 17, 2009, Agencywide Documents Access and Management System Accession No. ML091690577, Region III requested assistance from the Office of Nuclear Reactor Regulation (NRR) in answering the following component design basis inspection questions regarding the reliance on non-safety-related atmospheric dump valves (ADV) in Final Safety Analysis Report Chapter 14 analysis for steam generator tube rupture (SGTR) accident at the Palisades Nuclear Plant:

1. From a design and licensing basis perspective for system functional capability, can the licensee credit non-safety-related ADVs to terminate a design bases SGTR accident?
2. Based upon the assumed operation of the ADVs in the licensee's assessment of radiological consequences for a SGTR event:
  - a. Did NRC staff accept Palisades' use of non-safety-related ADVs?
  - b. If NRC staff did accept the use of non-safety-related ADVs, is a compliance backfit warranted to restore compliance with the current licensing bases?

The NRR staff's assessment is documented in the enclosed staff evaluation.

Docket No: 50-255

Enclosure:  
As stated

CONTACT: Holly D. Cruz, NRR/DPR  
301-415-1053

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**ADAMS ACCESSION NO.: ML101260128 \*No major changes to SBPB input NRR-043**

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**TASK INTERFACE AGREEMENT 2009-03**  
**RELIANCE ON NON-SAFETY-RELATED ATMOSPHERIC DUMP VALVES IN FSAR**  
**CHAPTER 14 ANALYSIS FOR STEAM GENERATOR TUBE RUPTURE ACCIDENT**

## 1.0 INTRODUCTION

During the 2008 Component Design Basis Inspection, as part of the review of atmospheric dump valves (ADVs), U.S. Nuclear Regulatory Commission (NRC) inspectors reviewed operating procedures to verify that the component operation and alignments were consistent with the Palisades Nuclear Plant design and licensing bases. The inspectors used the Chapter 14 analysis of a steam generator tube rupture (SGTR), coincident with a loss of off-site power (LOOP), that relied upon the post-accident operation of the non-safety-related atmospheric dump valves (ADVs). Because the accident analysis uses the ADVs for plant cooldown, the inspectors questioned the safety classification of the ADVs, as well as the availability of a back-up nitrogen air supply needed for the air-operated ADVs actuators.

By letter dated June 17, 2009, Agencywide Documents Access and Management System (ADAMS) Accession No. ML091690577, the NRC Region III requested assistance from the Office of Nuclear Reactor Regulation (NRR) in providing answers to the following questions regarding reliance on non-safety-related ADVs in Final Safety Analysis Report (FSAR) Chapter 14 analysis for SGTR accident at the Palisades Nuclear Plant. Region III requested NRR to address the following:

1. From a design and licensing basis perspective for system functional capability, can the licensee credit non-safety-related ADVs to terminate a design basis SGTR accident?
2. Based upon the assumed operation of the ADVs in the licensee's assessment of radiological consequences for a steam generator tube rupture event:
  - a. Did NRC staff accept Palisades' use of non-safety-related ADVs?
  - b. If NRC staff did accept the use of non-safety-related ADVs, is a compliance backfit warranted to restore compliance with the current licensing bases?

## 2.0 DISCUSSION AND EVALUATION

Applicable Regulations and NRC Staff Guidance:

- Pursuant to Section 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), Appendix A, General Design Criteria (GDC) 34 requires the licensee to have the capability to transfer decay heat and other residual heat from the reactor such that fuel and pressure boundary design limits are not exceeded.
- NUREG-0800, "Standard Review Plan," Branch Technical Position 5-4 (formerly Branch Technical Position Reactor Systems Branch (RSB) 5-1), "Design Requirements of the Residual Heat Removal System," states that the design shall be such that the reactor

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can be taken from normal operating conditions to cold shutdown using safety-grade systems (within a reasonable period of time following shutdown, assuming the most limiting single failure).

- 10 CFR 50.2 defines safety-related systems structures, systems, and components (SSCs) as those SSCs that are relied on to remain functional during and following postulated design basis events to assure: 1) integrity of the reactor coolant system boundary, 2) capability to shutdown and maintain the reactor in a safe shutdown condition 3) capability to prevent or mitigate the consequences of accidents which could result in off-site exposures.
- 10 CFR 50.109, and Generic Letter (GL) 88-20, individual plant examination program: in areas where non-safety-related SSCs have been identified as critical for reactor safety, the NRC staff has used the backfit rule, to require the licensee to upgrade the SSCs to safety-grade.
- NRC provided specific guidance to the industry regarding quality measures for non-safety-related SSCs in GL 84-01, 10 CFR 50.48 and Appendix R (fire protection), 10 CFR 50.49 (environmental qualification), 10 CFR 50.65 (maintenance rule), 10 CFR 50.54 (license renewal), 10 CFR 50.63 (SBO), 10 CFR 50.62 Anticipated transient without scram (ATWS), Generic Issue 124 (Auxiliary Feedwater), and Regulatory Guide 1.96 (Main Steam Isolation Valve Leakage Control System).
- NUREG 0138, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976, Memorandum from Director, NRR to NRR Staff," identifies specific instances where safety-related components were not available to perform a specific safety function, and the NRC staff has performed an evaluation to determine whether the licensee can use non-safety-related SSCs to perform a safety function.

#### Prior Relevant Evaluations:

RSB has previously evaluated the use of non-safety-related SSCs in a Region I Task Interface Agreement (TIA) Concerning the Licensing Basis of Various Steam System Valves at Three Mile Island Unit 1 (TMI-1) (TAC NO. M96028), ADAMS Accession No. M1100331810. The main steam lines and turbine bypass valves are non-safety-related components that were credited in the SGTR event. In the July 3, 1996, memorandum, Region I requested NRR to take the lead in a review to determine: 1) the acceptability of how the licensee for TMI-1 maintained the licensing bases for certain steam system valves, and 2) the acceptability of the treatment of these valves under Generic Letter 89-10 (Motor-Operated Valve Testing and Surveillance). The NRR staff responded to the TIA, stating:

However, the FSAR also states that operation of the atmospheric dump valves is not essential for safe shutdown (hot shutdown is the licensing basis safe shutdown mode for TMI-1) and that the condenser dump portion is not required for reactor safety [FSAR Section 10.3.2.1].

In the steam generator tube rupture accident analysis, the licensee again relies on the turbine stop valves, and not the (main steam isolation valves (MSIVs)), for isolating the affected steam generator (FSAR 14.1.2.10).

For the steam generator tube rupture analysis, the licensee, again relies on the turbine bypass system to cooldown and depressurize the Reactor Coolant System to the decay heat removal system entry points. In addition, in the calculations of the radiological doses for the steam generator tube rupture accident, the licensee did not account for direct release to the environment through the main steam safety valves. The licensee's analysis assumes that the reactor coolant that leaks as a result of the tube rupture is condensed in the condenser and that only the fission products that escape from the condensate are released to the atmosphere (FSAR Section 14.1.2.10.a.2).

#### Regulatory Background on Licensing Basis at Palisades

The Palisades' FSAR Section 1.4 describes the basis under which the plant was licensed. Palisades submitted application for an operating license in 1968. At that time, the General Design Criteria (GDCs) were in draft form. The NRC generic position was that the GDC are not applicable to plants with construction permits issued prior to May 21, 1971. The original FSAR presented a comparison of plant design features with the 1967 draft GDCs.

In 1977, the NRC initiated the Systematic Evaluation Program (SEP) to review the designs of older operating plants whose construction permits were issued before the final GDC (10 CFR 50 Appendix A), the associated Standard Review Plans (NUREG 75/087 and 0800), and other guidance documents. Based on the SEP reviews, topics were closed based on the adequacy of the existing system designs or, in some cases, after the licensees made procedural or design changes. The outputs of the integrated safety assessment process, which documented the final agency conclusions for the evaluated topics, were published in NUREG 0820 (Integrated Plant Safety Assessment Report). Palisades was one of the eleven plants that the SEP reviewed to identify any differences between the requirements for those plants licensed under the GDCs and those plants licensed pre-GDC.

The Palisades FSAR Section 1.8.10 states:

For Palisades' original design, "Safe Shutdown" was "Hot Shutdown". The original design did not require the ability to achieve cold shutdown conditions; therefore, the design of the systems used to get to cold shutdown was determined by the Architect Engineer or the Nuclear Steam Supply System vendor and was not based on any regulatory safety concern.

The original design did not require the ability to achieve cold shutdown conditions; therefore, the design of the systems used to get to cold shutdown was determined by the Architect Engineer or the Nuclear Steam Supply System vendor and as not based on any regulatory safety concern." Equipment and components needed to get to cold shutdown may be non-safety-related if:

- a. An alternate means exists to allow cooldown to cold shutdown assuming failure of the non-safety-related equipment/component under consideration or,
- b. Manual action or repairs are identified to correct a single failure within some reasonable time period and are found to be acceptable to allow cooldown to cold shutdown.

## Technical Evaluation

The Palisades' FSAR, Chapter 10, Main Steam, describes the ADVs as having a similar function as the main condenser steam dump and bypass system. Each of the two main steam lines has two ADVs installed upstream of the MSIVs. One function of the ADVs is to prevent lifting of the main steam safety valves following a turbine and reactor trip. The ADVs also have a back-up nitrogen supply to allow for steam generator pressure control during a station blackout.

The equipment classification was originally specified in the Palisades 1980 FSAR, Appendix A, and TER-C5257-428. The ADVs were part of Palisades' original design. The pressure boundary function of the ADVs is part of the main steam system and classified as safety-related. The valve operators and back-up instrument air for the ADVs at Palisades are designated as non-safety-grade, 'augmented quality', because the licensee credits the use of the ADVs to mitigate a SGTR accident in FSAR Chapter 14 analysis.

Under 10 CFR 50.59, the licensee installed a bulk nitrogen tank as a back-up air supply to the ADVs to comply with the 10 CFR 50.63, SBO requirements. The nitrogen back-up to the ADVs was classified as 'augmented quality,' but was not considered safety-related per Regulatory Guide 1.155 and was not required for the operability for the ADVs. For consistency, the ADVs were also reclassified to "augmented quality". The ADVs were added to the Palisades Technical Specifications (TS) in 1999 when the TS were converted to a format and content based on NUREG-1432, "Standard Technical Specifications, Combustion Engineering Plants." In a safety evaluation, dated June 25, 1992, ADAMS Accession No. ML9207060139, the NRC found the Palisades' proposed modification, adding back-up air to the ADVs, was acceptable to comply with Station Blackout (SBO) requirements.

The NRC allows a licensee to use non-safety-grade SSCs to mitigate an accident as long as their analyses using these SSCs comply with regulations, and are approved by the NRC. The Palisades' FSAR describes how the ADVs are used to mitigate the SGTR event and provides the maximum expected off-site dose exposure. The NRR staff reviewed the licensee's proposed calculated off-site dose from an SGTR, and accepted the FSAR analysis as Palisades' licensing basis for an SGTR, as stated in the original safety evaluation report (SER), dated March 6, 1970, ADAMS Accession No. ML100331810. Note that during that evaluation, using different meteorological conditions, the staff calculated a larger potential off-site dose from an SGTR when main steam is released through the ADVs. This larger off-site dose still did not exceed the limits specified in 10 CFR Part 100. This calculated expected off-site dose became part of Palisades' licensing basis, which bound the SGTR event as worst case for off-site radiological dose estimates.

In accordance with Palisades' FSAR Section 1.8.10, non-safety-related ADVs are credited for cooldown, require a means to cooldown the primary coolant system in the event the non-safety-related components are not available. The event description in the FSAR Section 14.15 for a SGTR states that the plant is brought to shutdown cooling conditions per plant operating procedures and the time will vary based upon the availability of the plant equipment. In the Palisades Systematic Evaluation Program (SEP), NUREG-0820, dated April 1982, the NRC staff cited the licensee for not having procedures detailing the use of only safety-grade SSCs in the event the non-safety-grade SSCs were not available. As a result of the SEP, the licensee proposed to develop appropriate documented procedures for operation of safety-grade systems and components to achieve cold shutdown.

During the 2008 Component Design Basis Inspection, the licensee responded to request for information-306 by stating that the emergency operating procedure- 5.0, "Steam Generator Tube Rupture Recovery," directs operators to use the strategy of once-through-cooling, which utilizes safety-related components, the pressurizer power-operated relief valves and the high pressure safety injection system if the ADVs and the turbine bypass valves are both unavailable. Although using the ADVs is the preferred method to mitigate a SGTR event, an alternate method using safety grade equipment is proceduralized.

In the scope of this TIA, the NRR staff did not evaluate the once-through-cooling method.

The Palisades' FSAR, Chapter 14, states that operator actions, event recovery strategy, and the use of specific plant components assumed in the SGTR analysis were chosen to identify the mitigation strategy resulting in the highest off-site dose estimates. The FSAR analysis using the ADVs provides the largest off-site release. Palisades' analyses show in this extreme case, in which the faulted steam generator was not isolated until the PCS was cooled sufficiently to allow actuation of the shutdown cooling system, the off-site dose would still not exceed 10 CFR Part 100 limits. The actual actions that the licensee takes in the event of a SGTR may differ based upon available SSCs, but the resulting radiological releases would remain lower than the dose calculated in the bounding analysis using the ADVs. Therefore, use of the ADVs, as described in the FSAR, is part of the licensing basis for dose assessment and bounds the once-through-cooling method by maximizing off-site radiological dose estimates.

The results of the SEP reflect the staff's assessment of plant's planned response to a SGTR event.

- In topic VII-3 of the SEP, the staff evaluated plant systems that were needed to achieve and maintain a safe shutdown condition, and bring a pressurized water reactor from a high pressure condition to a low pressure condition assuming the use of only safety-grade equipment. The report only identified one problem, isolating low pressure systems that were connected to the PCS boundary.
- In topic XV-17 of the SEP, the staff reviewed the radiological consequences of the SGTR. The staff concluded the analysis was consistent with the related section in the Standard Review Plan. The dose assessment presented in the analysis was based on the assumption that the plant was "cooled down by releasing secondary steam to the environment through the safety and dump valves." This report concludes that the assumption was consistent with the Chapter 14 analysis for the SGTR with LOOP.

In summary, the licensee has provided an analysis using the ADV's in the Palisades' FSAR as a preferred shutdown method. In the event that the non-safety-related SSCs are not available, the licensee has identified safety-related SSCs to perform the cooldown function. In subsequent plant evaluations, the staff has not identified to the licensee a requirement to upgrade the non-safety-grade ADVs under the backfit rule, 10 CFR 50.109.

### 3.0 CONCLUSION

Based on the review of TIA 2009-03, the NRR staff responds as follows to the questions presented:

Question 1: *From a design and licensing basis perspective for system functional capability, can the licensee credit non-safety-related atmospheric dump valves (ADV) to terminate a design bases SGTR accident?*

Response: Yes. The Region III inspectors asked if Palisades can credit non-safety-related ADVs to terminate a design basis SGTR accident. The NRR staff concludes that the NRC approved the use of the non-safety-related ADVs as an acceptable method of mitigating a SGTR in the Palisades' FSAR; therefore, this method became part of their licensing basis. . The original SER for Palisades reflects that the NRC reviewed the FSAR and approved the use of the ADVs as part their licensing basis. The use of the ADVs provides the bounding calculation as worse case for off-site dose assessment, yet still does not exceed the limits for off-site dose in accordance with 10 CFR Part 100. From a licensing perspective, in the event the nonsafety-related ADVs, were not available, the licensee would meet their licensing basis defined in FSAR Section 1.8.10, by having an established alternate method using established procedures and evaluated to remain bounded by the worst case dose analysis using the ADVs.

The NRR staff notes the original licensing basis did not identify the ADV as safety-related. Improvements to the ADVs made by the licensee did not qualify them as safety-related. Therefore, the NRR staff concludes that no change has been made to the original classification of non-safety related for the ADVs.

Question 2: *Based upon the assumed operation of the ADVs in the licensee's assessment of radiological consequences for a SGTR event:*

- a. *Did NRC staff accept Palisades' use of non-safety-related ADVs?*
- b. *If NRC staff did accept the use of non-safety-related ADVs, is a compliance backfit warranted to restore compliance with the current licensing bases?*

Response: a. Yes. b. No. In regards to the NRC action in the licensee crediting the use of the non-safety-related ADVs, NRR staff finds that the licensee is in compliance with their current licensing basis and does not find evidence to support a backfit for the non-safety related ADVs.

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