

March 27, 2007

MEMORANDUM TO: Cynthia D. Pederson, Director
Division of Reactor Safety
Region III

FROM: Michael J. Case, Director **/RA by JGolder for/**
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

SUBJECT: FINAL RESPONSE TO QUAD CITIES NUCLEAR POWER STATION -
TASK INTERFACE AGREEMENT (TIA) 2006-005 RE: APPENDIX R
DISPUTED VIOLATIONS (TAC NOS. MD3126 AND MD3127)

On September 28, 2006, the Region III Division of Reactor Safety requested assistance from the Office of Nuclear Reactor Regulation (NRR) to evaluate two contested violations from the Quad Cities Nuclear Power Station (QCNPS) triennial fire protection inspection. Specifically, Region III requested that NRR provide answers to the following questions:

With respect to Non-Cited Violation (NCV) 05000254(265)/2006002-01:

1. Can licensees perform a Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.59 evaluation (or other equivalent adverse effects evaluation) for fire protection program changes which result in changing a previously approved "alternate/dedicated" Safe Shutdown system to a "redundant" system? If not, please identify what regulatory tool precludes the licensee from making such a change and how we have communicated this expectation to licensees.
2. If such evaluation processes can be utilized, what is the system design criteria which licensees must meet to rely upon these systems as "redundant" for the purposes of meeting 10 CFR Part 50, Appendix R, Section III.G.2 requirements?
3. For boiling water reactors, what systems can licensees appropriately classify as "preferred" for the purposes of meeting 10 CFR Part 50, Appendix R, Section III.G.2 requirements? For those systems, has the NRC defined the design or functional requirements for systems to be classified as "preferred?"
4. With respect to the QCNPS NCV and licensee response, can the licensee classify the safe shutdown makeup pump as redundant to the reactor core isolation cooling system for the purposes of meeting 10 CFR Part 50, Appendix R, Section III.G.2?
5. With respect to the QCNPS NCV and licensee response, does the licensee's position asserting compliance with 10 CFR Part 50 Appendix R, Section III.G.2 have merit and thereby warrant withdrawal of the NCV?

With respect to NCV 05000254(265)/2006002-02:

6. Can licensees perform a 10 CFR Part 50.59 evaluation (or other equivalent adverse effects evaluation) for fire protection program changes which result in reliance on a multi-unit cross-tie capability for the purpose of meeting 10 CFR Part 50, Appendix R, Section III.G.2? If not, please identify what regulatory tool precludes the licensee from making such a change and how we have communicated this expectation to licensees.
7. With respect to the QCNPS NCV and licensee response, for the residual heat removal service water system configuration, can the licensee rely upon the multi-unit cross-tie capability (previously relied upon for meeting 10 CFR Part 50, Appendix R, Section III.G.3), for the purpose of meeting 10 CFR Part 50, Appendix R, Section III.G.2?
8. With respect to the QCNPS NCV and licensee response, does the licensee's position asserting compliance with 10 CFR Part 50, Appendix R, Section III.G.2, through reliance upon the multi-unit cross-tie capability, have merit and thereby warrant withdrawal of the NCV?

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

Docket Nos: 50-254 and 50-265

Enclosure: As stated

CONTACTS: Sean E. Peters, DPR
301-415-1842

Holly D. Cruz, DPR
301-415-1053

March 27,2007

With respect to NCV 05000254(265)/2006002-02:

- 6. Can licensees perform a 10 CFR Part 50.59 evaluation (or other equivalent adverse effects evaluation) for fire protection program changes which result in reliance on a multi-unit cross-tie capability for the purpose of meeting 10 CFR Part 50, Appendix R, Section III.G.2? If not, please identify what regulatory tool precludes the licensee from making such a change and how we have communicated this expectation to licensees.
- 7. With respect to the QCNPS NCV and licensee response, for the residual heat removal service water system configuration, can the licensee rely upon the multi-unit cross-tie capability (previously relied upon for meeting 10 CFR Part 50, Appendix R, Section III.G.3), for the purpose of meeting 10 CFR Part 50, Appendix R, Section III.G.2?
- 8. With respect to the QCNPS NCV and licensee response, does the licensee's position asserting compliance with 10 CFR Part 50, Appendix R, Section III.G.2, through reliance upon the multi-unit cross-tie capability, have merit and thereby warrant withdrawal of the NCV?

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

Docket Nos: 50-254 and 50-265

Enclosure: As stated

CONTACTS: Sean E. Peters, DPR
301-415-1842

Holly D. Cruz, DPR
301-415-1053

<u>DISTRIBUTION:</u>	RidsNrrAdro	HollyCruz
PUBLIC	PhilQualls	SusanUttal
PSPB Reading File	DavidSolorio	
RidsNrrDpr	SunilWeerakkody	
RidsNrrDprPspb	CorneliusHolden	
RidsNrrLADBaxley	RidsRgn1MailCenter	
RidsAcrsAcnwMailCenter	RidsRgn2MailCenter	
RidsNrrPMSPeters	RidsRgn3MailCenter	
RidsOgcMailCenter	RidsRgn4MailCenter	

ADAMS ACCESSION NO: ML070640415

OFFICE	PSPB/PM	PSPB/PM	PSPB/LA	EEEE/BC	PSPB/BC	OE/SC	OGC/NLO	DPR/D
NAME	HCruz	SPeters	DBaxley	SWeerakkody	SRosenberg	DSolorio	SUttal	MCase
DATE	3/5/07	3/5/07	3/6/07	3/8/07	3/23/07	3/14/07	3/22/07	3/27/07

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

DISPUTED APPENDIX R VIOLATIONS REGARDING

QUAD CITIES NUCLEAR POWER STATION

TASK INTERFACE AGREEMENT (TIA) 2006-005

1.0 INTRODUCTION

On July 31, 2006 (Agencywide Documents Access Management System (ADAMS) Accession No. ML062140118), the U.S. Nuclear Regulatory Commission (NRC) staff issued Inspection Report 05000254(265)/2006002 for the Quad Cities Nuclear Power Station (QCNPS) 2006 triennial fire protection inspection. In this report, the NRC staff identified two non-cited violations (NCVs) of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979." One NCV involved the safe shutdown makeup pump (SSMP) and the other involved the residual heat removal service water (RHRSW) system.

On August 31, 2006 (ADAMS Accession No. ML062560198), the licensee contested the two NCVs. Subsequently, on September 28, 2006 (ADAMS Accession No. ML062710539), the NRC, Region III, Division of Reactor Safety requested assistance from the Office of Nuclear Reactor Regulation (NRR) to evaluate the two contested violations from the QCNPS triennial fire protection inspection.

2.0 BACKGROUND

The first finding, NCV 05000254(265)/2006002-01, involves the fact that the licensee credited the use of the dedicated SSMP for reactor coolant inventory makeup in lieu of ensuring that one of the redundant trains of reactor coolant inventory makeup water would remain free of fire damage. The NRC staff found this to be a violation of 10 CFR Part 50, Appendix R, Section III.G.2.

With respect to the SSMP finding, the SSMP was originally installed as a dedicated shutdown system, and therefore, the system was required to meet the requirements in Appendix R, Section III.G.3. The licensee asserts that it has maintained compliance with 10 CFR Part 50, Appendix R, Section III.G.2 because the SSMP and reactor core isolation cooling (RCIC) system are redundant. The licensee maintains that the SSMP and RCIC meet the requirements to be considered redundant since they perform the same design functions. However, the NRC Region III staff notes that the SSMP redundancy is limited to the inventory makeup function for a fire event. Since the SSMP would only be used for inventory makeup, plant safe shutdown would also require the use of other systems to perform the overall same system function as the RCIC system.

ENCLOSURE

The second finding, NCV 05000254(265)/2006002-02, was also found to be a violation of 10 CFR Part 50, Appendix R, Section III.G.2. In this violation, the NRC staff found that in the event of a severe fire, the licensee failed to ensure that one redundant train of the RHRSW system necessary to achieve and maintain hot shutdown conditions would be free of fire damage. Instead, the licensee credited the cross-tie of the RHRSW system train from the opposite unit for torus cooling during hot shutdown.

With respect to the RHRSW system finding, the licensee maintains that for multiple unit plants, systems shared between units may be credited as redundant for each unit. Accordingly, the licensee relies upon the opposite unit RHRSW system, through a locally-operated system cross-tie valve, for the purposes of meeting the 10 CFR Part 50, Appendix R, Section III.G.2 requirement to ensure that at least one redundant train of a system is available to support safe shutdown.

3.0 EVALUATION

By this TIA, Region III requested answers to the following questions:

SSMP: NCV 05000254(265)/2006002-01:

1. Can licensees perform a 10 CFR 50.59 evaluation (or other equivalent adverse effects evaluation) for fire protection program changes which result in changing a previously approved "alternate/dedicated" Safe Shutdown system to a "redundant" system? If not, please identify what regulatory tool precludes the licensee from making such a change and how we have communicated this expectation to licensees.

Yes. With respect to the structures, systems, and components (SSCs) described in the Updated Final Safety Analysis Report (UFSAR), licensees may make a change to the plant in accordance with 10 CFR 50.59. In addition, the licensee would also have to evaluate that change with respect to the fire protection program to determine that the change does not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. If the licensee makes the change in accordance with 10 CFR 50.59 and determines that the change does not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire, then the licensee may change their fire protection program without prior approval.

Precedent

In its September 6, 2001, TIA 2001-05 response (ADAMS Accession No. ML012080008) to a question concerning change from a 10 CFR Part 50, Appendix R, Section III.G.2 fire area ("redundant") to a III.G.3 ("alternative" or "dedicated") fire area, the NRC staff stated:

"Although, the licensee was licensed to operate after January 1, 1979, the requirements of 10 CFR Part 50, Appendix R, Section III.G.3, were incorporated into the approved fire protection program. In accordance with License Condition 2E, the licensee may change designation of a fire zone from 10 CFR Part 50, Appendix R, Section III.G.2, Separation Requirements, to 10 CFR Part 50, Appendix R, III.G.3, Alternative Shutdown, without prior approval, if a

licensee remains in compliance with the provisions of the specified requirements in 10 CFR Part 50, Appendix R, as set forth in the fire protection program. Fire protection program changes that adversely affect the ability of the plant to achieve safe shutdown, require prior NRC approval.”

The cited precedent discusses a change from 10 CFR Part 50, Section III.G.2 compliance to 10 CFR Part 50, Appendix R, Section III.G.3 compliance for a plant licensed to operate after January 1, 1979. The precedent demonstrates that a licensee may make changes to their compliance strategy from one 10 CFR Part 50, Appendix R, Section III.G category to another.

2. If such evaluation processes can be utilized, what is the system design criteria which licensees must meet to rely upon these systems as “redundant” for the purposes of meeting 10 CFR Part 50, Appendix R, Section III.G.2 requirements?

The design criteria for a redundant system is given in the design basis documents and the UFSAR for the plant.

The regulatory requirements classifying a system as “redundant” with respect to fire protection have been established in Appendix R. Regulatory guidance for when a system is “redundant” for fire protection safe shutdown purposes was provided in Generic Letter (GL) 86-10 in the response to Question 3.8.3 which stated, in part:

“If the system is being used to provide its design function, it generally is considered redundant. If the system is being used in lieu of the preferred system because the redundant components of the preferred system does not meet the separation criteria of Section III.G.2, the system is considered an alternative shutdown capability.”

With respect to the QCNPS NCV, the licensee originally installed the SSMP as a new system to provide dedicated shutdown system capability to comply with 10 CFR Part 50, Appendix R, Section III.G.3. This was consistent with the response to Question 3.8.3 and Footnote 1 in Appendix R, “...*dedicated shutdown capability is provided by installing new structures and systems for the function of post-fire shutdown*”. However, at a later time the licensee reclassified the SSMP as “redundant” and asserted the SSMP meets III.G.2 requirements. In this case, the function of the SSMP system is for Appendix R safe shutdown and the SSMP system does not perform the same design function as the RCIC system. Therefore, the SSMP system is not “redundant” and the design function of the SSMP system should remain characterized as a “Dedicated Shutdown” system.

3. For boiling water reactors, what systems can licensees appropriately classify as “preferred” for the purposes of meeting 10 CFR Part 50, Appendix R, Section III.G.2 requirements? For those systems, has the NRC defined the design or functional requirements for systems to be classified as “preferred?”

As described below, the **preferred** system is a redundant system used to provide its design function; and it is also one of the two normal safe shutdown trains. The response to GL 86-10, Question 5.1.2 states in part, “For the purposes of analysis to Section III.G.2 criteria, the safe shutdown capability is defined as one of the two normal safe

shutdown trains. If the criteria of Section III.G.2 are not met, an alternative shutdown capability is required.”

The following question pertains to regulatory guidance provided in GL 86-10, Question 3.8.3, which asks:

“3.8.3 Redundant Trains/Alternate Shutdown

QUESTION: Confusion exists as to what will be classified as an alternate shutdown system and thus what systems might be required to be protected by suppression and detection under Section III.G.3.b....

RESPONSE: If the system is being used to provide its design function, it generally is considered redundant. If the system is being used in lieu of the **preferred** system because the redundant components of the **preferred** system does not meet the separation criteria of Section III.G.2, the system is considered an alternative shutdown capability....”

As stated in the response to Question 2, the design criteria for a redundant system is given in the design basis documents and the UFSAR for the plant. The system designs approved by the NRC staff will generally identify which systems are used to maintain plant conditions. In many cases, these systems are incorporated into technical specifications with mode restraint requirements.

4. With respect to the QCNPS NCV and the licensee response, can the licensee classify the SSMP as redundant to the RCIC system for the purposes of meeting 10 CFR Part 50, Appendix R, Section III.G.2?

No. With respect to the QCNPS NCV, the licensee has not demonstrated that the SSMP design function is the same as the RCIC system design function. As discussed in the response to Question 2, the design criteria for a redundant system is given in the plant's design basis documents and the UFSAR.

5. With respect to the QCNPS NCV and licensee response, does the licensee's position asserting compliance with 10 CFR Part 50, Appendix R, Section III.G.2 have merit and thereby warrant withdrawal of the NCV?

No. The NCV should not be withdrawn because the licensee deviated from the regulatory requirements (Footnote to Appendix R defining “dedicated systems” for Alternate Shutdown capability) and regulatory guidance (Question 3.8.3 to GL 86-10).

Although the 10 CFR 50.59 process used by the licensee may provide an approach to make a plant change to designate and credit a system as redundant (see responses to Questions 1 and 2), the licensee must also be able to demonstrate that the change does not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire, and the SSMP must be designated and shown to be one of the two normal safe shutdown trains (GL 86-10, Question 5.1.2 response).

The SSMP is not one of the two normal safe shutdown trains and, thus, is an alternative shutdown capability. In addition, the inspection report identified the concern with the fire

water system as the backup water source for reactor coolant inventory makeup for the SSMP. Although the licensee's August 31, 2006, response letter stated that it does not consider the system difference (i.e., different backup water supply) to "substantially alter the design function of the SSMP system," the letter did not fully address the system difference of the backup water supply, in that it did not address the lack of ability to supply the SSMP from the suppression pool.

The acceptability of reliance on a system, other than the normal shutdown trains for the purpose of establishing compliance with 10 CFR Part 50, Appendix R, Section III.G.2, necessitates significant safety analysis and regulatory reviews. For example, after such reviews, the NRC staff concluded that the use of safety relief valves and low pressure systems as "redundant" post-fire safe shutdown systems under the provisions of 10 CFR Part 50, Appendix R, was acceptable. (Reference NRC letter to BWR Owners Group dated December 12, 2000, ADAMS Accession No. ML003776828)

USE OF RHRSW SYSTEM CROSS-TIE BETWEEN UNITS: NCV 05000254(265)/2006002-02:

6. Can licensees perform a 10 CFR 50.59 evaluation (or other equivalent adverse effects evaluation) for fire protection program changes which result in reliance on a multi-unit cross-tie capability for the purpose of meeting 10 CFR Part 50, Appendix R, Section III.G.2? If not, please identify what regulatory tool precludes the licensee from making such a change and how we have communicated this expectation to licensees.

No. 10 CFR 50.48 states that "**Each** operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of appendix A of this part" (emphasis added to "each"). The regulations are applied to each nuclear power plant or unit, and in the case of QCNPS each of the two units must individually comply with the regulations. With respect to 10 CFR Part 50, Appendix R, Section III.G.2, the regulation states in part:

"Except as provided for in paragraph G.3 of this section, where cables or equipment...of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided..."

Since the redundant trains of RHRSW system in one unit could be exposed to a single fire, the licensee is attempting to credit the non-fire affected unit's RHRSW system as being redundant to the fire affected unit's RHRSW system and vice versa. This does not satisfy the requirements of III.G.2 for a plant licensed to operate before January 1, 1979, because the redundant RHRSW system trains in the same unit are not free of fire damage.

The licensee's approach could be acceptable as an alternative shutdown method provided that the requirements of 10 CFR Part 50, Appendix R, Section III.G.3 and Section III.L are met for plants licensed to operate before January 1, 1979. Plants licensed to operate on or after January 1, 1979, must meet the requirements for alternative shutdown as described in their approved fire protection program. For the licensee's approach to be acceptable as an alternate shutdown method, there should be assurance that during all modes and alignments on one unit, the RHRSW system is

available to support fire safe shutdown of the opposite unit. Technical specification or Technical Requirements addressing availability of the opposite unit's RHRSW system should be in place to ensure that the RHRSW system is available.

7. With respect to the QCNPS NCV and licensee response, for the RHRSW system configuration, can the licensee rely upon the multi-unit cross-tie capability (previously relied upon for meeting 10 CFR Part 50, Appendix R, Section III.G.3), for the purpose of meeting 10 CFR Part 50, Appendix R, Section III.G.2?

No. In accordance with the answer to Question 6 above, neither unit at QCNPS can rely upon the multi-unit cross-tie capability to meet 10 CFR Part 50, Appendix R, Section III.G.2 unless an exemption request has been granted.

8. With respect to the QCNPS NCV and licensee response, does the licensee's position asserting compliance with 10 CFR Part 50, Appendix R, Section III.G.2, through reliance upon the multi-unit cross-tie capability, have merit and thereby warrant withdrawal of the NCV?

No. The licensee contended that the systems shared between units are redundant because the systems perform their design functions. Although the systems may perform their design function, 10 CFR Part 50, Appendix R applies to each unit individually as discussed in the response to Question 6. Therefore, the use of components from one unit to supply an adjacent, fire affected unit does not meet the requirement of 10 CFR Part 50, Appendix R, Section III.G.2.

4.0 CONCLUSION

Redundant trains of equipment required for safe shutdown that are in the same fire area must be separated in accordance with 10 CFR Part 50, Appendix R, Section III.G.2 or they must meet the requirements of 10 CFR Part 50, Appendix R, Section III.G.3. The condition of the operating license allows fire protection program changes within the scope of "no adverse affect" on safe shutdown capability so long as the regulatory requirements of 10 CFR 50.48, Criterion 3, and applicable sections of 10 CFR Part 50, Appendix R are met. Changes to plant systems can be made in accordance with 10 CFR 50.59. A change must comply with all of these requirements or receive prior NRC staff approval.

Each unit at QCNPS, licensed in 1972, must meet Section III.G.2 of 10 CFR Part 50, Appendix R, for their respective redundant trains or must satisfy the requirements of 10 CFR Part 50, Appendix R, Section III.G.3. Neither the SSMP or the RHRSW system changes made by the licensee satisfy 10 CFR Part 50, Appendix R, Section III.G.2. NRC staff agree that the QCNPS NCVs should not be withdrawn.

Principal Contributors: P. Qualls
A. Klein

Date: March 27, 2007