

November 19, 2001

MEMORANDUM TO: Geoffrey E. Grant, Director  
Division of Reactor Projects  
Region III

FROM: Ledyard B. Marsh, Acting Deputy Director */RA/*  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

SUBJECT: TASK INTERFACE AGREEMENT - TIA 2001-008, EVALUATION OF A  
CHANGE TO THE BYRON STATION DIESEL GENERATOR  
VENTILATION SYSTEM, PER 10 CFR 50.59 (TAC NOS. MB2593 AND  
MB2594)

## 1.0 INTRODUCTION

The Office of Nuclear Reactor Regulation (NRR) staff has reviewed your request for technical assistance, dated August 7, 2001. You were concerned that the licensee has made temporary modifications to the emergency diesel generator room ventilation system in response to a material condition problem with the outside air damper. You requested that NRR determine whether the licensee adequately assessed the substitution of manual operator actions for automatic actions and whether the modification should have required prior NRC approval. Based on our review of your request and supporting documentation, we have concluded that the licensee's analysis of suitability of operator actions was inadequate. Further, we have concluded that the modification should have been submitted to the NRC for approval prior to implementation.

## 2.0 BACKGROUND

The licensee modified the diesel generator (DG) room ventilation system and associated operating procedure in response to a problem with the material condition of the outside air dampers. Specifically, the air dampers did not seal tightly and allowed excessive leakage of cold air from the outside into the DG rooms. The cold air leakage into the rooms affected DG operability by challenging the minimum temperature requirements for the lube oil and jacket water systems, as well as other safety-related components located in the rooms. The "as needed" modification involved placing the affected DG room ventilation fan control switch to the "pull-to-lock" position to prevent its operation, placing a caution card on the control switch, and covering the ventilation outside air damper(s) with prefabricated plastic covers that were secured in place with tie-wraps. Prior to implementation of the modification, the licensee performed an evaluation per 10 CFR 50.59 to support an onsite review (OSR). The licensee originally revised the procedure in 1989 (OSR-223) to allow use of the covers, with manual restoration of the ventilation system. The licensee subsequently revised the procedure and 10 CFR 50.59 safety evaluation in 1997 to address some additional operator actions, such as securing the plastic cover (OSR 97-003). The operating procedure also provided instructions to return the DG room ventilation system to its normal configuration when environmental

conditions permit removal of the covers. The licensee's operating procedure did not specify any restrictions to prevent implementing this modification on all four DG room ventilation systems simultaneously.

In their August 7, 2001, TIA, Region III specifically requested that NRR determine whether:

- (1) the safety evaluation performed for OSR 97-003 adequately assessed the modification with respect to the substitution of manual operator actions for automatic actions.
- (2) the change required prior NRC approval in accordance with 10 CFR 50.59.

Regional and NRR staff discussed this issue during conference calls on May 8, and July 23, 2001.

### 3.0 REGULATORY BACKGROUND

In 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Section 50.59, "Changes, Tests, and Experiments," contains requirements for the process by which licensees may modify their facilities and procedures, as described in the final safety analysis report (FSAR), without prior NRC approval under certain conditions. The objectives of 10 CFR 50.59 are to ensure that licensees (1) evaluate proposed changes to their facilities to determine their effects on the plant's licensing basis, as described in the FSAR; and (2) obtain prior NRC approval for changes that meet specified criteria as having a potential impact upon the basis for issuing the operating license. Any changes that affect the plant's FSAR will require the licensee to perform a safety evaluation, in accordance with 10 CFR 50.59.

In Generic Letter (GL) 91-18, "Guidance on Resolution of Degraded and Nonconforming Conditions and on Operability," dated November 7, 1991, the NRC discussed the conditions under which manual actions may be substituted for automatic actions related to safety system operations.

Information Notice (IN) 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," dated October 23, 1997, alerted licensees to the importance of considering the effects on human performance of such changes made to plant safety systems:

The original design of nuclear power plant safety systems and their ability to respond to design-basis accidents are described in licensees' FSARs and were reviewed and approved by the NRC. Most safety systems are designed to rely on automatic system actuation to ensure that the safety systems are capable of carrying out their intended functions. In a few cases, limited operator actions, when appropriately justified, were approved. Proposed changes that substitute manual action for automatic system actuation or that modify existing operator actions, including operator response times, that were not reviewed and approved during the original licensing review of the plant, may raise the issue of an unreviewed safety question (USQ). Such changes must be evaluated under the criteria of 10 CFR 50.59 to determine whether a USQ is involved and whether

NRC's review and approval are required before implementation... In the NRC staff's experience, many of the changes involving operator actions proposed by licensees do involve a USQ.

In ANSI/ANS-58.8, "Time Response Design Criteria for Safety-Related Operator Actions," 1994, the American National Standards Institute (ANSI), and American Nuclear Society (ANS) define "safety-related operator action," as follows:

A manual action required by plant emergency procedures that is necessary to cause a safety-related system to perform its safety-related function during the course of any DBE [design-basis event].

IN 97-78 lists nine criteria as NRC review areas of the licensee analysis:

- (1) the specific operator actions required
- (2) the potentially harsh or inhospitable environmental conditions expected
- (3) a general discussion of the ingress/egress paths taken by the operators to accomplish functions
- (4) the procedural guidance for required actions
- (5) the specific operator training and operator qualifications needed to carry out actions
- (6) any additional support personnel and/or equipment that the operation requires to carry out actions
- (7) information that the control room staff requires to determine whether such operator action is needed, including qualified instrumentation used to diagnose the situation and to verify that the required action has successfully been taken
- (8) the ability to recover from credible errors in the performance of manual actions, and the expected time required to make such a recovery
- (9) consideration of the risk significance of the proposed operator actions.

More recently, the staff has further clarified its regulatory position with regard to 10 CFR 50.59. Specifically, the licensee's 10 CFR 50.59 safety evaluation may result in the identification of changes that require prior NRC review and approval because they result in more than a minimal increase in risk, as defined by one of the eight criteria of the newly revised 10 CFR 50.59(c)(2). One of the eight criteria is "would the activity result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC [a structure, system, or component] important to safety..." In most cases, a change would require prior NRC approval if it would substitute manual action for automatic action to perform design functions described in the plant's updated final safety analysis report (UFSAR). Revision 1 of Nuclear Energy Institute (NEI) Report 96-07, "Guidelines for 10 CFR 50.59 Implementation," dated November 2000, provides methods that are acceptable to the NRC staff for complying with the provisions of 10 CFR 50.59.

#### 4.0 EVALUATION AND DISCUSSION

##### 4.1 Adequacy of the Licensee's 10 CFR 50.59 Evaluation

The NRR staff's review of the licensee's analysis supports the Region III concern that the licensee did not address the consequences of operators failing to restore the DG room

ventilation system and non-conservatively assumed that operators would always be successful (i.e., success probability equal to one). Region III also noted that the restoration of the DG room ventilation system was not “uncomplicated” and required multiple operator actions. In the event of an emergency start of the DG, operators would first have to recognize the need to restore the DG room ventilation system, since the automatic function would be disabled. The recovery actions involve entering the ventilation plenum with the DG running, climbing to the outside air damper, cutting and removing tie-wraps that fasten the covers over the damper, removing the covers, and manually starting the ventilation fan. Operators must exercise caution when entering and exiting the plenum because a sudden pressure change can affect the operation of the turbo charger and result in inadvertent shutdown of the DG. (The DG turbo charger shares a common plenum with the ventilation system.) The ventilation plenum is a relatively small and poorly lit space, and the airflow in the plenum would be in excess of 20,000 standard cubic feet per minute. These factors create an adverse environment for the operators to work (e.g., high airflow, high noise, poor lighting, climbing a ladder). In addition, airflow at this rate could possibly suck items out of the operators’ hands and into the DG intake, and foreign materials sucked into the DG intake could render the DG inoperable. An error in performing any step or omission of any step could prevent successful restoration of the system and render the DG inoperable.

The NRR staff’s review of the licensee’s analysis supports the conclusion that the licensee’s 10 CFR 50.59 safety evaluation should have considered information such as the following factors, since manual actions were replacing an automatic action:

**(1) The specific operator actions required**

OSR 97-003 specifies the following required operator actions:

- Recognize decreasing room temperature or low temperature alarm conditions that indicate that DG operability may be impacted
- Place the affected ventilation damper (VD) system supply fan control switch in the “Pull-to-Lock” position in the control room
- Cover the affected system's outside air damper with a pre-fabricated cover
- Anchor the cover to the inlet screen on top of the outside air dampers with tie-wraps
- Document independent verification of the installation in the affected unit's NSO logs
- Place Caution cards on the affected supply fan control switch and the DG control switch.
- In the event of an emergency start of the affected DG, then, within 2 hours of the start demand, remove the cover over the outside air damper and return the control switch to "after trip" which will start the fan.

In the event of an emergency start of the affected DG, the recovery actions involve entering the ventilation plenum with the DG running (the DG turbo charger shares a common plenum with the ventilation system), climbing to the outside air damper, cutting and removing tie-wraps that fasten the covers over the damper, and removing the covers. Consequently, the NRR staff does not believe that the operator action list provided above is sufficient for the analysis.

The licensee also assumed that sufficient time would exist for operators to restore the ventilation system following a DG start signal before environmental conditions in the room would render the DG inoperable. (Restoration within 2 hours would ensure sustained DG operability.) The NRR staff does not believe that the licensee's analysis provides a sufficient discussion of operator action time. At a minimum, the licensee should discuss how it reached the conclusion that sufficient time would be available.

**(2) The potentially harsh or inhospitable environmental conditions expected**

The licensee's OSR 97-003 did not discuss this item.

Since the OSR did not address the poor light available in the room, high air flow, small room size, high noise level, and the need for operators to climb up a ladder, the staff considers the analysis to be inadequate.

**(3) A general discussion of the ingress/egress paths taken by the operators to accomplish functions**

The licensee's OSR 97-003 did not discuss this item.

Given that the operators must exercise caution when entering and exiting the plenum because a sudden pressure change could affect the operation of the turbo charger and could result in shutdown of the DG, the staff considers the analysis to be inadequate with respect to this item.

**(4) The procedural guidance for required actions**

The licensee stated that the required actions are controlled by an operating procedure, BOP VD-5, Revision 4, "DG Room Ventilation System Operation." This procedure provides instructions to return the DG room ventilation system to its normal configuration. In March 2001, the procedure was changed to delete steps that allowed plastic to be placed over failed dampers.

The specific procedural directions include a "caution" which states that if an emergency start signal is received for the affected DG, then dispatch an operator as soon as possible, and within two hours of the start demand, remove the cover over the outside air damper to ready the fan for operation. The specific procedural instructions for removing the cover just state -- "Remove the cover over the damper. Ensure all tie-wraps have been removed." The NRR staff does not believe that the licensee procedures are sufficient nor do they provide sufficient cautions.

**(5) The specific operator training necessary to carry out actions, including any unique operator qualifications required to carry out actions**

Training request TR#97-529 specifically covered diesel ventilation issues. No lesson plan was available for the training. However, all crews were trained during continuing licensed operator training on what needs to be operable in the VD system to maintain operability of the DGs. This training was conducted by June 18, 1987. The NRR staff did not review the specific training.

(6) **Any additional support personnel and/or equipment required by the operator to carry out actions**

The only piece of equipment that the OSR discussed was the plastic covers, which the licensee stores in an operations department storage cage in the turbine building. The OSR did not address ladders and other tools needed to return the DG ventilation system to its normal configuration. Therefore, the staff considers the analysis to be inadequate with respect to this item.

(7) **A description of information required by the control room staff to determine whether such operator action is required, including qualified instrumentation used to diagnose the situation and to verify that the required action has successfully been taken**

The OSR did not address the low temperature alarm or any other instrumentation that might be required. Therefore, the staff considers the analysis to be inadequate with respect to this item.

(8) **The ability to recover from credible errors in performance of manual actions, and the expected time required to make such a recovery**

The licensee's analysis did not address any actions that would be required in the event that the manual actions were not successful. Therefore, the staff considers the analysis to be inadequate with respect to this item.

(9) **Consideration of the risk significance of the proposed operator actions**

The licensee did consider the risk if the plastic were to become dislodged and cover the combustion air intake for the DG. However, the licensee did not consider other risks such as the failure to complete the task of cover removal or the effect of tools or other material being drawn into the DG air intake. Therefore, the staff considers the analysis to be inadequate with respect to this item.

In addition, the staff considered this situation in the context of guidance given in GL 91-18, Revision 1, with respect to applicability of 10 CFR 50.59 requirements to compensatory measures in response to degraded conditions. The problem with the dampers not properly sealing is a degraded condition that potentially affected operability. The guidance discusses examination of the compensatory action with respect to the 10 CFR 50.59 criteria before implementation, to see if the action itself meets any of the evaluation criteria. In this case, the actions taken involve putting the fans in "pull-to-lock" and placing covers over the dampers, as compensatory measures for the leaking dampers (and cold temperatures). These steps would render the diesel inoperable, if fans are not restored in sufficient time, or if debris were drawn into the diesel during the removal process. Thus, the conclusions about the adequacy of the evaluation would not be different if the situation were examined from this perspective.

#### 4.2 Need for Prior NRC Approval of the Proposed Change

The NRR staff concludes that the licensee's substitution of manual operator actions in place of automatic system actuation to recover the DG room ventilation system requires NRC review and approval before implementation because the change could potentially increase the probability of a malfunction of equipment that is important to safety as previously evaluated in the UFSAR. The staff further concludes that the change meets Criterion 4.3.2 of NEI 96-07 (does the activity result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety, p. 45) and is similar to example 7 of NEI 96-07 (page 48), which requires submittal to the NRC for approval.

Specifically, the staff determined that the proposed change required prior NRC approval because; (1) the plant now relies on operator intervention for effective performance of systems that are important to safety, (2) this reliance on human intervention potentially introduces unanalyzed failure modes caused by operator errors of omission or commission, and (3) the change increased the likelihood of malfunction of SSCs that are important to safety.

The staff considered whether the change would satisfy the evaluation criteria of the revised 10 CFR 50.59 (specifically, whether it resulted in "more than a minimal increase" in the likelihood of malfunction). For the reasons noted above, the regulatory guidance leads to the conclusion that the substituted manual action would, in fact, result in more than a minimal increase.

#### 5.0 CONCLUSION

The NRR staff noted that the licensee did not conduct a comprehensive 10 CFR 50.59 evaluation to support the change, failed to perform either a task analysis or walk-through, and did not consider the possibility of operator errors (of omission or commission) or the likelihood of recovering from such errors. Moreover, the staff concluded that the licensee did not provide adequate evidence to support its contention that 2 hours is sufficient operator response time to; (1) ensure accurate diagnosis of a transient that requires a DG to startup, (2) perform the required manual actions on up to four separate DGs, and (3) recover from potential operator errors.

The NRR staff also determined that the licensee did not sufficiently evaluate the proposed operator actions (such as the items summarized in IN 97-78). Therefore, the NRR staff concluded that the licensee did not have a documented basis for determining that the facility modification did not require prior NRC approval.

G. E. Grant

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As discussed in Section 4.2, the NRR staff has also concluded that the proposed change required NRC review prior to implementation.

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Docket Nos. STN 50-454 and STN 50-455

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