

May 15, 2000

MEMORANDUM TO: Arthur T. Howell III, Director  
Division of Reactor Safety  
Region IV

FROM: Suzanne Black, Deputy Director  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

SUBJECT: RESPONSE TO THE REGION IV TASK INTERFACE  
AGREEMENT OF NOVEMBER 3, 1999 (99TIA023) – ADEQUACY  
OF AUTOMATIC RESEQUENCING OF NONSAFETY  
ELECTRICAL LOADS TO THE CLASS 1E BUS AT WATERFORD  
STEAM ELECTRIC STATION, UNIT 3, (TAC NO. MA7122)

By letter dated November 3, 1999, subject as above, you discussed a potential design configuration problem with the Class 1E electrical circuitry at Waterford Steam Electric Station, Unit 3 (Waterford 3) operated by Entergy. Region IV determined that the licensee had violated 10 CFR 50.59 with respect to the design configuration and you requested that the Office of Nuclear Reactor Regulation (NRR) evaluate the technical adequacy of the installed design in order to determine the severity level of the violation. The issue is described below.

The Waterford 3 Updated Final Safety Analysis Report (UFSAR), Section 8.3.1, stated that nonsafety electrical loads were not automatically sequenced onto the Class 1E bus during a load sequence following a diesel generator start, and could only be reconnected manually under administrative control. The licensee determined that this statement was incorrect and initiated Engineering Request ER-W3-98-0936-00-00, "Evaluation of Discrepancy in UFSAR, Chapter 8, Section 8.3.1.1.2.13f and Table 8.3-1." Some nonsafety loads, including emergency lighting, compressors, and several nonsafety power distribution panels were configured to automatically reconnect to the Class 1E bus following a loss-of-offsite power event. Although these loads were listed in the UFSAR, Table 8.3-1, as being automatically sequenced to the Class 1E bus, they were not identified as being nonsafety related. The automatic sequencing of nonsafety loads to the Class 1E bus was identified by the licensee to be inconsistent with the intent of Regulatory Guide (RG) 1.75, "Physical Independence of Electric Systems," to which the licensee is committed.

Region IV has specifically requested that NRR provide a response to the following question - Is the licensee's installed electrical design, which, following a loss-of-offsite power event, automatically resequences several nonsafety loads to the Class 1E bus, acceptable?

The question was asked with the understanding that the determination, of whether the configuration would be found acceptable to the staff, was necessary in order to determine the severity level of the violation of 10 CFR 50.59. Since that time, the Office of Enforcement informed us that the acceptability of the change is no longer the determining factor in assessing severity level of violations of 10 CFR 50.59. Once a violation of 10 CFR 50.59 involving an

unreviewed safety question is determined to exist, the question of acceptability of the change will be determined through the licensee's submittal of a license amendment. In order to restore compliance for violations of 10 CFR 50.59 involving unreviewed safety questions licensees must either restore the "change" back to the approved configuration or submit a license amendment seeking approval of the change. Thus, it is unnecessary to attempt to determine whether an unapproved change is acceptable outside of the formal license amendment process.

The determination of severity level for 10 CFR 50.59 violations is now determined by assessing the actual and/or potential consequences of the underlying physical, procedural, or analytical change to the facility. Accordingly to determine the severity level of this violation, a risk assessment associated with the resequencing of the nonsafety-related loads must be performed.

However, prior to understanding this change in enforcement approach, the staff did perform an indepth analysis of the licensee's configuration and provides the following insights.

The staff believes that the automatic sequencing of non-safety-related loads that perform critical functions (emergency lighting, uninterrupted power supply for plant computer, emergency diesel generator (EDG) air compressor, etc.) to Class 1E buses is acceptable provided such sequencing will not have adverse impact on the EDG or the safety-related systems. However, the staff does have concerns with Waterford's specific configuration that need to be addressed through the license amendment process. These concerns are detailed in the enclosed Safety Evaluation.

Please see the enclosure for NRR's response.

Enclosure: As stated

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Please see the enclosure for NRR's response.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ADEQUACY OF AUTOMATIC SEQUENCING OF NON-SAFETY-RELATED

ELECTRICAL LOADS TO THE CLASS 1E BUS

WATERFORD STEAM ELECTRIC STATION, UNIT 3

REGION IV TASK INTERFACE AGREEMENT (99TIA023)

TAC NO. MA7122

1.0 BACKGROUND

During a recent inspection (NRC Inspection Report 50-382/99-15) of the 10 CFR 50.59 safety evaluation program at Waterford Steam Electric Station, Unit 3, an inspector identified a potential design configuration problem with the Class 1E electrical circuitry. The problem is associated with the automatic re-connection of several non-Class 1E loads (emergency lighting, uninterruptible power supply for plant computer, diesel generator air compressor, and several non-safety-related power distribution panels) to the emergency diesel generators (EDGs) following a loss-of-offsite-power (LOOP). The Updated Final Safety Analysis Report (UFSAR), Section 8.3.1, states that non-safety-related electrical loads were not automatically sequenced onto the Class 1E bus during a load sequence following a diesel generator start, and could only be reconnected manually under administrative control. The licensee identified that the automatic sequencing of non-safety-related loads to the Class 1E bus was inconsistent with the intent of Regulatory Guide (RG) 1.75, "Physical Independence of Electric Systems." RG 1.75, to which the licensee is committed, states the following:

[T]he susceptibility of non-Class 1E loads energized from redundant Class 1E power sources to design basis events (e.g., seismic events) could similarly threaten the redundant main circuit breakers. Tripping of the main circuit breakers would cause the loss of emergency power to redundant "divisions" of equipment. It is recognized that proper breaker or fuse coordination could prevent such an event. However, because the main breakers are in series with the fault and could experience momentary currents above their set points, it is prudent to preclude the use of interrupting devices actuated only by fault current as acceptable devices for isolating non-Class 1E circuits from Class 1E or associated circuits.

The uninterruptible power supply (UPS) for the plant computer was isolated from the Class 1E bus by only one Class 1E protective device (a circuit breaker). The other non-safety-related loads (according to statements from licensee representatives) were isolated from the Class 1E bus by at least two Class 1E protective devices. The licensee's review, therefore, was centered on the UPS configuration.

In its review, the licensee concluded that an unreviewed safety question did not exist, principally because the UPS, though not seismically or environmentally qualified, was of inherently rugged design and that the non-Class 1E circuit breaker within the UPS provided additional circuit isolation. The evaluation stated that the information available from the plant computer for mitigating the consequences of an event outweighed the risk associated with automatically sequencing this load to the power source. The licensee decided to make no changes to the existing installed design and processed a change to correct the UFSAR under the provisions of 10 CFR 50.59.

It appears that this design feature is not typical, in that few, if any, other cases are known to the Region in which the Nuclear Regulatory Commission (NRC) has licensed plants with Class 1E electrical buses that are designed to accept automatic sequencing of several non-safety loads.

In NRC Inspection Report 50-382/99-15, the issue of compliance to 10 CFR 50.59 requirements and the technical issue of whether the change would have been approved, if submitted, was identified as an unresolved item, pending further review by the NRC. The Region paneled the compliance issue and determined that a violation of 10 CFR 50.59 exists, because the licensee implemented a change involving an unreviewed safety question without prior NRC approval. The panel considered the change to be an unreviewed safety question because it increased the probability of a malfunction of the Class 1E bus beyond that previously evaluated in the UFSAR.

## 2.0 EVALUATION

The NRR staff agrees with the Region that the design feature of automatic sequencing of several non-safety-related loads to EDG is unique. The staff is not aware of any other plants having similar design features. In most cases, the important non-safety loads are added manually to the EDG by administrative controls after 30 minutes.

The staff believes that the automatic sequencing of non-safety-related loads that perform critical functions (emergency lighting, UPS for plant computer, EDG air compressor, etc.) to Class 1E buses is acceptable provided such sequencing will not have adverse impact on the EDG or the safety-related system. However, the staff does have the following concerns with Waterford's specific configuration that need to be addressed through the license amendment process.

- a. The analyses should verify that the automatic sequencing of the non-safety-related loads does not have an adverse impact on the EDG (momentary and steady state). The steady-state kW and kVAR demands of the non-safety loads on the EDG should be based on trip setting (including the tolerances) of the protective device for the loads rather than the actual calculated load demands so that the EDG has adequate capacity to support high impedance faults or overloads.
- b. The non-safety-related loads should be provided with two Class 1E protective devices in series such that the failure of one protective device will not degrade the safety-related systems.
- c. The non-safety-related loads should have complete protection (from overload to maximum short circuits) and be properly coordinated.

- d. The protective device for the non-safety-related loads should have fast fault clearing characteristics so that the EDG will not be degraded to support the fault.
- e. The EDG surveillance testing per technical specifications should verify EDG operation with auto-connected loads (shutdown and non-safety loads) for LOOP and LOOP with loss-of-coolant accident.

### 3.0 CONCLUSION

Once a violation of 10 CFR 50.59 involving an unreviewed safety question is determined to exist, the question of acceptability of the change will be determined through the licensee's submittal of a license amendment. In order to restore compliance for violations of 10 CFR 50.59 involving unreviewed safety questions, licensees should either restore the "change" back to the approved configuration or submit a license amendment seeking approval of the change. Thus, it is unnecessary to attempt to determine whether an unapproved change is acceptable outside of the formal license amendment process.

The determination of severity level for 10 CFR 50.59 violations is now determined by assessing the actual and/or potential consequences of the underlying physical, procedural, or analytical change to the facility. Accordingly to determine the severity level of this violation, a risk assessment associated with the resequencing of the nonsafety-related loads must be performed.

In summary, although we conclude that automatic sequencing of non-safety loads can be acceptable, based on the available information, the staff has concerns with the licensee's installed design that need to be addressed through the license amendment process.

Principal Contributor: Amar Pal

Date: May 15, 2000