



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20543-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON THREE EMERGENCY ACTION LEVELS CHANGES FOR

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

1.0 INTRODUCTION

By letter dated June 10, 1998, Florida Power Corporation (the licensee) submitted proposed changes to three emergency action levels (EALs) for the Crystal River Unit 3 plant. The licensee stated in its letter that the proposed changes were based upon an extensive review of the current EALs and U.S. Nuclear Regulatory Commission (NRC) inspector comments contained in Inspection Report 97-17. The licensee further stated that the proposed EALs remain in accordance with guidance of NUREG-0654/FEMA-REP-1 and were designed to improve consistency in the EAL scheme, decrease the possibility of misinterpretations, and reduce excessive conservatism.

In its transmittal, the licensee also indicated that the proposed changes were reviewed and received concurrence from representatives of the State of Florida Division of Emergency Management; the State of Florida Department of Health, Bureau of Radiation Control; the Citrus County Sheriff's Office, Division of Emergency Management; and the Levy County Department of Emergency Management in a meeting held on February 11, 1998.

The staff held a telephone conference with the licensee on October 21, 1998, to clarify some issues.

2.0 REGULATORY BACKGROUND

10 CFR 50.47(b)(4) states, in part: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee ...."

Appendix E, Subsection IV.B, states, in part: "... These emergency action levels shall be discussed and agreed on by the applicant and State and local governmental authorities and approved by the NRC ...." (Emphasis added).

Appendix E, Subsection IV.C, states, in part: "... Emergency action levels (based not only on onsite and offsite radiation monitoring information but also on readings from a number of sensors that indicate a potential emergency, such as pressure in the containment and

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sensors that indicate a potential emergency, such as pressure in the containment and response of the Emergency Core Cooling System) for notification of offsite agencies shall be described ... The emergency classes defined shall include (1) notification of unusual events, (2) alert, (3) site area emergency, and (4) general emergency ..."

Regulatory Guide 1.101, Revision 2, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" as an acceptable method for licensees to meet the requirements of 10 CFR 50.47 (b)(4) and Appendix E to 10 CFR Part 50. NUREG-0654/FEMA-REP-1 provides example initiating conditions for development of EALs.

### 3.0 EVALUATION

Crystal River's EALs scheme follows the guidance in NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants." NUREG-0654/FEMA-REP-1 was endorsed by the staff in Regulatory Guide 1.101, Revision 2 as an acceptable method for meeting the requirements of 10 CFR Part 50.47(b)(4) and Appendix E to 10 CFR Part 50.

The licensee proposes three EAL changes. The NRC evaluation of these changes is presented below:

#### 1. Modified EALs regarding Fire within the Protected Area

The current Crystal River EALs for this condition are:

**Unusual Event:**

> 10 minute duration

**Alert:**

Potentially affecting safety-related systems > 10 minute duration

**Site Area Emergency:**

Compromising the function of safety-related system (inability to shut down unit or extinguish fire).

The proposed EALs changes are:

**Unusual Event:**

> 10 minute duration (no change)

**Alert:**

Potentially affecting safe shutdown equipment > 10 minute duration

**Site Area Emergency:**

Compromising the function of safe shutdown equipment (inability to shut down unit or extinguish fire).

Analysis

NUREG-0654/FEMA-REP-1 provides the following Initiating Conditions (ICs):

**Unusual Event:**

Fire within the plant lasting more than 10 minutes

**Alert:**

Fire potentially affecting safety systems

**Site Area Emergency:**

Fire compromising the function of safety systems.

The licensee cites two reasons for the change: (1) for this application, the term "safety-related systems" is too broad and vague and can lead to inconsistent interpretation, and (2) by revising the term "safety-related systems" to "safe shutdown equipment" in the "Fire" EALs, it will be consistent with the terminology for "Missile Impact" and "Severe Explosions" EALs. Since these changes will improve internal consistency between EALs and reduce the potential for misinterpretation, the NRC considers these changes acceptable.

**2. Modified IC regarding the Loss of Main and Emergency Feedwater and modified EAL regarding the Loss of off-site power AND all on-site AC power**

The current Crystal River ICs and EALs for these conditions are:

CONDITION	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
Loss of Main and Emergency Feedwater	X HPI Available		X No core cooling available for > 20 min.	X No core cooling available with core damage imminent
Loss of off-site power AND all on-site AC power		X <= 15 min.	X > 15 min.	X No EFW > 3 hrs.

The proposed IC and EAL changes are (indicated in bold):

CONDITION	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
<b>Loss of Main, Emergency and Auxiliary Feedwater</b>	X HPI Available		X No core cooling available for > 20 min.	X No core cooling available with core damage imminent
Loss of off-site power AND all on-site AC power		X <= 15 min.	X > 15 min.	X <b>No Emergency or Auxiliary Feedwater &gt; 3 hrs.</b>

## Analysis

NUREG-0654/FEMA-REP-1 provides the following Initiating Conditions (ICs):

### **Alert:**

Loss of offsite power and loss of all onsite AC power (see Site Area Emergency for extended loss)

### **Site Area Emergency:**

Loss of offsite power and loss of all onsite AC power for more than 15 minutes

### **General Emergency:**

Transient initiated by loss of feedwater and condensate systems (principal heat removal system) followed by failure of emergency feedwater system for extended period. Core melting possible in several hours. Ultimate failure of containment likely if core melts

or

Failure of offsite and onsite power along with total loss of emergency feedwater makeup capability for several hours Would lead to eventual core melt and likely failure of containment

The licensee justifies the changes to the IC and associated EAL (indicated in bold in the previous table) based on the availability of Auxiliary Feedwater, which can provide mitigative action in the event of the loss of Main and Emergency Feedwater. Auxiliary Feedwater provides core cooling through heat transfer to the steam generators.

Because Auxiliary Feedwater continues to be available to provide for core cooling, the NRC considers it appropriate to change the IC to include Auxiliary Feedwater, since solely the loss of Main and Emergency Feedwater does not constitute a "*condition where either the potential exists for a radiological emergency, or such an emergency has occurred*" (which corresponds to the general definition of an IC).

Concerning the EAL change related to the loss of off-site power IC, it is overly conservative, given a loss of off-site power event, to declare a General Emergency based only on the loss of Emergency Feedwater when Auxiliary Feedwater is available. Adding Auxiliary Feedwater to the EAL makes it consistent with the NUREG-0654/FEMA-REP-1 corresponding IC, which is "*Failure of offsite and onsite power along with total loss of emergency feedwater makeup capability*." Therefore, the NRC considers it acceptable to add Auxiliary Feedwater to the EAL.

### **3. Combination of the "Steam Generator Tube Leak" IC and the "Rupture of Steam Generator Tube With Loss of Off-site Power" IC**

The current Crystal River ICs and EALs for these conditions are:

CONDITION	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY
Steam Generator Tube Leak	X >1.0 to <= 50 gpm	X > 50 to 200 gpm	X > 200 gpm
Rupture of steam generator tube with loss of off-site power		X <= 200 gpm	X > 200 gpm

The proposed ICs and EALs changes are:

CONDITION	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY
Steam Generator Tube Leak	>1.0 gpm	X Tube leakage requiring one or more HPI injection valves to maintain RCS inventory	X a. <u>Or</u> b. a. Tube leakage results in loss of subcooling margin <u>OR</u> b. Tube leakage requiring one or more HPI injection valves to maintain RCS inventory <u>and</u> loss of off-site power

### Analysis

NUREG-0654/FEMA-REP-1 provides the following Initiating Conditions:

#### **Unusual Event:**

Exceeding either primary/secondary leak rate technical specification or primary system leak rate technical specification

#### **Alert:**

Primary coolant leak rate greater than 50 gpm

or

Rapid gross failure of one steam generator tube with loss of offsite power

or

Rapid failure of steam generator tubes (e.g., several hundred gpm primary to secondary leak rate)

#### **Site Area Emergency:**

Rapid failure of steam generator tubes (several hundred gpm leakage) with loss of offsite power

### Unusual Event:

The proposed EAL reduces the overly conservative EAL. The proposed EAL for an Unusual Event would raise the leak rate from the range of 1.0 to approximately 100 gpm (normal makeup flow), in contrast to a leak rate value of 1.0 to 50 gpm. In the current EAL scheme, a very small tube generator tube leak (a few gpm) occurring concurrently with a loss of off-site power would trigger an Alert, which is lower than the threshold values in NUREG-0654 for an Alert. With the proposed EAL, the emergency classification would be an Unusual Event as long as the leak does not require one or more HPI injection valves to maintain RCS inventory (i.e., the leak does not exceed approximately 100 gpm, which is the normal makeup flow). The proposed change is acceptable.

### Alert:

The licensee proposes to combine the two existing EALs corresponding to the Alert into one single EAL. This proposed change is designed to reduce the overly conservative EALs regarding small leaks. In the proposed scheme, an Alert would be declared for "tube leakage requiring one or more HPI injection valves to maintain RCS inventory" (i.e., greater than approximately 100 gpm, which is the normal makeup flow). Currently, an Alert is declared for a leak rate value in the range of 50 to 200 gpm (with off-site power available) and in the range of 1.0 to 200 gpm (with loss of off-site power). Under the current EAL scheme, given the RCS makeup capability, a very small tube generator tube leak (a few gpm) occurring concurrently with a loss of off-site power would trigger an Alert, even if it posed no threat to the plant. With the proposed EAL, an Alert would only be declared for "tube leakage requiring one or more HPI injection valves to maintain RCS inventory" (i.e., greater than approximately 100 gpm, which is the normal makeup flow), whether or not off-site power is available.

The proposed EAL scheme does not reflect the NUREG-0654 guidance that differentiates between a "*Rapid gross failure of one steam generator tube with loss of offsite power*" and a "*Rapid failure of steam generator tubes (e.g., several hundred gpm primary to secondary leak rate)*" (the current EAL does). Nevertheless, the proposed EAL meets the underlying objective of NUREG-0654, which is to declare an Alert for an "*actual or potential substantial degradation of the level of safety of the plant.*" A substantial degradation of the level of safety of the plant could only exist if the primary-to-secondary leak was such that RCS liquid inventory could not be maintained by normal operation of the Chemical and Volume Control System. The proposed change is acceptable.

### Site Area Emergency:

The current EAL corresponding to a steam generator tube rupture (SGTR) with off-site power available is conservative relative to the NUREG-0654 EAL scheme. NUREG-0654 does not provide for an SAE [site area emergency] declaration based only on a SGTR. It is based on a SGTR concurrent with a loss of off-site power. However, the current EAL threshold, calling for an SAE for leakage greater than 200 gpm, is conservative and may not meet the NUREG-0654 definition of an SAE ("*actual or likely major failures of plant functions needed for protection of the public*"). The licensee proposes to change the EAL by specifically introducing the state of the "*plant functions needed for protection of the public,*" namely core cooling (instead of basing the emergency declaration on a specific leak rate). In addition, in a

telephone conference with the NRC held on October 21, 1998, the licensee indicated that the "subcooling margin" is easily available to the operators on computer monitors in the control room. Furthermore, the determination of "subcooling margin" is straight forward and does not require calculations; it would expedite the recognition of an emergency. In contrast, the determination of the primary to secondary leak rate would require calculations, is slower and more difficult to assess, and could delay declaration. The proposed change reduces the overly conservative EAL, is consistent with the NUREG-0654 definition of an SAE, and expedites declaration of an emergency. The proposed change is acceptable.

The proposed EAL corresponding to the steam generator tube rupture with loss of off-site power is also more conservative than the current EAL. The proposed EAL would call for a SAE for "tube leakage requiring one or more HPI injection valves to maintain RCS inventory" (this translates into a leak rate greater than approximately 100 gpm), while the current EAL has a threshold leak rate of 200 gpm. However, the proposed EAL would make the licensee's EAL scheme more consistent with NUREG-0654. The EAL to classify and declare a SAE would be the same as that for an Alert (namely, "Tube leakage requiring one or more HPI injection valves to maintain RCS inventory") with the additional requirement of loss of off-site power. The proposed change is acceptable.

#### 4.0 CONCLUSION

The proposed EAL changes for the Crystal River Unit 3 plant are generally consistent with the guidance in NUREG-0654/FEMA-REP-1. The licensee has stated that these changes were discussed and agreed upon with the appropriate offsite agencies. Departures from the guidance were identified and reviewed; and the staff determined that the changes meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

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