



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
OF THE EMERGENCY ACTION LEVEL CHANGES  
FOR  
IES UTILITIES INC.  
CENTRAL IOWA POWER COOPERATIVE  
CORN BELT POWER COOPERATIVE  
DUANE ARNOLD ENERGY CENTER  
DOCKET NO. 50-331

1.0 INTRODUCTION

By letter dated September 15, 1995, as supplemented by letters dated September 23, 1996, January 16, 1997, and March 28, 1997, IES Utilities Inc. (the licensee) proposed changes to the Duane Arnold Energy Center's (DAEC) emergency action levels (EALs) to implement the guidance in NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels," Revision 2, dated January 1992. The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 BACKGROUND

The proposed revision to the DAEC EALs was reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

In accordance with 10 CFR 50.47(b)(4), onsite emergency plans must meet the following standard: "A standard 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 (IV)(C) specifies that, "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 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."

In Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," the NRC endorsed NUMARC/NESP-007, Revision 2,

ENCLOSURE

"Methodology for Development of Emergency Action Levels," 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. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of the DAEC EAL changes.

### 3.0 EVALUATION

This evaluation pertains to the EALs included in page 1 of Revision 2 to the DAEC Emergency Plan Implementing Procedure EPIP-1.1, "Determination of Emergency Action Levels." The technical basis for these EALs was provided in Revision 2 to the DAEC EAL Technical Basis Document. These documents were submitted to the NRC in a letter dated January 16, 1997, which also included responses to NRC concerns on early versions of the proposed EALs. In addition, this evaluation pertains to minor changes to the EALs that were provided to the NRC in a letter dated March 28, 1997.

A majority of the proposed EALs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of the licensee's justification for these variations, as discussed below, found the variations to be acceptable.

#### Deviation #1 Basis for Alert Level Radiation Monitor EAL

The setpoints for the licensee's Alert level gaseous effluent radiation monitor EALs are based upon 50 times technical specification levels rather than the 200 times technical specification levels specified in the NUMARC/NESP-007 guidance. This deviation allows for a logical step progression in monitor setpoints from the Alert radiation monitor setpoints to the Site Area Emergency EAL radiation monitor setpoints. The licensee's EAL setpoints are indicative of a significant loss of control of radioactive material which is the basis for this NUMARC/NESP-007 EAL. Therefore, this deviation is acceptable.

#### Deviation #2 Removal of Main Steam Line Break EAL from the Fission Product Barrier Table

The DAEC EAL scheme did not include the following EAL which corresponds to a potential loss of reactor coolant system (RCS) barrier in the NUMARC/NESP-007 fission product barrier matrix.

*(Site-Specific) indication of main steam line break.*

Subsequent to development of the NUMARC/NESP-007 guidance, questions were raised as to whether this EAL should be included in the fission product barrier (FPB) matrix. NUMARC's response to these questions was: "This condition (main steam line break) should be removed from the FPB chart, but must still be classified under system failures due to the probable offsite dose release from the puff release." The staff endorsed this position in a letter to NUMARC dated June 10, 1993.

The licensee followed this guidance and included the following Unusual Event EAL under the System Malfunction Category:

*SU5 Main steam line break as determined from annunciators or plant personnel report.*

In the DAEC basis document, the licensee states that, "because this event (main steam line break) at DAEC has dose consequences similar to those of AU1, Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 2 Times Radiological Technical Specifications for 60 Minutes or longer, it has been added as an Unusual Event EAL ...."

This deviation from the NUMARC/NESP-007 guidance is acceptable.

Deviation #3 Modification of Drywell Pressure Setpoint for the Potential Loss of the RCS barrier EAL

The NUMARC/NESP-007 EAL for the potential loss of the RCS barrier based on drywell pressure indications is:

*Pressure greater than (site-specific) psig.*

The NUMARC/NESP-007 basis for this EAL is:

*The (site-specific) drywell pressure is based on the drywell high pressure alarm setpoint and indicates a LOCA. A higher value may be used if supporting documentation is provided that indicates the chosen value is less than the pressure that would be reached for a 50 gpm Reactor Coolant System leak.*

The corresponding DAEC EAL is:

*Drywell pressure above 2 psig and not caused by a loss of DW cooling.*

The licensee states that there is no significant deviation from the generic indicator. The (site-specific) value for this loss indicator corresponds to the drywell high pressure emergency core cooling system initiation signal setpoint of 2.0 psig. Furthermore, the licensee states that the high pressure alarm setpoint of 1.5 psig was not selected, because it is too close to the normal operating pressure band, and could be exceeded for reasons other than an RCS leak. Lastly, the licensee states that analysis at DAEC shows that a 50 gpm leak would result in a 2 to 3 psig pressure rise over a 6 minute time period.

This deviation from the NUMARC/NESP-007 guidance is acceptable.

Deviation #4 Modification of Reactor Pressure Vessel Water Level Setpoint for the Potential Loss of the Containment Barrier EAL

The NUMARC/NESP-007 EAL for the potential loss of the containment barrier based on reactor pressure vessel water level is:

*Reactor vessel water level LESS THAN (site-specific) value and the maximum core uncover time limit is in the UNSAFE region.*

The corresponding DAEC EAL is:

*RPV level below -40 inches.*

The licensee states that -40 inches RPV water corresponds to the Minimum Zero-Injection Water level which is defined to be the lowest RPV water level at which the covered portion of the reactor core will generate sufficient steam to preclude any fuel clad temperature in the uncovered portion of the core from exceeding 1800 °F. Therefore, if RPV water level was below -40 inches, it should be assumed that severe core melt is imminent. This is consistent with the basis for the corresponding NUMARC/NESP-007 EAL and, therefore, is acceptable.

Deviation #5 Classification of Site Area Emergency Based upon Fission Product Barrier Status

The NUMARC/NESP-007 EAL methodology includes a fission product barrier matrix for determining whether or not a barrier (fuel clad, reactor coolant system, or containment) is lost or potentially lost and for classifying events based on the combination of lost or potentially lost barriers. The fission product barrier matrix provides multiple indications to operators for assessing the status of each of the barriers.

Classification of an event is made by determining the combination of barriers that have either been lost or potentially lost. The NUMARC/NESP-007 guidance specifies that the following combination of barriers is indicative of a Site Area Emergency.

*Loss of BOTH fuel clad and RCS,*

*OR*

*Potential loss of BOTH fuel clad and RCS,*

*OR*

*Potential loss of EITHER fuel clad OR RCS, and loss of ANY additional barrier.*

The DAEC EAL scheme also contains a fission product barrier matrix. However, the DAEC EAL scheme defines the combination of barriers that is indicative of a Site Area Emergency differently than the NUMARC/NESP-007 guidance. The combination of barriers specified in the DAEC EAL scheme for the Site Area Emergency is:

*Loss or potential loss of any two barriers.*

The DAEC EAL basis document explains that using this combination of barriers makes the classification easier to understand. In addition, the licensee's review of the possible combinations of fission product barrier EALs indicated

that the DAEC EAL scheme would result in the same event classification as the NUMARC/NESP-007 scheme. Therefore, this deviation from the NUMARC/NESP-007 guidance is acceptable.

Deviation #6 Increased Time in Control Room Evacuation EAL for Establishing Control from Remote Shutdown Panel

NUMARC/NESP-007 IC HS2 includes the following EAL:

1. *The following conditions exist:*
  - a. *Control room evacuation has been initiated,*  
*AND*
  - b. *Control of the plant cannot be established per (site-specific) procedure within (site-specific) minutes.*

The corresponding DAEC EAL is:

*HS2 Control room has been evacuated AND control of plant from Remote Shutdown Panel IC388 NOT established within 20 minutes.*

The NUMARC/NESP-007 guidance specifies that the time to establish control used in this EAL should not exceed 15 minutes. The DAEC EAL deviates from the NUMARC/NESP-007 guidance by specifying 20 minutes for establishing plant control. The licensee states that there are satellite panels associated with the remote shutdown panel and that it is not possible to fully line up all the required switches in less than 15 minutes. Furthermore, the licensee states that its analyses show that operator control within 20 minutes would not impact the integrity of the fuel clad, reactor vessel, or primary containment. This deviation from the NUMARC/NESP-007 guidance is acceptable.

Deviation #7 No Specific Threshold for Loss of Power EAL

NUMARC/NESP-007 IC SU1 and its associated EALs are:

*Loss of all offsite power to essential busses for greater than 15 minutes.*

*The following conditions exist:*

- a. *Loss of power to (site-specific) transformers for greater than 15 minutes,*  
*AND*
- b. *At least (site-specific) emergency generators are supplying power to emergency buses.*

The corresponding DAEC EAL is:

*Loss of offsite power lasting more than 15 minutes.*

The licensee did not include specific combinations of transformers for this loss of power EAL. The licensee states that the DAEC EAL is consistent with their Operations Department terminology for the conditions of SU1 and that the use of the NUMARC/NESP-007 conditions would be less clear to the operators at DAEC. The licensee's EAL meets the intent of the NUMARC/NESP-007 EAL and, therefore, is acceptable.

Deviation #8 Addition of Boron Injection Condition in the Site Area Emergency ATWS EAL

NUMARC/NESP-007 IC SS2 and its associated EAL are:

*SS2 Failure of Reactor Protection System instrumentation to complete or initiate an automatic reactor scram once a Reactor Protection System setpoint has been exceeded and manual scram was NOT successful (POWER OPERATION)*

- *(Site-specific) indications exist that automatic and manual scram were not successful.*

The corresponding DAEC EAL is:

*Failure of automatic and manual scram,  
AND  
Power remains above 5%,  
OR  
Boron injection required.*

The licensee states that its EAL equates to the condition where automatic and manual scrams are not considered successful and the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. The NUMARC/NESP-007 basis for this EAL is: "Automatic and manual scram are not considered successful if action away from the reactor control console was required to scram the reactor. Under these conditions the reactor is producing more heat than the maximum decay heat load for which safety systems are designed." The DAEC EAL is consistent with the intent of the NUMARC/NESP-007 guidance and, therefore, is acceptable.

Site-Specific Addition #1 Dose Assessment Unusual Event EAL

The licensee's EAL scheme includes the following Unusual Event EAL based upon dose assessment results:

*Dose assessment determines hourly dose outside the site boundary above 0.1 mrem TEDE.*

The NUMARC/NESP-007 guidance did not provide for this EAL, but did provide for an EAL based upon "automatic real-time dose assessment capability." This site-specific EAL is similar to the automatic real-time dose assessment EAL provided for in the NUMARC/NESP-007 guidance and, therefore, is acceptable. A similar EAL was added at the Alert classification level. This deviation is also acceptable.

Site-Specific Addition #2 Field Survey Alert EAL

The licensee's EAL scheme includes the following Alert EAL based upon field survey results.

*Valid field survey reading outside the site boundary >10 mR/hr or >50 mR/hr thyroid.*

The NUMARC/NESP-007 guidance did not specify this EAL, but did provide for an EAL based upon "a valid reading on perimeter radiation monitor system greater than 10.0 mR/hr." This site-specific EAL is similar to the perimeter radiation monitor system EAL specified in the NUMARC/NESP-007 guidance and, therefore, is acceptable.

Site-Specific Addition #3 Core Damage Assessment EAL

The DAEC EAL scheme included the following EAL as a site-specific indication of the fuel clad barrier loss:

*Core damage assessment determines at least 5% fuel clad damage.*

This EAL is consistent the other loss of the fuel clad barrier EALs and provides an additional method for determining the status of the fuel clad barrier. The addition of this EAL is acceptable. A similar EAL was added for the potential loss of the containment barrier and is also acceptable.

Site-Specific Addition #4 Natural and Destruction Phenomena EALs

NUMARC/NESP-007 ICs HU1 and HA1 for natural and destructive phenomena include the EAL, "site-specific occurrences." The licensee added the following site-specific occurrence EALs.

HU1 (Unusual Event Classification Level)

- River level above 757 feet
- River level below 725 feet 6 inches
- Any area water level above Max Normal Operating Limit

HA1 (Alert Classification Level)

- River level above 767 feet
- River level below 724 feet 6 inches
- Water level above Max Normal Operating Limit in 2 or more areas AND reactor shutdown is required

These site-specific EALs meet the intent of the NUMARC/NESP-007 guidance and, therefore, are acceptable.

#### 4.0 CONCLUSION

The proposed EAL changes for DAEC are consistent with the guidance in NUMARC/NESP-007, with variations as identified and accepted in this review, and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: J. O'Brien

Date: