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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON REVISED EMERGENCY ACTION LEVELS FOR

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, and 3

DOCKET Nos. 50-259, 50-260, and 50-296

1.0 INTRODUCTION

By letter dated October 19, 1994, as supplemented by letter dated June 20, 1995, Tennessee Valley Authority (TVA, the licensee) proposed changes to the Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3 emergency action levels (EALs). Specifically, the licensee provided Appendix A to the TVA Nuclear Power Radiological Emergency Plan (REP), which included the initiating condition for event classes, applicable plant mode, and emergency action levels (EALs); Emergency Plan Implementing Procedure (EPIP-1), "Emergency Classification Procedure;" and technical basis documentation. These collectively describe how the proposed EALs incorporated the guidance in NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels", Revision 2, 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 Browns Ferry Nuclear Plant Units 1, 2, and 3 emergency action levels (EALs) was reviewed against the requirements in 10 CFR 50.47 (b)(4) and Appendix E to 10 CFR Part 50.

Section 10 CFR 50.47 (b)(4) specifies that 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, Subsection IV.B specifies in part that "...These emergency action levels shall be discussed and agreed on by the applicant and State and local governmental authorities..."

Appendix E, Subsection 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

ENCLOSURE

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, (NESP-007), "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 Browns Ferry Nuclear Power Plant Units 1, 2, and 3 EAL changes. Appendix A of the TVA Nuclear Power Radiological Emergency Plan described the BFN emergency event methodology.

3.0 EVALUATION

The licensee uses a system-based approach and provided a format and presentation consistent with the approach in developing the BFN Emergency Operating Instructions. An Event Classification Matrix is provided in EPIP-1 which organized 32 events in the EAL tables into 8 categories. The following are the eight EAL categories:

Category 1.0	Reactor
Category 2.0	Primary Containment
Category 3.0	Secondary Containment
Category 4.0	Radiation Release
Category 5.0	Loss of Power
Category 6.0	Hazards
Category 7.0	Natural Events
Category 8.0	Emergency Director Judgment

Each category is divided into two or more subcategories, titled with a brief statement of the NUMARC Initiating Condition (IC). For example: Category 1.0, Reactor, contained the following subcategories:

1.1 Water Level
1.2 Scram Failure
1.3 Reactor Coolant Activity
1.4 MSL/Offgas Radiation
1.5 Loss of Decay Heat Removal

Classification using Category 1.0 EALs is performed in accordance with a section of EPIP-1 entitled Reactor. The remainder of categories are listed and the classification of general emergency, site area emergency, alert, or unusual event would be made based upon the applicable event and descriptive emergency action levels. The applicable plant operation mode is specified for each classification level. Following the EAL description, a basis is provided to technically justify the plant specific format of the initiating condition and accompanying EALs. A large number of the proposed EALs for each of the barriers and ICs conform closely to the guidance. However, several of the licensee's proposed EALs depart from the ICs and example EALs in

NUMARC/NESP-007. Review of the licensee justification for these deviations, as discussed below, found the deviations to be acceptable.

1. NUMARC example EALs AU1-3 and AU1-4 states:

   3. *Valid reading on perimeter radiation monitoring system greater than 0.10 mrem/hr above normal background for 60 minutes [for sites having telemetered perimeter monitors].*

   4. *Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].*

The licensee states that BFN does not currently possess a telemetered radiation monitoring system or real-time dose assessment capability and, therefore, does not include site-specific EALs for these examples. In that this EAL was included in the NUMARC NESP-007 for those plants which have such systems or capabilities and BFN does not have such systems or capabilities but does include EALs which specify use of field assessment at the site boundary, the omission of this EAL is acceptable. This comment also applies to the licensee's deviation from NUMARC example EALs AA1-3, AA1-4, AS1-2, and AG1-2.

2. The NUMARC criteria (1 or 2 or 3 or 4), applicable to all operating modes, for AU2 state:

   1. *(Site-specific) indication of uncontrolled water level decrease in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water.*

   2. *Uncontrolled water level decrease in the spent fuel pool and fuel transfer canal with all irradiated fuel assemblies remaining covered by water.*

   3. *(Site-specific) radiation reading for irradiated spent fuel in dry storage.*

   4. *Valid Direct Area Radiation Monitor readings increases by a factor of 1000 over normal* levels.*

   **Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.*

The equivalent BFN IC and EALs (UE, 1.1-U1; 1.1-U2) for the NUMARC IC and EALs AU2-1 and AU2-2 state:

Uncontrolled water level in Reactor Cavity with irradiated fuel assemblies expected to remain covered by water.

OPERATING CONDITIONS:
- Refueling
Uncontrolled water level in Spent Fuel Pool with fuel assemblies expected to remain covered by water.

OPERATING CONDITIONS:
- ALL

The equivalent BFN IC and EAL (UE, 6.1-U) for NUMARC EAL AU2-4 states:

VALID unexplained increase in any in plant ARM reading up to 1000 mrem/hr (except TIP Room)

OPERATING CONDITIONS:
- ALL

BFN applies EAL 1.1-U1 to refueling only. The deviation document states that this EAL is not applicable during other operating conditions due to the installation of the refuel cavity to spent fuel pool gates. For the deviation from NUMARC AU2-2, BFN does not have installed means for monitoring level, other than a ± 3-inch level change alarm, in the identified areas. Classification would not be based upon the alarm alone. An additional aid is indication of increasing radiation levels. This comment also applies to the licensee's deviation from NUMARC example EAL AA2 which is discussed further below. BFN indicates it does not have an equivalent EAL for NUMARC AU2-3 because it does not maintain dry storage. BFN deviation from NUMARC EAL AU2-4 is because BFN instruments contain an internal source which maintain a minimum reading of 1 mrem/hr. Consequently, BFN does not continuously track normal background levels for all of the area radiation monitors and uses a fixed 1000 mrem/hr as recommended by the plant Radiological Controls Staff. Based upon the above discussion, these deviations are acceptable.

3. The NUMARC criteria for EALs AA2-1 and AA2-2 state:

Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.

1. A (site-specific set point) alarm on one or more of the following radiation monitors: (site-specific monitors)

   Refuel Floor Area Radiation Monitor
   Fuel Handling Building Ventilation Monitor
   Fuel Bridge Area Radiation Monitor

2. Report of visual observation of irradiated fuel uncovered

The licensee equivalent EAL states:

3.2-A Alert

Any of the following alarms on Panel 9-3:

RA-90-1A	*RA-90-250A*
RA-90-142A	*RA-90-140A*

AND

Confirmation by Refuel Floor personnel that irradiated fuel damage may have occurred.

BFN indicates that these alarms are not necessarily associated with irradiated fuel damage and that the added qualifying "AND" logic statement provides association. BFN states that personnel are stationed on the refuel floor whenever fuel handling is underway, a security post on the refuel floor is manned any time the reactor cavity is open and that the visual observation of irradiated fuel uncovered has been included in BFN EALs 1.1.A1 and 1.1.A2. Therefore, this deviation from the NUMARC guidance is acceptable.

4. The NUMARC example EAL SU4-1 states:

1. (Site-Specific) radiation monitor readings indicating fuel clad degradation greater than Technical Specification allowable limits.

BFN's equivalent IC and EAL (1.4-U) state:

Valid Main Steam Line Radiation HIGH Alarm, RA-90-135C

OR

Valid OG Pretreatment Radiation HIGH Alarm, RA-90-157A

BFN does not have a failed fuel monitor system and states that main steam line radiation HIGH or Offgas radiation HIGH is indicative of fuel cladding leakage. The presence of a valid alarm warrants declaration of the UE and consideration of other symptoms and event classifications for possible upgrade of the event based on fission product barrier loss. In that BFN also monitors fuel clad degradation through an established chemistry sampling program, this deviation from the NUMARC example is acceptable.

5. The NUMARC criteria specify an EAL for Drywell Pressure loss:

Drywell pressure response not consistent with LOCA conditions.

BFN does not include an EAL directly relating to the NUMARC example. BFN indicates that this is due to the difficulty in relating pressure trend to a specific amount of RCS leakage. RCS leakage combined with loss of primary containment is covered in BFN EALs 3.1-S and 3.2-S. This deviation from the NUMARC guidance is acceptable.

6. The NUMARC criteria for EAL HA1-3 and HA1-4 state:

3. Report of any visible structural damage on any of the following plant structures:

Reactor Building
Intake Building
Ultimate Heat Sink
Refueling Water Storage Tank
Diesel Generator Building

Turbine Building
Condensate Storage Tank
Control Room

4. Other (site-specific) Structures.

BFN indicates it does not use a specific EAL for each of the plant structures in this example but covers them in various BFN EALs such as 6.3-A, 6.4-A, 7.1-A, 7.2-A, and 7.3-A. This deviation from the NUMARC guidance is acceptable.

7. The NUMARC criteria for IC SA3 state:

SA3 Inability to Maintain Plant in Cold Shutdown.

1. The following conditions exist:

a. Loss of (site-specific) Technical Specification required functions to maintain cold shutdown

AND

b. Temperature increase that either:

- *Exceeds Technical Specification cold shutdown temperature limit*

OR

- *Results in uncontrolled temperature rise approaching cold shutdown technical specification limit.*

BFN's equivalent EAL states:

1.5-A Alert

Reactor moderator temperature CANNOT be maintained below 212 °F whenever Technical Specifications require cold conditions or during refueling.

The example NUMARC EAL requires site-specific identification of the Technical Specification functions necessary to maintain cold shutdown and provides an anticipatory concern with controlled temperature rise. BFN primary means of maintaining cold shutdown is not a Technical Specification function. Additionally, BFN defines the phrase "cannot be maintained below" and that definition includes anticipatory wording. This deviation from the NUMARC guidance is acceptable.

8. The NUMARC criteria for EAL SU5-1 state:

1. The following conditions exist:

a. Unidentified or pressure boundary leakage greater than 10 gpm.

OR

b. Identified leakage greater than 25 gpm.

BFN's equivalent EAL states:

2.4-U Unusual Event

Drywell unidentified leakage exceeds 10 gpm

OR

Drywell identified leakage exceeds 40 gpm.

BFN justifies the use 40 gpm identified leakage instead of the 25 gpm identified leakage in the NUMARC guidance because it provides clear demarcation between UEs and 10 CFR 50.72 notifications in that 40 gpm is approximately two times the licensed operating value of 25 gpm. This flow rate is within the capacity of the sump pumps if only one pump is operating, it is observable using control room instrumentation, and compatible with surveillance instructions. Based on the above and the discussion in NUMARC/NESP-007, page 5.2, this deviation is acceptable.

By letter dated November 3, 1994, the State of Alabama Department of Public Health (DPH) indicated that it had conducted a review of the proposed changes in the Emergency Action Levels for Browns Ferry Nuclear Plant and had discussed the rationale for and implementation of the EALs on September 22, 1994. The State of Alabama DPH had no objections to the proposed changes.

4.0 CONCLUSION

The proposed EAL changes for Browns Ferry 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.

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