



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 166 TO

FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

On August 31, 1994, the staff issued amendments to the Calvert Cliffs Nuclear Power Plant Technical Specifications (TSs) revising the TS to permit both doors in the personnel airlock to be open during fuel handling. Prior to issuance of that amendment, at least one of the two doors was required to be closed during fuel handling. Approval of the Calvert Cliffs amendments was based on: (1) the findings of an analysis of radiological consequences of a fuel handling accident (FHA) that the calculated radiological doses are acceptable, and (2) commitments by the licensee that would ensure that containment closure would be promptly established following containment evacuation, in the event of a FHA. Subsequently, similar applications were received and approved for other facilities. It is the staff's policy to approve such applications if (1) confirmatory dose calculations by the staff indicate acceptable radiological consequences and (2) the licensee has committed to implement administrative procedures that ensure that the open airlock can and will be promptly closed following containment evacuation in the event of a refueling accident (even though the containment fission product control function is required to meet acceptable dose consequences criteria).

By application dated May 19, 1995, as supplemented by letter dated July 21, 1995, Entergy Operations, Inc. (the licensee) requested similar amendments for Arkansas Nuclear One, Units 1 and 2 (ANO-1 and ANO-2). The July 21, 1995, supplement provided clarifying information that did not change the initial proposed no significant hazards consideration determination. Following review of supporting calculations associated with the consequences of a fuel handling accident, the staff found that detailed information was included to address radiological consequences involving ANO-2 fuel. However, similar information to evaluate a fuel handling accident involving ANO-1 fuel was not included. The staff proceeded to evaluate the requested TS amendment for ANO-2 only. The ANO-1 amendment request will be processed when ANO-1 specific information is submitted by the licensee.

2.0 BACKGROUND

The proposed ANO-2 amendment would revise the TSs to permit both doors in the personnel airlock to be open during handling of irradiated fuel in the containment as follows:

- TS 3.9.4 would be revised to allow the containment building personnel airlock doors to remain open during fuel handling as long as at least 23 feet of water is maintained covering the fuel (currently required by TS 3.9.9) seated within the reactor pressure vessel.
- TS 3/4.9.3.a would be revised to increase the minimum decay time from shutdown to the movement of irradiated fuel in containment from 72 to 100 hours.
- The bases for TS 3/4.9.9 and 3/4.9.10 would be revised to reflect an increase in the assumed amount of iodine gas activity from 10% to 12%.

3.0 EVALUATION

The containment at ANO-2 is provided with a personnel airlock, a personnel escape (emergency) airlock, an equipment hatch and other penetrations for piping and cables. The airlocks are provided with double doors to permit access while maintaining containment integrity. The double doors are provided with interlocks to ensure that only one door at a time can be open. Per the existing specification, during cold shutdown and refueling the interlocks may be disabled and both doors may be opened, if irradiated fuel is not being moved in containment. Also, during such periods, temporary (less than full strength) hatch covers may be used on the equipment hatches.

The staff has evaluated the application to confirm that (1) confirmatory dose calculations indicate acceptable radiological consequences without taking credit for the containment's fission product control function, and (2) the licensee has committed to implement administrative procedures that ensure that the open airlock can and will be promptly closed, following containment evacuation, in the event of a refueling accident.

3.1 CAPABILITY TO PROMPTLY ESTABLISH CONTAINMENT CLOSURE IN THE EVENT OF A FHA

The licensee's initial application did not explicitly confirm that administrative controls would be implemented to ensure that an open airlock can and would be promptly closed in the event of a fuel handling accident in the containment. After discussions with the staff, the licensee provided a letter dated July 21, 1995, stating that when the airlocks are opened during fuel handling and core alterations, an individual will be assigned to monitor the status of the door and close it following containment evacuation. Procedures will be implemented to ensure that the airlock passages are not obstructed in such a manner as to inhibit prompt closure. Based on the July 21, 1995, commitment, the staff finds that the capability for prompt closure criterion is met.

3.2 RADIOLOGICAL CONSEQUENCES

The staff has completed its evaluation of the potential radiological consequences of a FHA at ANO-2, based upon the conditions of the proposed TS changes. In addition to reviewing the licensee's submittal, the staff performed an independent analysis to determine conformance with the requirements of 10 CFR Part 100 and General Design Criteria (GDC) 19 of Appendix A to 10 CFR Part 50. The staff's analysis utilized the accident source term given in Regulatory Guide (RG) 1.4, the assumptions contained in RG 1.25, and the review procedures specified in Standard Review Plan (SRP) Sections 15.7.4 and 6.4. The licensee stated in its analysis that only four rows of fuel pins (60 pins) would be damaged if a fuel assembly was to drop. The staff reviewed the licensee's analysis in the ANO-2 SAR, Section 15.1.23, Fuel Handling Accident. The staff concludes that the licensee's analysis is consistent with the requirements of the NRC SRP Section 15.7.4, conservative, and adequate to justify the number of fuel rods (four rows) assumed to be damaged in the fuel handling accident. The staff further assumed an instantaneous puff release of noble gases and radioiodines from the gap and plenum of the broken fuel rods. These released gas bubbles would then pass through at least 23 feet of water covering the fuel, prior to reaching the containment atmosphere. All airborne activity reaching the containment atmosphere is assumed to exhaust to the environment within 2 hours. As stipulated in the proposed TS change, the activity of the gases in the fuel gap and plenum is assumed to have decayed for a period of 100 hours.

The staff computed the offsite doses for ANO-2 using the above assumptions and NRC computer code ACTICODE. Control room operator doses were determined using the methodology in Section 6.4. The computed offsite doses and control room operator doses are within the acceptance criteria given in SRP Section 15.7.4 and GDC 19. The assumptions used in calculating those doses and the resulting calculated values are contained in Tables 1 and 2.

TABLE 1

CALCULATED RADIOLOGICAL CONSEQUENCES
(rem)

<u>Exclusion Area Boundary</u>	<u>Dose</u>	<u>SRP 15.7.4 Guidelines</u>
Whole Body	0.16	6
Thyroid	33.0	75

<u>Control Room Operator</u>	<u>Dose</u>	<u>GDC-19 Guidelines</u>
Whole Body	<0.1	5
Thyroid	1.9	Equivalent to 5 rem whole body

* The guideline dose provided in Standard Review Plan Section 6.4 defines the dose-equivalent to the thyroid as 30 rem.

TABLE 2

ASSUMPTIONS USED FOR CALCULATING RADIOLOGICAL CONSEQUENCES

<u>Parameters</u>	<u>Quantity</u>
Power Level, Mwt	2,955
Number of Fuel Rods Damaged (4 rows)	60
Total Number of Rods	40,716
Shutdown time, hours	100
Power Peaking Factor	1.65
Fission Product Release Duration	2 hours
Core Fission Product Inventories per TID-14844	
<u>Receptor Point Variables</u>	
<u>Exclusion Area Boundary</u>	
Atmospheric Relative Concentration, X/Q (sec/m ³) 0-2 hours	6.8 x 10 ⁻⁴
<u>Low Population Zone</u>	
Atmospheric Relative Concentration, X/Q (sec/m ³) 0-2 hours	1.2 x 10 ⁻⁴
8-24 hours	7.6 x 10 ⁻⁵
1-4 days	3.0 x 10 ⁻⁵
4-30 days	8.2 x 10 ⁻⁶
<u>Control Room</u>	
Atmospheric Relative Concentration, X/Q (sec/m ³)	5.6 x 10 ⁻⁴
Control Room Volume, cubic feet	1.8 x 10 ⁶
Maximum Infiltration Rate, ft ³ /min	10
Geometry Factor	32.6
Iodine Protection Factor	144
<u>Recirculation Air Flow</u>	
Flow Rate, ft ³ /min	1667
ESF Filter Efficiency	
Elemental Iodine	95%
Organic Iodine	95%
Particulate Iodine	95%

Note: Dose conversion factors from ICRP-30 were utilized for all calculations

4.0 TECHNICAL CONCLUSION

The staff concluded that the radiological consequences associated with a fuel handling accident at ANO-2 during refueling operations with the containment airlocks open are within the acceptance criteria set forth in 10 CFR Part 100 and GDC 19 of Appendix A to 10 CFR Part 50. Additionally, administrative controls are in place to reduce the calculated radiological release substantially, if not completely, by closing the open airlock doors promptly after a fuel handling accident. The staff concludes that the proposed amendment is acceptable for ANO-2.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (60 FR 39437). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: September 28, 1995