



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 80 TO FACILITY OPERATING LICENSE NO. NPF-58
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, ET AL.
PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

By application dated November 2, 1995, The Cleveland Electric Illuminating Company (CEI or the licensee) requested changes to the Technical Specifications (TSs) (Appendix A to Facility Operating License No. NPF-58) for the Perry Nuclear Power Plant, Unit 1. The proposed changes would revise the TSs to allow the containment personnel air locks (PAL) to be open in Modes 4 and 5 during core alterations except for movement of recently irradiated fuel. The licensee provided additional information by letter dated January 26, 1996, which did not change the initial no significant hazards consideration determination.

The current TSs require that the PALs be operable during fuel movement and core alteration. This requirement is to prevent the release of radioactive material in the event of a fuel handling accident. CEI stated that because of the high level of modification, maintenance, and repair activities during outages, wear and tear on the two airlocks doors to containment causes the doors to break down resulting in increased repair costs. These repairs also create a bottle neck situation for processing personnel and equipment in and out of the containment and drywell.

The licensee's application dated November 2, 1995, also proposed changes for the secondary containment isolation valves, control room heating, ventilation, and air conditioning system, primary containment during shutdown, fuel handling building, fuel handling building ventilation exhaust system, AC sources during shutdown, DC sources during shutdown, and distribution systems during shutdown. The NRC is not acting on these changes pending further review. The action on these items is deferred, will continue to be pursued by the licensee and the NRC, and may be the subject of future licensing action.

2.0 BACKGROUND

By letter dated November 2, 1995, CEI proposed to amend Facility Operating License No. NPF-58 for the Perry Nuclear Power Plant, Unit 1 (PNPP), by incorporating changes to their TSs. The licensee provided additional information by letter dated January 26, 1996, adding their administrative controls on air locks to their license as a license condition. The proposed changes will allow the containment personnel air locks to be open during CORE ALTERATIONS within the containment after the reactor has been subcritical for

a period of 7 days. These CORE ALTERATIONS, which include the movement of fuel, will be governed by conditions or specific language committed to by the licensee and added as a license condition. This condition states:

Primary Containment air lock penetrations may be open during CORE ALTERATIONS and movement of irradiated fuel within the primary containment, except when moving recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous seven days), provided the following conditions exist:

- 1) One door in each air lock is capable of being closed.
- 2) Hoses and cables running through the air lock employ a means to allow safe, quick disconnect or severance, and are tagged at the air lock with specific instructions to expedite removal.
- 3) The air lock door is not blocked in such a way that it cannot be expeditiously closed.
- 4) A designated individual is available to expeditiously close the air lock door.

In addition, the term "recently irradiated fuel" is defined in the bases of the technical specifications as "fuel that has occupied part of a critical reactor core within the previous 7 days." This condition of prohibiting movement of irradiated fuels with less than 7 days decay, was a part of the larger review for opening containment, secondary containment, and other items and the 7 days directly relates to the fuel accident analysis for technical acceptance of all those provisions.

3.0 EVALUATION

PNPP has an upper and lower PAL, which opens up into the intermediate building. The intermediate building is vented through a filter. Additionally, the annulus exhaust gas treatment system and the control room emergency recirculation system will be operable in accordance with TS during fuel handling to protect against any radioactive fission products that might escape an open PAL during a fuel handling accident inside the containment. PNPP has experienced outage delays due to the PAL door problems resulting from heavy use. CEI proposes that a designated individual be available to expeditiously and safely remove any hoses or cables running through the PAL, and to be available to expeditiously close one of the PAL doors in the event of an accident. Also, the minimum decay time prior to handling of irradiated fuel with the PAL doors open is established at 7 days, consistent with the revised fuel handling accident dose analysis which is discussed later in the safety evaluation.

The PAL is provided for the purpose of permitting personnel to enter and exit the containment while maintaining the integrity of the containment pressure boundary. Each PAL contains two airlock doors with a personnel chamber between the doors. In reactor operational Modes 1, 2, and 3, at least one of the two doors must be closed. Mechanical interlocks ensure that both doors

cannot be opened at the same time. During shutdown and refueling operations, both doors may be opened at the same time (the interlock mechanism is intentionally disabled) unless (a) core alterations are in progress, (b) during operations with a potential for draining the reactor vessel, or (c) during movement of irradiated fuel assemblies in the primary containment. The licensee does not propose to change the PALs' operation during the potential for draining down the vessel.

Core alterations are defined in the TSs as follows:

"CORE ALTERATION shall be the addition, removal, relocation or movement of fuel, sources, incore instruments or reactivity controls within the reactor pressure vessel with the vessel head removed and fuel in the vessel. Normal movement of the SRMs, IRMs, LPRMs, TIPS, or special movable detectors is not considered a CORE ALTERATION. Suspension of CORE ALTERATIONS shall not preclude completion of the movement of a component to a safe conservative position."

The Updated Final Safety Analysis Report for PNPP includes an analysis of the accidents which can occur during core alterations. Those accidents postulated to occur during core alterations are: inadvertent criticality due to a control rod removal error, continuous control rod withdrawal error during refueling; and the inadvertent loading and operation of a fuel assembly in an improper location. These accidents are not postulated to result in fuel cladding integrity damage during shutdown. However, core alterations cover the movement of any fuel and the accident analysis of concern is the fuel handling accident. The licensee's original fuel handling accident after 24 hours decay and with the containment closed except for certain vent and drain lines, has not been changed. The analysis for fuel handling accidents after the 7 day decay period as proposed by the licensee should bound any CORE ALTERATIONS with the PAL doors open. Therefore, for the PALs it is acceptable to delete core alterations for other than Modes 1, 2, or 3 based on an acceptable analysis for the fuel handling accident after the decay period proposed by the licensee.

The licensee has proposed a license condition to include provisions to expeditiously close one of the PAL doors in the event of a fuel handling accident. These provisions are acceptable. Additionally, TS 3.9.8 continues to require at least 22 feet 9 inches of water above the reactor vessel flange for movement of fuel assemblies or control rods. Therefore, for CORE ALTERATIONS during shutdown or irradiated fuel movement, any release of radioactive fission products from damaged fuel will occur under water at a depth of at least 22 feet 9 inches.

The minimum decay time of 7 days will ensure that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are well within the guideline values specified in 10 CFR Part 100. Further guidance regarding limits for offsite radiation exposure are contained in Standard Review Plan Section 15.7.4, Rev. 1, which defines "well within" 10 CFR Part 100 to be 25% or less of the 10 CFR Part 100 values.

The staff has completed its evaluation of the potential radiological consequences of a fuel handling accident at PNPP, based upon the license condition and the proposed TS changes. In addition to reviewing the licensee's submittal, the staff performed an independent analysis to determine conformance with the dose acceptance criteria of 10 CFR Part 100 and General Design Criterion (GDC) 19 of Appendix A to 10 CFR Part 50. The staff's analysis utilized the accident source term given in Regulatory Guide 1.3, the assumptions contained in Regulatory Guide 1.25, and the review procedures specified in Standard Review Plan (SRP) Sections 15.7.4 and 6.4. The staff assumed an instantaneous puff release of noble gases and radioiodines from the gap and plenum of the broken fuel rods. These gas bubbles will pass through at least 22 feet 9 inches of water covering the fuel prior to reaching the containment atmosphere. All airborne activity reaching the containment atmosphere is assumed to exhaust from the plant vent to the environment within 2 hours. As stipulated in the proposed TS change, the gap activity is assumed to have decayed for a period of 7 days.

The staff computed the offsite doses for PNPP using the above assumptions and NRC computer code ACTICODE. Control room operator doses were determined using the methodology in SRP Section 6.4, including use of the Murphy-Campe methodology for calculation of the relative concentration. Prior to entry into the control room intake, the effluent was assumed to mix within the cross-sectional area bounded by the containment diameter and the top of the containment downward to the height of the intake. 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 attached in Tables 1 and 2.

The staff's dose calculation was based on the assumption that all of the radioactive material released to the containment escapes the containment within 2 hours. However, the staff has historically required plant technical specifications to maintain containment closure during core alterations and fuel handling as a defense-in-depth measure to further limit releases. Recently the staff has allowed changes to plant technical specifications to keep both doors to a containment air lock open during core alterations and fuel handling with provisions in place to close one door quickly, thereby reestablishing containment closure. The provisions described in the Background Section of this safety evaluation provide reasonable assurance that containment closure as a defense-in-depth measure can be reestablished quickly to limit releases to much lower than assumed in the dose calculations.

The staff has reviewed the licensee's analysis and has performed an independent assessment of the radiological consequences resulting from a fuel handling accident during refueling operations with the containment air locks open. The staff concludes that the radiological consequences associated with this accident are within the acceptance criteria set forth in 10 CFR Part 100 and the control room operator dose criteria specified in GDC-19 of Appendix A to 10 CFR Part 50 and are acceptable.

4.0 TECHNICAL SPECIFICATIONS/LICENSE CONDITIONS

The licensee in their original request had proposed changes to the TSs to

allow the PALs to be open during CORE ALTERATIONS except for movement of recently irradiated fuel (fuel that has been critical in the past 7 days). The licensee's proposal was made as part of a larger consideration for removal of systems during refueling based on technical merits, however, the staff is not prepared at this time to act on those considerations and has deferred most of the request pending further review. The wording of the TSs proposed by the licensee reflects that larger consideration (i.e., during the period the PALs could be open, the TSs would not be applicable and the PAL doors would not be required to be operable), but does not reflect consideration of containment integrity. While the staff is prepared to accept the operation of PALs with both doors open, additional controls in the license to assure prompt reestablishment of containment are necessary. The licensee's commitment in their letter dated January 26, 1996, clarified those actions or controls, and proposed adding the controls to the license as a license condition. These controls and actions are consistent with the licensee's intent and original proposal and are being proposed by the licensee to provide clarification. The amended TSs and the license condition provide the necessary assurance for reestablishment of containment integrity during CORE ALTERATIONS and movement of fuels. We find the proposed TSs and license condition acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Louisiana 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. 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 62497). 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.

Attachments: 1. Table 1
2. Table 2

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TABLE 1
CALCULATED RADIOLOGICAL CONSEQUENCES
 (rem)

<u>Exclusion Area Boundary</u>	<u>Dose</u>	<u>SRP 15.7.4 Guidelines</u>
Whole Body	0.17	6
Thyroid	38.8	75
<u>Control Room Operator</u>	<u>Dose</u>	<u>GDC-19 Guidelines</u>
Whole Body	0.1	5
Thyroid	18.1	Equivalent to 5 rem whole body*

* Guideline doses provided in Standard Review Plan Section 6.4 define the dose-equivalent as 30 rem to the thyroid.

TABLE 2

ASSUMPTIONS USED FOR CALCULATING RADIOLOGICAL CONSEQUENCES

<u>Parameters</u>	<u>Quantity</u>
Power Level, Mwt	3,834
Number of Fuel Rods Damaged	124
Total Number of Rods	46,376
Shutdown time, hours	168
Power Peaking Factor*	1.5
Fission Product Release Duration*	2 hours
<u>Release Fractions*</u>	
Iodine	0.12
Noble Gases	0.30
<u>Pool Decontamination Factors*</u>	
Iodine	100
Noble Gases	1
<u>Iodine Forms*</u>	
Elemental	75%
Organic	25%
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	4.9 x 10 ⁻⁴
<u>Low Population Zone**</u>	
Atmospheric Relative Concentration, X/Q (sec/m ³) 0-8 hours	5.8 x 10 ⁻⁵
<u>Control Room</u>	
Atmospheric Relative Concentration, X/Q (sec/m ³)	4.5 x 10 ⁻³
Control Room Volume, cubic feet	3.44 x 10 ⁵
Maximum Infiltration Rate, ft ³ /min	1173
Geometry Factor	15.8
Iodine Protection Factor	19.6

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

* Regulatory Guide 1.25

** Perry Nuclear Power Plant, Units 1 & 2 SER