



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATING TO REQUEST FOR EXEMPTION FROM 10 CFR 70.24 REQUIREMENTS

DUKE POWER COMPANY, ET AL.

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413 AND 50-414

1.0 INTRODUCTION

Title 10 of the Code of Federal Regulations (10 CFR) at subsection (a) of 10 CFR 70.24, "Criticality Accident Requirements," requires that each licensee authorized to possess special nuclear material shall maintain in each area where such material is handled, used, or stored, a criticality accident monitoring system "using gamma- or neutron-sensitive radiation detectors which will energize clearly audible alarm signals if accidental criticality occurs." Subsections (a)(1) and (a)(2) of 10 CFR 70.24 specify the detection, sensitivity, and coverage capabilities of the monitors required by 10 CFR 70.24(a). Subsection (a)(3) of 10 CFR 70.24 requires that the licensee shall maintain emergency procedures for each area in which this licensed special nuclear material is handled, used, or stored and provides (1) that the procedures ensure that all personnel withdraw to an area of safety upon the sounding of a criticality monitor alarm, (2) that the procedures must include drills to familiarize personnel with the evacuation plan, and (3) that the procedures designate responsible individuals for determining the cause of the alarm and placement of radiation survey instruments in accessible locations for use in such an emergency. Subsection (b)(1) requires licensees to have a means to quickly identify personnel who have received a dose of 10 rads or more. Subsection (b)(2) requires licensees to maintain personnel decontamination facilities, to maintain arrangements for a physician and other medical personnel qualified to handle radiation emergencies, and to maintain arrangements for the transportation of contaminated individuals to treatment facilities outside the site boundary. Subsection (c) exempts Part 50 licensees (such as Catawba) from the requirements of paragraph (b). Subsection (d) states that any licensee who believes that there is good cause why he should be granted an exemption from all or part of 10 CFR 70.24 may apply to the Commission for such an exemption and shall specify the reasons for the relief requested.

By letter dated February 4, 1997, as supplemented March 19, 1997, Duke Power Company (the licensee) requested an exemption for all its nuclear plants from the requirements of 10 CFR 70.24. The staff has reviewed the licensee's submittal and has determined that procedures and design features make an inadvertent criticality in special nuclear materials handling or storage at Catawba unlikely, in accordance with General Design Criterion 62.

Enclosure

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2.0 EVALUATION

Special nuclear material, as nuclear fuel, is stored in the spent fuel pool and the new fuel storage vault. The spent fuel pool is used to store irradiated fuel under water after its discharge from the reactor, and new fuel prior to loading into the reactor. New fuel is stored dry (in air) in the new fuel storage vault.

Special nuclear material is also present in the form of fissile material incorporated into nuclear instrumentation. The small quantity of special nuclear material present in these items precludes an inadvertent criticality.

2.1 Requirements of 10 CFR 70.24(a)(1) and (2)

Each Catawba unit has its own spent fuel pool. The spent fuel pool is designed to store the fuel in a geometric array that precludes criticality. Section 5.6 of the unit's Technical Specifications requires that the spent fuel racks are designed and shall be maintained such that the effective neutron multiplication factor, k_{eff} , will remain less than or equal to 0.95 under all normal and accident conditions for fuel of maximum nominal enrichment of 5.0 weight percent (wt%) U-235. The staff has previously found this design acceptable, meeting all applicable regulatory requirements and guidance (Catawba Safety Evaluation Report, NUREG-0954, February 1983).

Each Catawba unit has its own new fuel storage vault. The new fuel storage vault is used to receive and store new fuel in a dry condition upon arrival on site and prior to loading in the reactor or spent fuel pool. Although the new fuel storage area is prevented by design from flooding (there is no piping which could rupture and flood the area, there is a drainage system, and there is no hydrogenous fire fighting equipment in the area), the spacing between new fuel assemblies in the vault is sufficient to maintain the array in a subcritical condition even under accident conditions assuming the presence of neutron moderator. The maximum nominal enrichment of 5.0 wt% U-235 for the new fuel assemblies results in a maximum k_{eff} of less than 0.95 under conditions of accidental flooding by unborated water, and k_{eff} less than 0.98 under conditions of low-density optimum moderation. The staff has previously found the design of the licensee's new fuel storage vault to be adequate to store fuel enriched to 5.0 wt% U-235, meeting all applicable regulatory requirements and guidance (Catawba Safety Evaluation Report, NUREG-0954, February 1983).

Nuclear fuel is moved between the shipping container (two assemblies in each container), the new fuel storage vault, the reactor vessel, and the spent fuel pool to accommodate refueling operations. In all cases, fuel movements are procedurally controlled and designed to preclude conditions involving

criticality concerns. Only one new fuel assembly is handled at any one time in any area of the fuel building. Upon removal from the shipping container, the assembly is inspected and transferred by the crane to the new fuel storage vault or the spent fuel pool for storage. All valves that could allow water into the area of the spent fuel operating deck are administratively controlled, and remain shut during fuel handling operations.

The licensee's current procedures and controls prevent an inadvertent criticality during fuel handling; nevertheless, radiation monitoring, as required by General Design Criterion 63, are provided for handling new fuel prior to being placed into the spent fuel pool. In addition, handling of fuel in the spent fuel pool is monitored by radiation monitors on the fuel handling bridges (Section 3/4.3.3 of each unit's Technical Specifications). These required radiation monitors have associated alarm response procedures that provide instructions to the operators upon receipt of alarms.

On the basis of the information provided, the licensee has met the intent of 10 CFR 70.24(d) by the existing facility design, extremely low probability of criticality, and operating procedures. Literal compliance with the requirements of 10 CFR 70.24(a)(1) and (2) would not increase the margin of safety.

2.2 Requirements of 10 CFR 70.24(a)(3)

The purpose of 10 CFR 70.24 is to ensure that if a criticality were to occur during the handling of special nuclear material, personnel would be alerted to that fact and would take appropriate action. The staff has previously discussed that reasonable and satisfactory precautions exist to preclude a nuclear criticality accident, thereby meeting the requirements of General Design Criterion 62. In addition, the licensee has installed radiation monitors, as required by General Design Criterion 63, in fuel storage and handling areas. These monitors will alert personnel to excessive radiation levels and allow them to initiate appropriate safety actions.

The licensee provides radiation alarm training in the general employee plant access training that each employee receives before being badged for unescorted access at the plant. This training identifies the types of alarms that are used, the types of alarm signals emitted, and the expected employee response. While literally the licensee does not meet the "emergency procedures for each area" requirement of 10 CFR 70.24(a)(3), the licensee has met the intent by having general plant procedures. Existing radiation monitors installed to meet the requirements of another regulation (General Design Criterion 63) will continue to be available to carry out the function required by 10 CFR 70.24(a)(3). Thus an exemption to 10 CFR 70.24(a)(3) would not decrease personnel's ability to identify and respond to radiation alarms in areas involving fresh fuel as long as the licensee's general procedures described in its submittals are in effect.

2.3 Requirements of 10 CFR 70.24(b) and (c)

The requirements of 10 CFR 70.24(c) exempt holders of Part 50 operating licenses (e.g., Catawba) from the requirements of 10 CFR 70.24(b)(1) and (2) regarding decontamination facilities, arrangements for physician and other medical personnel qualified to handle radiation emergencies, and arrangements

for the transportation of contaminated individuals to treatment facilities outside the site boundary. Thus there is no need for the staff to take any action on 10 CFR 70.24(b) and (c) for Catawba.

3.0 CONCLUSION

In accordance with 10 CFR 70.24(d), the licensee has demonstrated that good cause exists for an exemption: the existing facility design and operating procedures ensure extremely low probability of criticality, and the existing emergency procedure provides for notification and evacuation of personnel. Literal compliance with the requirements of 10 CFR 70.24(a)(1), (2), and (3) would not increase the margin of safety, and therefore an exemption can be granted.

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