

UNITED STATES OF AMERICA
 NUCLEAR REGULATORY COMMISSION
 OFFICE OF NUCLEAR REACTOR REGULATION
 HAROLD R. DENTON, DIRECTOR

In the Matter of

COMMONWEALTH EDISON COMPANY
 (Zion Station, Units 1&2)

Docket Nos. 50-295
 50-304
 (10 CFR 2.206)

DIRECTOR'S DECISION UNDER 10 CFR 2.206

By letter dated April 27, 1979, Ms. Catherine Quigg, on behalf of Pollution and Environmental Problems, Inc. (PEPI), transmitted a request pursuant to 10 CFR 2.206 for the preparation of an environmental impact statement on high burnup fuel at Zion Station, Units 1 and 2. This request was predicated on the fact that on March 7, 1979, the Nuclear Regulatory Commission issued Amendments Nos. 44 and 41, respectively, to Facility Operating License Nos. DPR-39 and DPR-48. The amendments revise Technical Specifications for Zion Station, Units 1 and 2.^{1/} These amendments would allow the reinsertion of a maximum of four fuel assemblies previously irradiated in Unit 1 for a maximum of two additional fuel cycles (beyond the normal three fuel cycles) in Unit 2 to gain operating experience for an anticipated future extended burnup program.

PEPI requested the preparation of an environmental impact statement to provide information which it thought the public needed because of the following factors associated with high burnup fuel:

1. greater fission gas releases from nuclear reactors;
2. increased fission gas releases from spent fuel pools due to increased corrosion;

^{1/} Amendments 44 and 41 are attached as Appendix A.

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3. previous government research, based on "low burnup fuel" is useless in predicting the behavior of "high burnup fuel", and
4. potential for greater radiological impact in reactor and spent fuel pool accidents.

Consistent with the National Environmental Policy Act of 1969 (Public Law 91-190, 83 Stat. 852) and the Commission's regulations (10 CFR Part 51), an environmental impact statement ^{2/} was prepared at the operating license stage of Units 1 and 2. This statement addressed the range of environmental impacts associated with the operation of the Zion Station. However, an environmental impact statement is not required to be prepared for every license amendment. In this case, the Staff had prepared an environmental impact appraisal ^{3/} and negative declaration ^{4/} pursuant to 10 CFR 51.5 for the amendments, and had concluded that an EIS was not warranted because the action will not significantly affect the quality of the human environment. The negative declaration was published in the Federal Register on March 19, 1979, (44 FR 16504).

In the environmental impact appraisal, the Staff compared the fission gas release from the extended burnup fuel assemblies in the Unit 2 core to the releases from the other fuel assemblies in the core. It was noted that operating Unit 2

^{2/} Final Environmental Statement Related to Operation of Zion Nuclear Power Station Units 1 and 2, December 1972.

^{3/} Environmental Impact Appraisal by the Office of Nuclear Reactor Regulation Supporting Amendment No. 44 to Facility Operating License No. DPR-39 and Amendment No. 41 to Facility Operating License No. DPR-48 dated March 7, 1979. The Appraisal is attached as Appendix B.

^{4/} Notice of Issuance of Amendments to Facility Operating Licenses and Negative Declaration dated March 7, 1979. The Notice is attached as Appendix C.

with four spent fuel assemblies from Unit 1 could have greater fission gas releases due to an increase in the fraction of failed fuel in the core over that previously experienced. However, it was also noted, these increases are not expected to be significant because (1) only four assemblies in the core (2.1%) will be irradiated to the extended burnups; (2) the restrictions in the plant Technical Specifications require the four assemblies to be located in the core where the operating thermal stresses in the cladding are relatively low and where the thermal limits for cladding should not be approached; (3) there are no design changes in these four assemblies from ones previously irradiated at Unit 2; (4) the licensee will examine the four spent fuel assemblies before their insertion in the Unit 2 core for their fourth cycle and will only irradiate them in a fifth cycle after these assemblies have demonstrated satisfactory fuel performance in the fourth cycle.

There is a possibility that increased corrosion (or "crud") of the spent fuel due to extended burnup could lead to higher radioactive emissions in the spent fuel pool. However, the facility's Technical Specifications carefully control coolant chemistry to control corrosion of the Zircaloy Cladding of the fuel rods. Buildup of "crud" should be negligible as long as coolant chemistry is controlled. Extended burnup under such controls would add perhaps several thousandths of an inch of oxide to the existing oxide thickness due to corrosion. For example, the fuel bundles which were irradiated in the Shippingport nuclear reactor at pressurized water reactor conditions for 12 years (approximately 4100 calendar days of operation) had a maximum corrosion thickness of 0.5 mil (5×10^{-4} inches). Corrosion thicknesses even 10 times this value would not affect the integrity of the cladding as a fission-gas barrier or interfere in any way with safe handling of the fuel in the spent fuel pool.

PEPI has stated that previous government research based on "low burnup fuel" is "useless" in predicting pool storage behavior of extended burnup fuel. That statement is incorrect. First of all, the term "low burnup fuel" is misleading, as the normal burnup rate is not a low burnup. Fuel with this burnup (33,000 MWD/MTU) ^{5/} has been in the reactor for at least three cycles of operation, which is approximately three years. The fuel pellet has swelled, it has released a significant amount of fission-gas, and the cladding mechanical properties have reached asymptotic values due to irradiation. Data is available on the behavior of higher burnup fuel. Although this data base is not large, it shows no significant problems in reaching higher burnups than the present limits. While this data base would not support a complete fuel reload of extended burnup fuel, it does provide sufficient confidence to allow lead test assemblies to operate for two cycles in nonlimiting core positions.

However, before a full reload of assemblies of a new design is approved by the Commission a detailed safety review will be required. Part of this review will include the presentation of data to show that the fuel assemblies will meet all the requirements for safe operation of fuel in a licensed reactor. Test assemblies, such as the assemblies authorized at the Zion Station, often provide a significant amount of these data.

PEPI was also concerned with the radiological impact of high burnup fuel in the event of loss of coolant accidents. The potential impact on safety for four extended burnup fuel assemblies is not greater than that of the other fuel bundles in the Unit 2 core since all fuel bundles are governed by the same safety criteria. In the environmental impact appraisal, the Staff addressed

^{5/} Megawatt days/metric ton uranium.

the effect of the four higher burnup fuel assemblies on the potential consequences and the environmental impacts of postulated accidents.

Increasing the burnup of fuel assemblies increases the radioactivity within the fuel assemblies. The amount of radioactivity of a specific radionuclide in the fuel increases with fuel burnup until it reaches an asymptotic value. The magnitude of fuel burnup where the radioactivity of a specific radionuclide reaches its asymptotic value depends on the halflife of the radionuclide. The short-lived fission products will have reached equilibrium levels at lower burnups and will not be affected. Irradiating fuel to extended burnups will increase the amount of long-lived fission products in the core. The only significant long-lived radionuclide with respect to potential consequences of the design basis accidents is the noble gas Krypton 85. Extending burnups of the four assemblies up to about 44,000 MWD/MTU (one added cycle) will not increase the amount of Krypton 85 which was assumed in the fuel at Zion 2 for the postulated design basis accidents. The increase in the amount of Krypton 85 in the four fuel assemblies from 44,000 MWD/MTU to 55,000 MWD/MTU (the second added cycle) is not significant compared to the total amount of fission noble gases in the fuel. These conclusions are based on the Staff's independent calculations of the fission gas release from damaged spent fuel and the radiological impacts of the postulated accidents.

Therefore, the potential consequences of the accidents given in the Safety Evaluation Reports dated October 1972, 6/ and March 29, 1979, 7/ for Units 1 and 2 will not change due to four fuel assemblies in the core being irradiated to burnups up to 55,000 MWD/MTU.

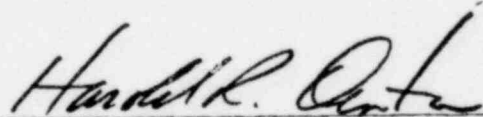
6/ Safety Evaluation of the Zion Nuclear Power Station Units 1&2, attached as Appendix D.

7/ Safety Evaluation by the Office of Nuclear Reactor Regulation Relating to the Modification of the Spent Fuel Storage Pool, attached as Appendix E.

Based on the environmental impact appraisal dated March 7, 1979, and the reasons set forth above, I have determined that Amendments 44 and 41 will not significantly affect the quality of the human environment and that a full environmental impact statement is not warranted. Therefore, the request of PEPI is denied.^{8/}

A copy of this decision will be placed in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D. C. 20555 and the local Public Document Room for the Zion Station located at Zion-Benton Public Library, 2600 Emmaus Avenue, Zion, Illinois 60099. A copy of this document will also be filed with the Secretary of the Commission for its review in accordance with 10 CFR 2.206(c) of the Commission's regulations.

In accordance with 10 CFR 2.206(c) of the Commission's Rules of Practice, this decision will constitute the final action of the Commission 20 days after the date of issuance, unless the Commission on its own motion institutes the review of this decision within that time.



Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland
this 13th day of March, 1980.

Attachments:

- Appendix A - Amendments 44 and 41
- Appendix B - Environmental Impact Appraisal by NRR (3/7/79)
- Appendix C - Notice of Issuance of Amendments to Facility Operating Licenses and Negative Declaration (3/7/79)
- Appendix D - Safety Evaluation of Zion Nuclear Power Station, Units 1&2
- Appendix E - Safety Evaluation by NRR - Modification of Spent Fuel Storage Pool

^{8/} PEPI also questioned why prior notice was not given before issuing the amendments. The amendments did not involve a significant hazard consideration and, therefore, the amendments were post-noticed. See also, Appendix D.