NUCLEAR REGULATORY COMMISSION

[Docket No. STN 50–530]

Arizona Public Service Company, et al., (Palo Verde Nuclear Generating Station, Unit 3); Exemption

I.

On November 25, 1987, the Commission issued Facility Operating License No. NPF–74 to Arizona Public Service Company, Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Southern California Edison Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority for the Palo Verde Nuclear Generating Station, Unit 3. The license provides, among other things, that the licensee is subject to all rules, regulations, and orders of the Commission now or hereafter in effect.

II.

Several sections of Title 10 of the Code of Federal Regulations discuss requirements for fuel that is used in light water nuclear power reactors. Since these requirements refer to specific cladding types of zircaloy or ZIRLO, the use of fuel clad with other zirconium-based alloys, or any other cladding material, that do not conform to these two designations requires an exemption from the code.

Specifically, 10 CFR 50.44, ''[s]tandards for combustible gas control system in light-water-cooled power reactors,'' contains requirements for the control of hydrogen gas that may be generated after a postulated loss-of-coolant accident in light-water nuclear power reactors fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding. Section 50.46 of Title 10 of the Code of Federal Regulations, ''[a]cceptance criteria for emergency core cooling systems for light water nuclear power reactors,'' contains acceptance criteria for emergency core cooling systems (ECCS) for light-water nuclear power reactors fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding. Appendix K to Part 50, ''ECCS Evaluation models,'' contains the required and acceptable features for ECCS evaluation models to meet the requirements of 10 CFR 50.46. Paragraph I.A.5 of Appendix K states that the rates of energy release, hydrogen concentration, and cladding oxidation from the metal-water reaction shall be calculated using the Baker-Just equation. The Baker-Just equation presumes the use of Zircaloy or ZIRLO clad fuel.

Testing of advanced clad materials is necessary to provide data to justify full-core use of clad materials and a subsequent rule change to implement the advanced clad designs.

III.

By letter dated September 12, 1996, as supplemented by letter dated December 13, 1996, Arizona Public Service Company (APS, or the licensee), submitted a request for exemption from the requirements of 10 CFR 50.44, 10 CFR 50.46, and Appendix K to Part 50, to allow use of three lead fuel assemblies (LFAs) that contain advanced zirconium-based cladding materials. These assemblies would be used to evaluate the performance of the advanced cladding materials for three fuel cycles, which are cycles 7, 8, and 9.

Pursuant to 10 CFR 50.12(a), ''[t]he Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of the regulations of this part, which are—(1) Authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. (2) The Commission will not consider granting an exemption unless special circumstances are present. Special circumstances are present whenever—* * * (ii) Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule * * *''. As discussed in Section II. above, three separate sections of Title 10 to the Code of Federal Regulations establish requirements for performance of fuel used in light-water nuclear power reactors. These regulations refer to the use of zircaloy or ZIRLO cladding material, but do not specify what constitutes zircaloy. Therefore, the use of fuel that is clad with other zirconium-based alloys may not be within the regulatory basis for use of other alloys and would, in effect, place the licensee outside the applicability of these sections of the code. The licensee would require an exemption to these portions of the code to allow use of advanced zirconium-based alloys in its reactor.

The information provided by the licensee in its September 12, 1996, letter demonstrates that the predicted chemical, mechanical, and material performance characteristics of the advanced zirconium-based cladding is within the parameters approved for zircaloy under anticipated operations occurrences and postulated accidents. In addition, nominal fuel performance characteristics of the advanced zirconium-based clad test rods continue to be the same as, or superior to, those experienced with existing Zircaloy-4 fuel rods. The information provided in the licensee's December 13, 1996, letter demonstrated that although two of the three proposed lead fuel assemblies will be in relatively high power and rodded positions during Unit 3 Cycle 7, these assemblies will not be in limiting (the highest power) regions of the core. The licensee also proposes to include up to six fuel rods that have already been exposed for three fuel cycles in one of the three fuel assemblies. These rods are being tested to determine the effects on the cladding of extended burnup. These rods will be measured after Cycle 6, and before use in Cycle 7, to ensure that end of cycle (EOC) 7 maximum circumferentially averaged oxide thickness projected for each rod transferred will remain below the approved oxide thickness limit, and that adequate shoulder gap will exist at EOC 7 for each rod using conservative assumptions for fuel rod and fuel assembly growth. The staff concludes that the use of advanced zirconium-based cladding materials in three lead fuel assemblies in non-limiting core locations will not present an undue risk to the public health and safety, and is consistent with the common defense and security.

The underlying purpose of 10 CFR 50.44 is to ensure that adequate means is provided for the control of hydrogen gas that may be generated following a loss of coolant accident (LOCA). The hydrogen produced in a post-LOCA scenario comes from cladding oxidation in a metal-water reaction. Most of the high temperature oxidation occurs during that portion of the LOCA scenario that results in a molecular phase of zirconium (the beta-phase) that allows a significantly higher diffusion coefficient for oxygen than that molecular phase of zirconium that exists during normal operation (the alpha-phase). The beta-phase oxidation resistance of the proposed alloys is expected to be as good as, or better than, that of the existing Zircaloy–4. In addition, the elemental composition used in the proposed alloy to improve the corrosion resistance of the alpha-phase of these alloys will also improve the corrosion resistance of the beta-phase of these alloys as well. The staff therefore concludes that the beta-phase oxidation rate of the proposed alloys will be at or lower than that of the

existing Zircaloy–4. A strict interpretation of the rule in this instance would conclude that the criteria of 10 CFR 50.44 are not met by advanced zirconium-based alloys, since these alloys are not specifically zircaloy or ZIRLO. Since the advanced zirconium-based alloys meet the underlying purpose of the rule, strict application of the rule to only apply to zircaloy or ZIRLO cladding is not necessary to achieve the underlying purpose of the rule. Since strict application of 10 CFR 50.44 is not necessary to meet the underlying purpose of the rule, special circumstances exist to grant an exemption from this regulation to allow a reactor to contain three lead fuel assemblies containing fuel rods clad with advanced zirconium-based alloys.

The underlying purpose of 10 CFR 50.46 is to specify acceptance criteria for ECCS performance at light-water nuclear power reactors. The fuel rods clad with the advanced zirconium-based alloys will be identical in design and dimensions to the fuel rods clad with the existing Zircaloy–4. The advanced cladding materials used in the proposed fuel assemblies were chosen to improve corrosion resistance exhibited in ex-reactor autoclave corrosion tests in both high-temperature water and steam environments. Fuel rods clad with similar types of advanced zirconium-based alloys have been successfully irradiated in high-temperature PWRs in Europe. The mechanical properties of the advanced zirconium-based alloy clad meets all the mechanical requirements of the existing Zircaloy–4 procurement specifications. Thus the cladding and structural integrity of the fuel rods and fuel assemblies with advanced zirconium-based alloy cladding will be maintained. In addition, although the staff has not yet reviewed and generically approved the overall behaviors of alloys A and F to meet the limits of ECCS performance criteria requirements, the three lead fuel assemblies will be placed in non-limiting locations within the core. Based on the above considerations, the staff concludes that the lead fuel assemblies will perform acceptably under postulated LOCA conditions. Thus, the underlying purpose of the rule has been met. A strict interpretation of the rule in this instance would conclude that the criteria of 10 CFR 50.46 are not met by advanced zirconium-based alloys, since these alloys are not strictly zircaloy or ZIRLO. Since the advanced zirconium-based alloys meet the underlying purpose of the rule, strict application of the rule to only apply to zircaloy or ZIRLO cladding is not necessary to achieve the underlying purpose of the rule. Therefore, special circumstances exist to grant an exemption from 10 CFR 50.46 that would allow the licensee to apply the acceptance criteria of 10 CFR 50.46 to a reactor containing a limited number of fuel rods with advanced zirconium-based alloys.

Paragraph I.A.5 of Appendix K to 10 CFR Part 50 states that the rates of energy release, hydrogen concentration, and cladding oxidation from the metal-water reaction shall be calculated using the Baker-Just equation. Since the Baker-Just equation presumes the use of zircaloy clad fuel, strict application of the rule would not permit use of the equation for advanced zirconium-based alloys for determining acceptable fuel performance. The underlying intent of this portion of the Appendix, however, is to ensure that analysis of fuel response to LOCAs is conservatively calculated. Due to the similarities in the composition of the advanced zirconium-based alloys and Zircaloy/ZIRLO, the application of the Baker-Just equation in the analysis of advanced zirconium-based clad fuel will conservatively bound all post-LOCA scenarios. Thus, the underlying purpose of the rule will be met. Thus, special circumstances exist to grant an exemption from Appendix K to 10 CFR Part 50 that would allow the licensee to apply the Baker-Just equation to advanced zirconium-based alloys.

IV.

Accordingly, the Commission has determined, pursuant to 10 CFR 50.12(a)(i), that an exemption as described in Section III above is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. The Commission has determined, pursuant to 10 CFR 50.12(a)(2)(ii), that special circumstances exist, as noted in Section III above. Therefore, the Commission hereby grants Arizona Public Service Company, *et al.*, an exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 for use of lead fuel assemblies.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not have a significant impact on the quality of the human environment (62 FR 3925).

This exemption is effective upon issuance.

For the Nuclear Regulatory Commission.

Dated at Rockville, Maryland this 4th day of February 1997.

Frank J. Miraglia, Jr.,

Acting Director, Office of Nuclear Reactor Regulation.

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[Docket Nos. 50–315 and 50–316]

Indiana Michigan Power Company; Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2 Environmental Assessment and Finding of no Significant Impact

The U.S. Nuclear Regulatory Commission (the Commission) is considering issuance of amendments to Facility Operating License Nos. DPR–58 and DPR–74, issued to Indiana Michigan Power Company, (the licensee), for operation of the D. C. Cook Nuclear Plant, Units 1 and 2, located in Berrien County, Michigan.

Environmental Assessment

Identification of the Proposed Action

By letter dated February 26, 1996, the licensee requested amendments to the Technical Specifications (TS) to allow an increased limit for the nominal enrichment of new (unirradiated) Westinghouse fabricated fuel stored in the new fuel storage racks. The proposed changes would allow for the storage of fuel with an enrichment not to exceed a nominal 4.95 weight percent (w/o) U–235, subject to certain integral fuel burnable absorber (IFBA) requirements, in the new fuel storage racks. Plant operation using the higher enriched fuel will be demonstrated to be acceptable by a cycle specific reload safety evaluation performed prior to each fuel loading.

Need for Proposed Action

The licensee intends to use higher enrichment fuel in subsequent fuel load cycles which does not currently meet the new fuel storage limits in the TSs. By increasing the fuel enrichment, the licensee will implement the fuel strategies developed for D.C. Cook Units 1 and 2.

Environmental Impact of the Proposed Action

The Commission has completed its evaluation of the proposed revision to the TSs and concludes that storage of fuel enriched with U–235 up to 4.95 weight percent at D.C. Cook Units 1 and 2 is acceptable. The safety considerations associated with higher enrichments have been evaluated by the NRC staff and the staff has concluded