

For the Atomic Safety and Licensing Board.

Rockville, Maryland, October 16, 2008.

**William J. Froehlich,**

*Chairman, Administrative Judge.*

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## NUCLEAR REGULATORY COMMISSION

[Docket No. STN 50-528]

### Arizona Public Service Company, et al.; Palo Verde Nuclear Generating Station, Unit 1; Temporary Exemption

#### 1.0 Background

The Arizona Public Service Company (APS, the licensee) is the holder of the Renewed Facility Operating License No. NPF-41 which authorizes operation of the Palo Verde Nuclear Generating Station (PVNGS), Unit 1. The license provides, among other things, that the facility is subject to all rules, regulations, and orders of the Nuclear Regulatory Commission (NRC or the Commission) now or hereafter in effect.

The facility consists of a pressurized-water reactor located in Maricopa County, Arizona.

#### 2.0 Request/Action

Pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.12, "Specific exemptions," APS has, by letter dated March 8, 2008, and supplemented by letter dated September 10, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML080790524 and ML082620212, respectively), requested a temporary exemption from 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and Appendix K to 10 CFR 50, "ECCS Evaluation Models," (Appendix K). The regulation in 10 CFR 50.46 contains acceptance criteria for the emergency core cooling system (ECCS) for reactors fueled with zircaloy or ZIRLO™ cladding. In addition, Appendix K to 10 CFR Part 50 requires that the Baker-Just equation be used to predict the rates of energy release, hydrogen concentration, and cladding oxidation from the metal-water reaction. The temporary exemption request relates solely to the specific types of cladding material specified in these regulations. As written, the regulations presume the use of zircaloy or ZIRLO™ fuel rod cladding. Thus, an exemption from the requirements of 10 CFR 50.46, and Appendix K is needed to irradiate lead fuel assemblies (LFAs) comprised of

different cladding alloys at PVNGS, Unit 1. The scope of the staff's review of this temporary exemption request is limited to the current burnup limits; i.e., 60 gigawatt days per metric ton unit (GWD/MTU). Extending the burnup of these LFAs will require further NRC staff review.

The temporary exemption requested by the licensee would allow up to eight LFAs manufactured by AREVA NP consisting of fuel rods with M5 cladding material to be inserted into the PVNGS, Unit 1 reactor core in non-limiting locations during operating Cycles 15, 16, and 17. The use of M5 LFAs will allow APS to evaluate cladding for future fuel assemblies that need to be of a more robust design than the current fuel assemblies to allow for possible higher duty or extended burnup.

#### 3.0 Discussion

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50, when (1) the exemptions are authorized by law, will not present an undue risk to public health and safety, and are consistent with the common defense and security; and (2) special circumstances are present. Under 10 CFR 50.12(a)(2), special circumstances include, among other things, when application of the specific regulation in the particular circumstance would not serve, or is not necessary to achieve, the underlying purpose of the rule.

#### Authorized by Law

This temporary exemption would allow the licensee the use of M5 LFAs to evaluate cladding for future fuel assemblies that may need to be of a more robust design than the current fuel assemblies to allow for possible higher duty or extended burnup. The regulations specify standards and acceptance criteria only for fuel rod clads with Zircaloy or ZIRLO™. Thus, a temporary exemption is required to use fuel rods clad with an advanced alloy that is not Zircaloy or ZIRLO™. As stated above, 10 CFR 50.12 allows the NRC to grant exemptions from the requirements of 10 CFR part 50. The NRC staff has determined that granting of the licensee's proposed temporary exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, the exemption is authorized by law.

#### No Undue Risk to Public Health and Safety

In regard to the fuel mechanical design, the PVNGS, Unit 1 temporary exemption request relates solely to the specific types of cladding material specified in the regulations. No new or altered design limits for purposes of 10 CFR 50, Appendix A, General Design Criterion 10, "Reactor Design," need to be applied or are required for this program. Also, the NRC staff's review was limited to the exemption request and does not address the core physics, core thermal hydraulics, fuel thermal-mechanical design, or the safety analysis aspects of the LFAs associated with the Updated Safety Analysis Report nor their placement in a non-limiting core location. APS has notified the staff of their intent to evaluate the LFAs as a change to the plant in accordance with 10 CFR 50.59. Furthermore, APS has provided information related to their planned evaluation of the LFAs as part of their exemption request (letter dated March 8, 2008) and in response to RAIs (letter dated September 10, 2008).

The underlying purpose of 10 CFR 50.46 is to establish acceptance criteria for ECCS performance. The staff's review and approval of topical report BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," dated February 4, 2000 (ADAMS Accession Nos. ML003681479 and ML003681490), addressed all of the important aspects of M5 with respect to ECCS performance requirements: (1) Applicability of 10 CFR 50.46(b) fuel acceptance criteria, (2) M5 material properties including fuel rod ballooning and rupture strains, and (3) steam oxidation kinetics and applicability of Baker-Just weight gain correlation. A subsequent NRC-approved topical report, BAW-10240P-A, "Incorporation of M5 Properties in Framatome ANP Approved Methods," May 5, 2004 (ADAMS Accession No. ML041260560), further addressed M5 material properties with respect to loss-of-coolant accident (LOCA) applications.

Based on an ongoing LOCA research program at Argonne National Laboratory (ANL) and Research Information Letter 0801, titled, "Technical Basis for Revision of Embrittlement Criteria in 10 CFR 50.46," dated May 30, 2008 (ADAMS Accession No. ML0813502251), cladding corrosion (and associated hydrogen pickup) has a significant impact on post-quench ductility. Pre-test characterization of irradiated M5 fuel cladding segments at ANL provide further evidence of

favorable corrosion and hydrogen pickup characteristics of M5 as compared with standard Zircaloy-4. Hence, the M5 fuel rods would be less susceptible to the detrimental effects of hydrogen uptake during normal operation and their impact on post-quench ductility. Furthermore, ANL post-quench ductility tests on un-irradiated and irradiated M5 cladding segments demonstrate that the 10 CFR 50.46(b) fuel criteria (i.e., 2200 degrees Fahrenheit and 17 percent equivalent cladding reacted) remain conservative up to current burnup limits.

Information provided in the previously approved M5 topical reports, as well as recent ANL LOCA research, demonstrate that the acceptance criteria within 10 CFR 50.46 remain valid for M5 alloy and meet the underlying purpose of the rule—maintain a degree of post-quench ductility in the fuel cladding material.

Paragraph I.A.5 of Appendix K to 10 CFR Part 50 states that the rates of energy release, hydrogen generation, 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 the LFA cladding for determining acceptable fuel performance. Metal-water reaction tests performed by AREVA (topical report BAW-10227-P-A) demonstrate conservative reaction rates relative to the Baker-Just equation. Thus, application of Appendix K, Paragraph I.A.5 is not necessary for the licensee to achieve its underlying purpose in these circumstances.

In addition, APS states that the eight LFAs will be placed in non-limiting core locations (e.g., lower power assembly locations), which provide further margin to ECCS performance requirements and ensure that the behavior of the LFAs is bounded by the safety analyses performed for the standard fuel rods. Based upon results of metal-water reaction testing and mechanical testing, which ensure the applicability of 10 CFR 50.46 acceptance criteria and 10 CFR 50 Appendix K methods and the placement of LFAs in non-limiting locations, the staff finds it acceptable to grant a temporary exemption from the requirements of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 for the use of eight AREVA LFAs within PVNGS, Unit 1.

Based on the above, no new accident precursors are created by allowing the use of LFAs with M5 cladding material in PVNGS, Unit 1 reactor core during

operating Cycles 15, 16, and 17, thus, the probability of postulated accidents is not increased. Also, based on the above, the consequences of postulated accidents are not increased. Therefore, there is no undue risk to public health and safety.

#### *Consistent With Common Defense and Security*

The proposed temporary exemption would allow the use of up to eight LFAs with advanced cladding materials. This change to the plant core configuration has no relation to security issues. Therefore, the common defense and security is not impacted by this temporary exemption.

#### *Special Circumstances*

Special circumstances, in accordance with 10 CFR 50.12(a)(2)(ii), are present whenever application of the specific regulation in the particular circumstance would not serve, or is not necessary to achieve, the underlying purpose of the rule. The underlying purpose of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 is to establish acceptance criteria for ECCS performance. The wording of the regulations in 10 CFR 50.46 and Appendix K is not directly applicable to these advanced cladding alloys, even though the evaluations discussed above show that the intent of the regulations are met. Therefore, since the underlying purposes of 10 CFR 50.46 and Appendix K are achieved with the use of these advanced cladding alloys, the special circumstances required by 10 CFR 50.12(a)(2)(ii) for granting of an exemption from 10 CFR 50.46 and Appendix K exist.

#### **4.0 Conclusion**

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the temporary exemption 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. Also, special circumstances are present. Therefore, the Commission hereby grants APS temporary exemption from the requirements of 10 CFR 50.46 and Appendix K to 10 CFR Part 50, to allow the use of fuel rods clad with an advanced alloy that is not Zircaloy or ZIRLO™ to be inserted into the PVNGS, Unit 1 reactor core in non-limiting locations during operating Cycles 15, 16, and 17.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this temporary exemption will not have a significant effect on the

quality of the human environment (73 FR 57386, October 2, 2008).

This temporary exemption is effective upon issuance.

Dated at Rockville, Maryland, this 14th day of October 2008.

For the Nuclear Regulatory Commission.

**Joseph G. Giitter,**

*Director, Division of Operating Reactor Licensing, Office of Nuclear Reactor Regulation.*

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## **NUCLEAR REGULATORY COMMISSION**

**[Docket No. 50-483]**

### **Union Electric Company; Notice of Consideration of Issuance of Amendment to Facility Operating License, Proposed No Significant Hazards Consideration Determination, and Opportunity for a Hearing**

The U.S. Nuclear Regulatory Commission (the Commission) is considering issuance of an amendment to Facility Operating License No. NPF-30 issued to Union Electric Company (the licensee) for operation of the Callaway Plant, Unit 1, located in Callaway County, Missouri.

The proposed amendment would revise Technical Specification (TS) 3.4.10, "Pressurizer Safety Valves," TS 3.4.11, "Pressurizer Power Operated Relief Valves (PORVs)," and TS 3.4.12, "Cold Overpressure Mitigation System (COMS)," to adopt the NRC-approved Technical Specification Task Force (TSTF) travelers TSTF-247-A and TSTF-352-A. In the **Federal Register** (FR) notice of consideration published on March 25, 2008 (73 FR 15791), the NRC staff identified the proposed changes to TSs 3.4.10 and 3.4.11 to modify the completion times for default conditions in both TSs and to allow separate condition entry for PORV block valves in TS 3.4.11, but did not identify the proposed change to TS 3.4.12 to extend the completion time for Condition G. This notice is to identify this proposed change to TS 3.4.12.

Before issuance of the proposed license amendment, the Commission will have made findings required by the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations.

The Commission has made a proposed determination that the amendment request involves no significant hazards consideration. Under the Commission's regulations in Title 10