OCT 19 1987

MEMORANDUM FOR: Chairman Zech
Commissioner Roberts
Commissioner Bernthal
Commissioner Carr
Commissioner Rogers

FROM: Victor Stello, Jr.
Executive Director
for Operations

SUBJECT: CONSIDERATION OF FULL POWER LICENSING OF PALO VERDE UNIT 3

Consideration of full power licensing of Palo Verde, Unit 3 is presently scheduled for late October 1987. Provided for your use is a copy of the Palo Verde Unit 3 briefing package, which includes:

1. Briefing Slides for the Full Power Briefing
2. The Low Power License
3. The Proposed Full Power License
4. Staff Report on Operating Experience on Palo Verde Units 1 and 2

Also enclosed for your information are copies of Supplements 10 and 11 to the Palo Verde Safety Evaluation Report (SER). Supplement 10 was issued following the full power briefing for Palo Verde Unit 2. Supplement 11 was issued with the Palo Verde Unit 3 low power license on March 25, 1987. (The SER and Supplements 1-9 were sent to you previously, prior to the briefings on Palo Verde Units 1 and 2).

Original Signed By:
James M. Taylor
Victor Stello, Jr.
Executive Director
for Operations

Enclosures:
1. Palo Verde 2 Briefing Package
2. Palo Verde 2 SER Supplements 10 and 11

cc: SECY
OGC

Contact : M. J. Davis, NRR
x28897

*See Previous Concurrence

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October 8, 1998

MEMORANDUM TO: Rules and Directives Branch
Division of Administrative Services
Office of Administration

FROM: Office of Nuclear Reactor Regulation

SUBJECT: ARIZONA PUBLIC SERVICE COMPANY
(Palo Verde Nuclear Generating Station Unit 3)

One signed original of the *Federal Register* Notice identified below is attached for your transmittal to the Office of the Federal Register for publication. Additional conformed copies (5) of the Notice are enclosed for your use.

- [ ] Notice of Receipt of Application for Construction Permit(s) and Operating License(s).
- [ ] Notice of Receipt of Partial Application for Construction Permit(s) and Facility License(s): Time for submission of Views on Antitrust matters.
- [X] Notice of Consideration of Issuance of Amendment to Facility Operating License. (Call with 30-day insert date).
- [ ] Notice of Receipt of Application for Facility License(s); Notice of Availability of Applicant's Environmental Report; and Notice of Consideration of Issuance of Facility License(s) and Notice of Opportunity for Hearing.
- [ ] Notice of Availability of NRC Draft/Final Environmental Statement.
- [ ] Notice of Limited Work Authorization.
- [ ] Notice of Availability of Safety Evaluation Report.
- [ ] Notice of Issuance of Construction Permit(s).
- [ ] Notice of Issuance of Facility Operating License(s) or Amendment(s).
- [ ] Order.
- [ ] Exemption.
- [ ] Notice of Granting Exemption.
- [ ] Environmental Assessment.
- [ ] Notice of Preparation of Environmental Assessment.
- [ ] Receipt of Petition for Director's Decision Under 10 CFR 2.206.
- [ ] Issuance of Final Director's Decision Under 10 CFR 2.206.
- [ ] Other: Please call Eileen Peyton on 415-1305 with 30-day insert date.

DOCKET NO. STN 50-530

Attachment(s): As stated

Contact: Eileen Peyton
Telephone: 415-1305

DOCUMENT NAME: Memo 2

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UNITED STATES NUCLEAR REGULATORY COMMISSION

ARIZONA PUBLIC SERVICE COMPANY

DOCKET NO. STN 50-530

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-74, issued to Arizona Public Service Company (APS or the licensee) for the Palo Verde Nuclear Generating Station (PVNGS) Unit 3 located in Maricopa County, Arizona.

The proposed amendment would clarify the power level threshold at which certain reactor protective system (RPS) instrumentation trips must be enabled and may be bypassed, and clarify that this level is a percentage of the neutron flux at rated thermal power (RTP). The bypass power level, 1E-4% RTP, would be specified as logarithmic power instead of thermal power. The intent of (and the implementation of) the 1E-4% RTP RPS instrumentation bypass threshold level in the technical specifications (TS) has always been that this power level is neutron power, which would be indicated by logarithmic power, and is not the heat transfer from the reactor core to the coolant, including decay heat, which is the thermal power definition in the TS.

This exigent situation for PVNGS Unit 3 exists because the current "THERMAL POWER" and "RATED THERMAL POWER" (RTP) wording in the PVNGS TS, when interpreted literally in

its application in TS Table 3.3.1-1 footnote (b), could prevent the resumption of operation of the unit following its current refueling outage. This exigent situation could not have been avoided because, although this wording has existed in the PVNGS TS since initial licensing, it was not identified as a potential source of conflict until APS learned on or about September 24, 1998, of emergency TS amendment requests by Southern California Edison Company, for the San Onofre Nuclear Generating Station, and Entergy Corporation, for the Waterford Nuclear Station.

The literal interpretation of "THERMAL POWER" in TS Table 3.3.1-1 footnote (b) could prevent the return to power operation of a shutdown reactor. This footnote specifies that the local power density–high trip and departure from nucleate boiling ratio-low trip may be bypassed when thermal power is less than 1E-4% RTP, and that the bypass must be automatically removed when thermal power is at or above 1E-4% RTP. Since thermal power, as defined in TS Section 1.1, includes decay heat, and decay heat would remain above 1E-4% RTP for a considerable time after shutdown, the literal interpretation of thermal power would effectively prevent the local power density and departure from nucleate boiling ratio trips from being bypassed during a normal outage, which would prevent low power testing and subsequent startup.

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.

Pursuant to 10 CFR 50.91(a)(6) for amendments to be granted under exigent circumstances, the NRC staff must determine that the amendment request involves no significant hazards consideration. Under the Commission's regulations in 10 CFR 50.92, this means that operation of the facility in accordance with the proposed amendment would not (1)

involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. As required by 10 CFR 50.91(a), the licensee has provided its analysis of the issue of no significant hazards consideration, which is presented below:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed change would replace the words "THERMAL POWER" with "logarithmic power" for the 1E-4% rated thermal power (RTP) level threshold in Table 3.3.1-1 footnotes (a) and (b), surveillance requirement SR 3.3.1.7 Note 2, and Table 3.3.2-1 footnote (d) for the reactor protective system (RPS) instrumentation. The purpose of the 1E-4% RTP threshold is to (1) specify the power, below which, the logarithmic power level trip is required to be operable and surveilled, and (2) specify the power, above which, the local power density (LPD) and departure from nucleate boiling ratio (DNBR) trips are required to be operable. For these purposes, the appropriate power threshold should be logarithmic power, which is the power indicated on the logarithmic nuclear instrumentation, and not thermal power. Thermal power is defined in TS section 1.1 as the total reactor heat transfer rate to the reactor coolant, and would include decay heat. Thermal power would therefore not drop to 1E-4% RTP for a considerable period of time after shutdown, and would not provide the plant protective function correlation required at 1E-4% neutron RTP. However, logarithmic power, which is indicated by neutron flux, does provide the plant protective function correlation required at 1E-4% neutron RTP for the required reactor trips as required by safety analyses. The logarithmic power level of 1E-4% neutron RTP nominally correlates to the neutron flux measured by the excore neutron instrumentation that is 1E-4% of the neutron flux at 100% RTP (3876 MWt) measured by the excore neutron instrumentation.

   The proposed editorial amendment would also replace "RTP" with "NRTP," in Table 3.3.1-1 footnotes (a) and (b), surveillance requirement SR 3.3.1.7 Note 2, and Table 3.3.2-1 footnotes (c) and (d). A definition would be added for NRTP (nuclear rated thermal power) in section 1.1 as the indicated neutron flux at RTP. These editorial clarifications will reflect the fact that the logarithmic power level of 1E-4% is not a percentage of the "total reactor core heat transfer rate to the reactor coolant of 3876 MWt," as RTP is defined in section TS 1.1, but is instead a percentage of the indicated neutron flux at RTP.

   An editorial change is also proposed to specify NRTP as the "ALLOWABLE VALUE" parameter for the high logarithmic power level trip setpoint in Table 3.3.1-1

to correct the unintended omission of the trip setpoint parameter during preparation of the Improved Technical Specifications. This change will fill in the omitted parameter with the correct parameter of NRTP that is also consistent with the high logarithmic power trip setpoint parameter in Table 3.3.2-1.

These changes do not constitute a physical change to the Unit or make changes in the RPS instrumentation setpoints, system logic or manual actuation. In addition, these changes do not alter physical plant equipment or the way in which plant equipment is operated. This change is editorial in that it corrects the TS wording to match the appropriate power parameter that was originally intended and required by safety analyses, and that has been implemented since original licensing of the PVNGS plants. Therefore, these changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed change would replace the words "THERMAL POWER" with "logarithmic power" for the 1E-4% RTP level threshold in Table 3.3.1-1 footnotes (a) and (b), surveillance requirement SR 3.3.1.7 Note 2, and Table 3.3.2-1 footnote (d) for the RPS instrumentation. The purpose of the 1E-4% RTP threshold is to (1) specify the power, below which, the logarithmic power level trip is required to be operable and surveilled, and (2) specify the power, above which, the LPD and DNBR trips are required to be operable. For these purposes, the appropriate power threshold should be logarithmic power, which is the power indicated on the logarithmic nuclear instrumentation, and not thermal power. Thermal power is defined in TS section 1.1 as the total reactor heat transfer rate to the reactor coolant, and would include decay heat. Thermal power would therefore not drop to 1E-4% RTP for a considerable period of time after shutdown, and would not provide the plant protective function correlation required at 1E-4% neutron RTP. However, logarithmic power, which is indicated by neutron flux, does provide the plant protective function correlation required at 1E-4% neutron RTP for the required reactor trips as required by safety analyses.

The proposed editorial amendment would also replace "RTP" with "NRTP," in Table 3.3.1-1 footnotes (a) and (b), surveillance requirement SR 3.3.1.7 Note 2, and Table 3.3.2-1 footnotes (c) and (d). A definition would be added for NRTP (nuclear rated thermal power) in section 1.1 as the indicated neutron flux at RTP. These editorial clarifications will reflect the fact that the logarithmic power level of 1E-4% is not a percentage of the "total reactor core heat transfer rate to the reactor coolant of 3876 MWt," as RTP is defined in section TS 1.1, but is instead a percentage of the indicated neutron flux at RTP.

An editorial change is also proposed to specify NRTP as the "ALLOWABLE VALUE" parameter for the high logarithmic power level trip setpoint in Table 3.3.1-1

to correct the unintended omission of the trip setpoint parameter during preparation of the Improved Technical Specifications. This change will fill in the omitted parameter with the correct parameter of NRTP that is also consistent with the high logarithmic power trip setpoint parameter in Table 3.3.2-1.

These changes do not constitute a physical change to the Unit or make changes in the RPS instrumentation setpoints, system logic or manual actuation. In addition, these changes do not alter physical plant equipment or the way in which plant equipment is operated. The proposed change does not introduce any new modes of plant operation or new accident precursors. This change is editorial in that it corrects the TS wording to match the appropriate power parameter that was originally intended and required by safety analyses, and that has been implemented since original licensing of the PVNGS plants. Therefore, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The proposed change does not involve a significant reduction in a margin of safety.

The proposed change would replace the words "THERMAL POWER" with "logarithmic power" for the 1E-4% RTP level threshold in Table 3.3.1-1 footnotes (a) and (b), surveillance requirement SR 3.3.1.7 Note 2, and Table 3.3.2-1 footnote (d) for the RPS instrumentation. The purpose of the 1E-4% RTP threshold is to (1) specify the power, below which, the logarithmic power level trip is required to be operable and surveilled, and (2) specify the power, above which, the LPD and DNBR trips are required to be operable. For these purposes, the appropriate power threshold should be logarithmic power, which is the power indicated on the logarithmic nuclear instrumentation, and not thermal power. Thermal power is defined in TS section 1.1 as the total reactor heat transfer rate to the reactor coolant, and would include decay heat. Thermal power would therefore not drop to 1E-4% RTP for a considerable period of time after shutdown, and would not provide the plant protective function correlation required at 1E-4% neutron RTP. However, logarithmic power, which is indicated by neutron flux, does provide the plant protective function correlation required at 1E-4% neutron RTP for the required reactor trips as required by safety analyses.

The proposed editorial amendment would also replace "RTP" with "NRTP," in Table 3.3.1-1 footnotes (a) and (b), surveillance requirement SR 3.3.1.7 Note 2, and Table 3.3.2-1 footnotes (c) and (d). A definition would be added for NRTP (nuclear rated thermal power) in section 1.1 as the indicated neutron flux at RTP. These editorial clarifications will reflect the fact that the logarithmic power level of 1E-4% is not a percentage of the "total reactor core heat transfer rate to the reactor coolant of 3876 MWt," as RTP is defined in section TS 1.1, but is instead a percentage of the indicated neutron flux at RTP.

An editorial change is also proposed to specify NRTP as the "ALLOWABLE VALUE" parameter for the high logarithmic power level trip setpoint in Table 3.3.1-1 to correct the unintended omission of the trip setpoint parameter during preparation of the Improved Technical Specifications. This change will fill in the omitted parameter with the correct parameter of NRTP that is also consistent with the high logarithmic power trip setpoint parameter in Table 3.3.2-1.

These changes do not constitute a physical change to the Unit or make changes in the RPS instrumentation setpoints, system logic or manual actuation. In addition, these changes do not alter physical plant equipment or the way in which plant equipment is operated. This change is editorial in that it corrects the TS wording to match the appropriate power parameter that was originally intended and required by safety analyses, and that has been implemented since original licensing of the PVNGS plants. Therefore, this change does not involve a significant reduction in a margin of safety.

The NRC staff has reviewed the licensee's analysis and, based on this review, it appears that the three standards of 10 CFR 50.92(c) are satisfied. Therefore, the NRC staff proposes to determine that the amendment request involves no significant hazards consideration.

The Commission is seeking public comments on this proposed determination. Any comments received within 14 days after the date of publication of this notice will be considered in making any final determination.

Normally, the Commission will not issue the amendment until the expiration of the 14-day notice period. However, should circumstances change during the notice period, such that failure to act in a timely way would result, for example, in derating or shutdown of the facility, the Commission may issue the license amendment before the expiration of the 14-day notice period, provided that its final determination is that the amendment involves no significant hazards consideration. The final determination will consider all public and State comments received. Should the Commission take this action, it will publish in the FEDERAL REGISTER a notice of issuance. The Commission expects that the need to take this action will occur very infrequently.

Written comments may be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and should cite the publication date and page number of this FEDERAL REGISTER notice. Written comments may also be delivered to Room 6D59, Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, from 7:30 a.m. to 4:15 p.m. Federal workdays. Copies of written comments received may be examined at the NRC Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC.

The filing of requests for hearing and petitions for leave to intervene is discussed below.

By , the licensee may file a request for a hearing with respect to issuance of the amendment to the subject facility operating license and any person whose interest may be affected by this proceeding and who wishes to participate as a party in the proceeding must file a written request for a hearing and a petition for leave to intervene. Requests for a hearing and a petition for leave to intervene shall be filed in accordance with the Commission's "Rules of Practice for Domestic Licensing Proceedings" in 10 CFR Part 2. Interested persons should consult a current copy of 10 CFR 2.714 which is available at the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, and at the local public document room located at the Phoenix Public Library, 1221 N. Central Avenue, Phoenix, Arizona 85004. If a request for a hearing or petition for leave to intervene is filed by the above date, the Commission or an Atomic Safety and Licensing Board, designated by the Commission or by the Chairman of the Atomic Safety and Licensing Board Panel, will rule on the request and/or petition; and the Secretary or the designated Atomic Safety and Licensing Board will issue a notice of hearing or an appropriate order.

As required by 10 CFR 2.714, a petition for leave to intervene shall set forth with

particularity the interest of the petitioner in the proceeding, and how that interest may be affected by the results of the proceeding. The petition should specifically explain the reasons why intervention should be permitted with particular reference to the following factors: (1) the nature of the petitioner's right under the Act to be made a party to the proceeding; (2) the nature and extent of the petitioner's property, financial, or other interest in the proceeding; and (3) the possible effect of any order which may be entered in the proceeding on the petitioner's interest. The petition should also identify the specific aspect(s) of the subject matter of the proceeding as to which petitioner wishes to intervene. Any person who has filed a petition for leave to intervene or who has been admitted as a party may amend the petition without requesting leave of the Board up to 15 days prior to the first prehearing conference scheduled in the proceeding, but such an amended petition must satisfy the specificity requirements described above.

Not later than 15 days prior to the first prehearing conference scheduled in the proceeding, a petitioner shall file a supplement to the petition to intervene which must include a list of the contentions which are sought to be litigated in the matter. Each contention must consist of a specific statement of the issue of law or fact to be raised or controverted. In addition, the petitioner shall provide a brief explanation of the bases of the contention and a concise statement of the alleged facts or expert opinion which support the contention and on which the petitioner intends to rely in proving the contention at the hearing. The petitioner must also provide references to those specific sources and documents of which the petitioner is aware and on which the petitioner intends to rely to establish those facts or expert opinion. Petitioner must provide sufficient information to show that a genuine dispute exists with the applicant on a material issue of law or fact. Contentions shall be limited to matters

within the scope of the amendment under consideration. The contention must be one which, if proven, would entitle the petitioner to relief. A petitioner who fails to file such a supplement which satisfies these requirements with respect to at least one contention will not be permitted to participate as a party.

Those permitted to intervene become parties to the proceeding, subject to any limitations in the order granting leave to intervene, and have the opportunity to participate fully in the conduct of the hearing, including the opportunity to present evidence and cross-examine witnesses.

If the amendment is issued before the expiration of the 30-day hearing period, the Commission will make a final determination on the issue of no significant hazards consideration. If a hearing is requested, the final determination will serve to decide when the hearing is held.

If the final determination is that the amendment request involves no significant hazards consideration, the Commission may issue the amendment and make it immediately effective, notwithstanding the request for a hearing. Any hearing held would take place after issuance of the amendment.

If the final determination is that the amendment request involves a significant hazards consideration, any hearing held would take place before the issuance of any amendment.

A request for a hearing or a petition for leave to intervene must be filed with the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemakings and Adjudications Staff, or may be delivered to the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, by the above date. A copy of the petition should also be sent to the Office of the General Counsel, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to Nancy C. Loftin,

Esq., Corporate Secretary and Counsel, Arizona Public Service Company, P.O. Box 53999, Mail Station 9068, Phoenix, Arizona 85072-3999, attorney for the licensee.

Nontimely filings of petitions for leave to intervene, amended petitions, supplemental petitions and/or requests for hearing will not be entertained absent a determination by the Commission, the presiding officer or the presiding Atomic Safety and Licensing Board that the petition and/or request should be granted based upon a balancing of the factors specified in 10 CFR 2.714(a)(1)(i)-(v) and 2.714(d).

For further details with respect to this action, see the application for amendment dated October 6, 1998, which is available for public inspection at the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, and at the local public document room, located at the Phoenix Public Library, 1221 N. Central Avenue, Phoenix, Arizona 85004

Dated at Rockville, Maryland, this 8th day of October 1998.

FOR THE NUCLEAR REGULATORY COMMISSION

Mel B. Fields

Mel B. Fields, Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

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February 4, 1997

MEMORANDUM TO: Rules Review and Directives Branch
Division of Freedom of Information and Publications Services
Office of Administration

FROM: Office of Nuclear Reactor Regulation

SUBJECT: ARIZONA PUBLIC SERVICE COMPANY
(Palo Verde Nuclear Generating Station)

One signed original of the *Federal Register* Notice identified below is attached for your transmittal to the Office of the Federal Register for publication. Additional conformed copies (5) of the Notice are enclosed for your use.

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- ☐ Notice of Consideration of Issuance of Amendment to Facility Operating License. (Call with 30-day insert date).
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- ☐ Order.
- ☒ Exemption.
- ☐ Notice of Granting Exemption.
- ☐ Environmental Assessment.
- ☐ Notice of Preparation of Environmental Assessment.
- ☐ Receipt of Petition for Director's Decision Under 10 CFR 2.206.
- ☐ Issuance of Final Director's Decision Under 10 CFR 2.206.
- ☐ Other: _____

DOCKET NO. STN 50-530
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Contact: Charles R. Thomas
Telephone: 415-1325

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
ARIZONA PUBLIC SERVICE COMPANY, ET AL.	)	Docket No. STN 50-530
	)	
(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

Frank J. Miraglia, Jr.

Frank J. Miraglia, Jr., Acting Director
Office of Nuclear Reactor Regulation

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