

February 14, 1995

Mr. William L. Stewart
Executive Vice President, Nuclear
Arizona Public Service Company
Post Office Box 53999
Phoenix, Arizona 85072-3999

SUBJECT: ISSUANCE OF AMENDMENTS FOR THE PALO VERDE NUCLEAR GENERATING STATION
UNIT NO. 1 (TAC NO. M85011), UNIT NO. 2 (TAC NO. M85012), AND UNIT
NO. 3 (TAC NO. M85013)

Dear Mr. Stewart:

The Commission has issued the enclosed Amendment No. 90 to Facility Operating License No. NPF-41, Amendment No. 77 to Facility Operating License No. NPF-51, and Amendment No. 61 to Facility Operating License No. NPF-74 for the Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications in response to your letters dated November 20, 1992, as supplemented by letters dated October 22, 1993, and November 30, 1994.

These amendments will increase the allowable out-of-service time for the core operating limit supervisory system (COLSS) from 1 hour to 4 hours before the more restrictive limits based on the core protection calculators (CPCs) must be applied.

A copy of the related Safety Evaluation is also enclosed. A notice of issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

Original signed by:

Brian E. Holian, Senior Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529
and STN 50-530

- Enclosures:
- 1. Amendment No. 90 to NPF-41 **DISTRIBUTION**
 - 2. Amendment No. 77 to NPF-51 **Docket File**
 - 3. Amendment No. 61 to NPF-74 **JLuenman**
 - 4. Safety Evaluation

Public
DFoster-Curseen
GHill (6), T5C3
OC/LFDCB, T9E10
PDIV-2/RF
OGC, 015B18
ACRS (4), T2E26
BHolian
KPerkins, WCFO

OPA, 02G5
JRoe
TQuay
CGrimes, 011E22
Region IV, WCFO(4)
LTran

cc w/encls: See next page

DOCUMENT NAME: PV85011.AMD

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OFC	PDIV-2/LA <i>JL</i>	PDIV-2/PM	PDIV-2/PM	OTSB/D	SRXB/D	OGC <i>W</i>	PDIV-2/D
NAME	DFoster-Curseen	LTran* <i>L</i>	BHolian <i>ret</i>	CGrimes <i>ret</i>	RJones	<i>U Quay</i>	TQuay
DATE	1/3/95	1/3/95	2/18/95	1/19/95	1/5/95	2/3/95	1/1/95

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Mr. William L. Stewart
Arizona Public Service Company

Palo Verde

cc:

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

February 14, 1995

Mr. William L. Stewart
Executive Vice President, Nuclear
Arizona Public Service Company
Post Office Box 53999
Phoenix, Arizona 85072-3999

SUBJECT: ISSUANCE OF AMENDMENTS FOR THE PALO VERDE NUCLEAR GENERATING STATION
UNIT NO. 1 (TAC NO. M85011), UNIT NO. 2 (TAC NO. M85012), AND UNIT
NO. 3 (TAC NO. M85013)

Dear Mr. Stewart:

The Commission has issued the enclosed Amendment No. 90 to Facility Operating License No. NPF-41, Amendment No. 77 to Facility Operating License No. NPF-51, and Amendment No. 61 to Facility Operating License No. NPF-74 for the Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications in response to your letters dated November 20, 1992, as supplemented by letters dated October 22, 1993, and November 30, 1994.

These amendments will increase the allowable out-of-service time for the core operating limit supervisory system (COLSS) from 1 hour to 4 hours before the more restrictive limits based on the core protection calculators (CPCs) must be applied.

A copy of the related Safety Evaluation is also enclosed. A notice of issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

A handwritten signature in black ink, appearing to read "B E Holian".

Brian E. Holian, Senior Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529
and STN 50-530

Enclosures: 1. Amendment No. 90 to NPF-41
2. Amendment No. 77 to NPF-51
3. Amendment No. 61 to NPF-74
4. Safety Evaluation

cc w/encls: See next page



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

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-528

PALO VERDE NUCLEAR GENERATING STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 90
License No. NPF-41

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Arizona Public Service Company (APS or the licensee) on behalf of itself and the 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 dated November 20, 1992, as supplemented by letters dated October 22, 1993, and November 30, 1994, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-41 is hereby amended to read as follows:

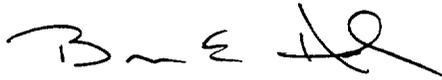
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P PDR

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No.90 , and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of the date of issuance and must be fully implemented no later than 45 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Brian E. Holian, Senior Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: February 14, 1995

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 90 TO FACILITY OPERATING LICENSE NO. NPF-41

DOCKET NO. STN 50-528

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change. The corresponding overleaf pages are also provided to maintain document completeness.

Remove

3/4 2-1
3/4 2-5
B 3/4 2-1

B 3/4 2-3

Insert

3/4 2-1
3/4 2-5
B 3/4 2-1
B 3/4 2-1a
B 3/4 2-3
B 3/4 2-3a

3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

3.2.1 The linear heat rate limit specified in the CORE OPERATING LIMITS REPORT shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to the COLSS calculated power operating limit based on linear heat rate (when COLSS is in service); or
- b. Maintaining peak linear heat rate within its limit using any operable CPC channel (when COLSS is out of service).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

- a. If the linear heat rate is not being maintained within the LCO limit, perform the following:
 1. If COLSS is in service, within 15 minutes initiate corrective action to restore the linear heat rate to within the LCO limit within 1 hour; or
 2. If COLSS is out of service, within 15 minutes and at least once every 15 minutes thereafter, verify that there is no adverse trend in LHR using any operable CPC channel; and
 - a) Upon identification that an adverse trend in LHR exists, within 15 minutes initiate corrective action to restore the LHR to within the LCO limit within 1 hour.
 - b) With no adverse trend, restore the LHR to within the LCO limit within 4 hours.
- b. If linear heat rate cannot be restored to within the LCO limit, as required by ACTION a., reduce THERMAL POWER to less than or equal to 20% RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limit when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within its limit.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on linear heat rate.

POWER DISTRIBUTION LIMITS

3/4.2.2 PLANAR RADIAL PEAKING FACTORS - F_{xy}

LIMITING CONDITION FOR OPERATION

3.2.2 The measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) shall be less than or equal to the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the Core Operating Limit Supervisory System (COLSS) and in the Core Protection Calculators (CPC).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

With an F_{xy}^m exceeding a corresponding F_{xy}^c , within 6 hours either:

- a. Adjust the CPC addressable constants to increase the multiplier applied to planar radial peaking by a factor equivalent to greater than or equal to F_{xy}^m/F_{xy}^c and restrict subsequent operation so that a margin to the COLSS operating limits of at least $[(F_{xy}^m/F_{xy}^c) - 1.0] \times 100\%$ is maintained; or
- b. Adjust the affected PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPC to a value greater than or equal to the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) or
- c. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER.

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 The measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) obtained by using the incore detection system, shall be determined to be less than or equal to the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c), used in the COLSS and CPC at the following intervals:

- a. After each fuel loading with THERMAL POWER greater than 40% but prior to operation above 70% of RATED THERMAL POWER, and
- b. At least once per 31 Effective Full Power Days.

*See Special Test Exception 3.10.2.

POWER DISTRIBUTION LIMITS

3/4.2.4 DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by one of the following methods:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
- b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance specified in the CORE OPERATING LIMITS REPORT (when COLSS is in service and neither CEAC is operable); or
- c. Operating within the region of acceptable operation specified in the CORE OPERATING LIMITS REPORT using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
- d. Operating within the region of acceptable operation specified in the CORE OPERATING LIMITS REPORT using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

- a. If the DNBR is not being maintained within the LCO limits, perform the following:
 1. If COLSS is in service, within 15 minutes initiate corrective action to restore the DNBR to within the LCO limits within 1 hour; or
 2. If COLSS is out of service, within 15 minutes and at least once every 15 minutes thereafter, verify that there is no adverse trend in DNBR using any operable CPC channel; and
 - a) Upon identification that an adverse trend in DNBR exists, within 15 minutes initiate corrective action to restore the DNBR to within the LCO limits within 1 hour.
 - b) With no adverse trend, restore the DNBR to within the LCO limits within 4 hours.
- b. If DNBR cannot be restored to within the LCO limits, as required by ACTION a., reduce THERMAL POWER to less than or equal to 20% RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit specified in the CORE OPERATING LIMITS REPORT.

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

POWER DISTRIBUTION LIMITS

3/4.2.5 RCS FLOW RATE

LIMITING CONDITION FOR OPERATION

3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to 155.8×10^6 lbm/hr.

APPLICABILITY: MODE 1.

ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5 The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to its limit at least once per 12 hours.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE

The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limits specified in the CORE OPERATING LIMITS REPORT are not exceeded.

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the maximum linear heat rate calculated by COLSS is conservative with respect to the actual maximum linear heat rate existing in the core. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB, and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the linear heat rate limit can be maintained by utilizing any operable CPC channel. The above listed uncertainty and penalty factors plus those associated with the CPC startup test acceptance criteria are also included in the CPCs.

The core power distribution and a corresponding POL based on LHR are more accurately determined by the COLSS using the incore detector system. The CPCs determine LHR less accurately with the excore detectors. When COLSS is not available the TS LCOs are more restrictive due to the greater power distribution uncertainty of the CPCs. However, when COLSS become inoperable the added margin associated with CPC uncertainty is not immediately required and a 4-hour ACTION is provided for appropriate corrective action.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE (Continued)

When operating with the COLSS out of service there is a possibility of a slow undetectable transient that degrades the LHR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. To remedy this, the CPC calculated values of LHR are monitored every 15 minutes when the COLSS is out of service. The increased monitoring of LHR during the 4-hour ACTION period ensures that adequate safety margin is maintained for anticipated operational occurrences and no postulated accident results in consequences more severe than those described in Chapter 15 of the UFSAR. Also, a maximum allowable change in the CPC calculated LHR ensures that further degradation requires the operators to take immediate action to reduce reactor power to comply with the Technical Specifications. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a decrease in reactor power and subsequent compliance with the existing COLSS out-of-service TS limits.

Four hours is allowed for restoring the LHR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of LHR has been increased, and, if operation is maintained steady, the likelihood of exceeding the LHR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

POWER DISTRIBUTION LIMITS

BASES

AZIMUTHAL POWER TILT - T_q (Continued)

$P_{\text{tilt}}/P_{\text{untilt}}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions and which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on DNBR includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the core power limits calculated by COLSS (based on the minimum DNBR Limit) are conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits specified in the CORE OPERATING LIMITS REPORT can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

The core power distribution and a corresponding POL based on DNBR are more accurately determined by the COLSS using the incore detector system. The CPCs determine DNBR less accurately with the excore detectors. When COLSS is not available the TS LCOs are more restrictive due to the greater power distribution uncertainty of the CPCs. However, when COLSS become inoperable the added margin associated with CPC uncertainty is not immediately required and a 4-hour ACTION is provided for appropriate corrective action.

When operating with the COLSS out of service there is a possibility of a slow undetectable transient that degrades the DNBR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. To remedy

POWER DISTRIBUTION LIMITS

BASES

3/4.2.4 DNBR MARGIN (Continued)

this, the CPC calculated values of DNBR are monitored every 15 minutes when the COLSS is out of service. The increased monitoring of DNBR during the 4-hour ACTION period ensures that adequate safety margin is maintained for anticipated operational occurrences and no postulated accident results in consequences more severe than those described in Chapter 15 of the UFSAR. Also, a maximum allowable change in the CPC calculated DNBR ensures that further degradation requires the operators to take immediate action to reduce reactor power to comply with the Technical Specifications. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a decrease in reactor power and subsequent compliance with the existing COLSS out-of-service TS limits.

Four hours is allowed for restoring the DNBR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of DNBR has been increased, and, if operation is maintained steady, the likelihood of exceeding the DNBR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.



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

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-529

PALO VERDE NUCLEAR GENERATING STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 77
License No. NPF-51

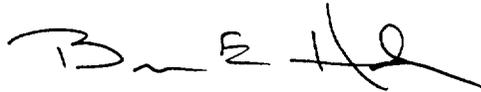
1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Arizona Public Service Company (APS or the licensee) on behalf of itself and the Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Southern California Edison Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority dated November 20, 1992, as supplemented by letters dated October 22, 1993, and November 30, 1994, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-51 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 77, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of the date of issuance and must be fully implemented no later than 45 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Brian E. Holian, Senior Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: February 14, 1995

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 77 TO FACILITY OPERATING LICENSE NO. NPF-51

DOCKET NO. STN 50-529

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change. The corresponding overleaf pages are also provided to maintain document completeness.

Remove

3/4 2-1
3/4 2-5
B 3/4 2-1

B 3/4 2-3

Insert

3/4 2-1
3/4 2-5
B 3/4 2-1
B 3/4 2-1a
B 3/4 2-3
B 3/4 2-3a

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. TO FACILITY OPERATING LICENSE NO. NPF-74

DOCKET NO. STN 50-530

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change. The corresponding overleaf pages are also provided to maintain document completeness.

Remove

3/4 2-1
3/4 2-5
B 3/4 2-1

B 3/4 2-3

Insert

3/4 2-1
3/4 2-5
B 3/4 2-1
B 3/4 2-1a
B 3/4 2-3
B 3/4 2-3a

POWER DISTRIBUTION LIMITS

3/4.2.4 DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by one of the following methods:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
- b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance specified in the CORE OPERATING LIMITS REPORT (when COLSS is in service and neither CEAC is operable); or
- c. Operating within the region of acceptable operation specified in the CORE OPERATING LIMITS REPORT using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
- d. Operating within the region of acceptable operation specified in the CORE OPERATING LIMITS REPORT using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

- a. If the DNBR is not being maintained within the LCO limits, perform the following:
 1. If COLSS is in service, within 15 minutes initiate corrective action to restore the DNBR to within the LCO limits within 1 hour; or
 2. If COLSS is out of service, within 15 minutes and at least once every 15 minutes thereafter, verify that there is no adverse trend in DNBR using any operable CPC channel; and
 - a) Upon identification that an adverse trend in DNBR exists, within 15 minutes initiate corrective action to restore the DNBR to within the LCO limits within 1 hour.
 - b) With no adverse trend, restore the DNBR to within the LCO limits within 4 hours.
- b. If DNBR cannot be restored to within the LCO limits, as required by ACTION a., reduce THERMAL POWER to less than or equal to 20% RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit specified in the CORE OPERATING LIMITS REPORT.

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

POWER DISTRIBUTION LIMITS

3/4.2.5 RCS FLOW RATE

LIMITING CONDITION FOR OPERATION

3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to 155.8×10^6 lbm/hr.

APPLICABILITY: MODE 1.

ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5 The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to its limit at least once per 12 hours.

3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

3.2.1 The linear heat rate limit specified in the CORE OPERATING LIMITS REPORT shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to the COLSS calculated power operating limit based on linear heat rate (when COLSS is in service); or
- b. Maintaining peak linear heat rate within its limit using any operable CPC channel (when COLSS is out of service).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

- a. If the linear heat rate is not being maintained within the LCO limit, perform the following:
 1. If COLSS is in service, within 15 minutes initiate corrective action to restore the linear heat rate to within the LCO limit within 1 hour; or
 2. If COLSS is out of service, within 15 minutes and at least once every 15 minutes thereafter, verify that there is no adverse trend in LHR using any operable CPC channel; and
 - a) Upon identification that an adverse trend in LHR exists, within 15 minutes initiate corrective action to restore the LHR to within the LCO limit within 1 hour.
 - b) With no adverse trend, restore the LHR to within the LCO limit within 4 hours.
- b. If linear heat rate cannot be restored to within the LCO limit, as required by ACTION a., reduce THERMAL POWER to less than or equal to 20% RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limit when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within its limit.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on linear heat rate.

POWER DISTRIBUTION LIMITS

3/4.2.2 PLANAR RADIAL PEAKING FACTORS - F_{xy}

LIMITING CONDITION FOR OPERATION

3.2.2 The measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) shall be less than or equal to the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the Core Operating Limit Supervisory System (COLSS) and in the Core Protection Calculators (CPC).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

With an F_{xy}^m exceeding a corresponding F_{xy}^c , within 6 hours either:

- a. Adjust the CPC addressable constants to increase the multiplier applied to planar radial peaking by a factor equivalent to greater than or equal to F_{xy}^m/F_{xy}^c and restrict subsequent operation so that a margin to the COLSS operating limits of at least $[(F_{xy}^m/F_{xy}^c) - 1.0] \times 100\%$ is maintained; or
- b. Adjust the affected PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPC to a value greater than or equal to the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) or
- c. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER.

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 The measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) obtained by using the incore detection system, shall be determined to be less than or equal to the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c), used in the COLSS and CPC at the following intervals:

- a. After each fuel loading with THERMAL POWER greater than 40% but prior to operation above 70% of RATED THERMAL POWER, and
- b. At least once per 31 Effective Full Power Days.

*See Special Test Exception 3.10.2.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE

The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limits specified in the CORE OPERATING LIMITS REPORT are not exceeded.

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the maximum linear heat rate calculated by COLSS is conservative with respect to the actual maximum linear heat rate existing in the core. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB, and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the linear heat rate limit can be maintained by utilizing any operable CPC channel. The above listed uncertainty and penalty factors plus those associated with the CPC startup test acceptance criteria are also included in the CPCs.

The core power distribution and a corresponding POL based on LHR are more accurately determined by the COLSS using the incore detector system. The CPCs determine LHR less accurately with the excore detectors. When COLSS is not available the TS LCOs are more restrictive due to the greater power distribution uncertainty of the CPCs. However, when COLSS become inoperable the added margin associated with CPC uncertainty is not immediately required and a 4-hour ACTION is provided for appropriate corrective action.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE (Continued)

When operating with the COLSS out of service there is a possibility of a slow undetectable transient that degrades the LHR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. To remedy this, the CPC calculated values of LHR are monitored every 15 minutes when the COLSS is out of service. The increased monitoring of LHR during the 4-hour ACTION period ensures that adequate safety margin is maintained for anticipated operational occurrences and no postulated accident results in consequences more severe than those described in Chapter 15 of the UFSAR. Also, a maximum allowable change in the CPC calculated LHR ensures that further degradation requires the operators to take immediate action to reduce reactor power to comply with the Technical Specifications. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a decrease in reactor power and subsequent compliance with the existing COLSS out-of-service TS limits.

Four hours is allowed for restoring the LHR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of LHR has been increased, and, if operation is maintained steady, the likelihood of exceeding the LHR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

POWER DISTRIBUTION LIMITS

BASES

AZIMUTHAL POWER TILT - T_q (Continued)

$P_{\text{tilt}}/P_{\text{no tilt}}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions and which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on DNBR includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the core power limits calculated by COLSS (based on the minimum DNBR Limit) is conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits specified in the CORE OPERATING LIMITS REPORT can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

The core power distribution and a corresponding POL based on DNBR are more accurately determined by the COLSS using the incore detector system. The CPCs determine DNBR less accurately with the excore detectors. When COLSS is not available the TS LCOs are more restrictive due to the greater power distribution uncertainty of the CPCs. However, when COLSS become inoperable the added margin associated with CPC uncertainty is not immediately required and a 4-hour ACTION is provided for appropriate corrective action.

POWER DISTRIBUTION LIMITS

BASES

3/4.2.4 DNBR MARGIN (Continued)

When operating with the COLSS out of service there is a possibility of a slow undetectable transient that degrades the DNBR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. To remedy this, the CPC calculated values of DNBR are monitored every 15 minutes when the COLSS is out of service. The increased monitoring of DNBR during the 4-hour ACTION period ensures that adequate safety margin is maintained for anticipated operational occurrences and no postulated accident results in consequences more severe than those described in Chapter 15 of the UFSAR. Also, a maximum allowable change in the CPC calculated DNBR ensures that further degradation requires the operators to take immediate action to reduce reactor power to comply with the Technical Specifications. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a decrease in reactor power and subsequent compliance with the existing COLSS out-of-service TS limits.

Four hours is allowed for restoring the DNBR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of DNBR has been increased, and, if operation is maintained steady, the likelihood of exceeding the DNBR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

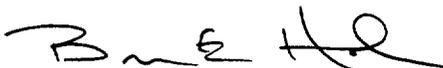
A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 61, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of the date of issuance and must be fully implemented no later than 45 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Brian E. Holian, Senior Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: February 14, 1995



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

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-530

PALO VERDE NUCLEAR GENERATING STATION, UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 61
License No. NPF-74

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Arizona Public Service Company (APS or the licensee) on behalf of itself and the 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 dated November 20, 1992, as supplemented by letters dated October 22, 1993, and November 30, 1994, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-74 is hereby amended to read as follows:

3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

3.2.1 The linear heat rate limit specified in the CORE OPERATING LIMITS REPORT shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to the COLSS calculated power operating limit based on linear heat rate (when COLSS is in service); or
- b. Maintaining peak linear heat rate within its limit using any operable CPC channel (when COLSS is out of service).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

- a. If the linear heat rate is not being maintained within the LCO limit, perform the following:
 1. If COLSS is in service, within 15 minutes initiate corrective action to restore the linear heat rate to within the LCO limit within 1 hour; or
 2. If COLSS is out of service, within 15 minutes and at least once every 15 minutes thereafter, verify that there is no adverse trend in LHR using any operable CPC channel; and
 - a) Upon identification that an adverse trend in LHR exists, within 15 minutes initiate corrective action to restore the LHR to within the LCO limit within 1 hour.
 - b) With no adverse trend, restore the LHR to within the LCO limit within 4 hours.
- b. If linear heat rate cannot be restored to within the LCO limit, as required by ACTION a., reduce THERMAL POWER to less than or equal to 20% RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limit when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within its limit.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on linear heat rate.

POWER DISTRIBUTION LIMITS

3/4.2.2 PLANAR RADIAL PEAKING FACTORS - F_{xy}

LIMITING CONDITION FOR OPERATION

3.2.2 The measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) shall be less than or equal to the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the Core Operating Limit Supervisory System (COLSS) and in the Core Protection Calculators (CPC).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

With an F_{xy}^m exceeding a corresponding F_{xy}^c , within 6 hours either:

- a. Adjust the CPC addressable constants to increase the multiplier applied to planar radial peaking by a factor equivalent to greater than or equal to F_{xy}^m/F_{xy}^c and restrict subsequent operation so that a margin to the COLSS operating limits of at least $[(F_{xy}^m/F_{xy}^c) - 1.0] \times 100\%$ is maintained; or
- b. Adjust the affected PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPC to a value greater than or equal to the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) or
- c. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER.

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 The measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) obtained by using the incore detection system, shall be determined to be less than or equal to the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c), used in the COLSS and CPC at the following intervals:

- a. After each fuel loading with THERMAL POWER greater than 40% but prior to operation above 70% of RATED THERMAL POWER, and
- b. At least once per 31 Effective Full Power Days.

*See Special Test Exception 3.10.2.

POWER DISTRIBUTION LIMITS

3/4.2.4 DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by one of the following methods:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
- b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance specified in the CORE OPERATING LIMITS REPORT (when COLSS is in service and neither CEAC is operable); or
- c. Operating within the region of acceptable operation specified in the CORE OPERATING LIMITS REPORT using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
- d. Operating within the region of acceptable operation specified in the CORE OPERATING LIMITS REPORT using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

- a. If the DNBR is not being maintained within the LCO limits, perform the following:
 1. If COLSS is in service, within 15 minutes initiate corrective action to restore the DNBR to within the LCO limits within 1 hour; or
 2. If COLSS is out of service, within 15 minutes and at least once every 15 minutes thereafter, verify that there is no adverse trend in DNBR using any operable CPC channel; and
 - a) Upon identification that an adverse trend in DNBR exists, within 15 minutes initiate corrective action to restore the DNBR to within the LCO limits within 1 hour.
 - b) With no adverse trend, restore the DNBR to within the LCO limits within 4 hours.
- b. If DNBR cannot be restored to within the LCO limits, as required by ACTION a., reduce THERMAL POWER to less than or equal to 20% RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit specified in the CORE OPERATING LIMITS REPORT.

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

POWER DISTRIBUTION LIMITS

3/4.2.5 RCS FLOW RATE

LIMITING CONDITION FOR OPERATION

3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to 155.8×10^6 lbm/hr.

APPLICABILITY: MODE 1.

ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5 The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to its limit at least once per 12 hours.

POWER DISTRIBUTION LIMITS

BASES

AZIMUTHAL POWER TILT - T_q (Continued)

$P_{\text{tilt}}/P_{\text{untilt}}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on DNBR includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the core power limits calculated by COLSS (based on the minimum DNBR Limit) are conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits specified in the CORE OPERATING LIMITS REPORT can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

The core power distribution and a corresponding POL based on DNBR are more accurately determined by the COLSS using the incore detector system. The CPCs determine DNBR less accurately with the excore detectors. When COLSS is not available the TS LCOs are more restrictive due to the greater power distribution uncertainty of the CPCs. However, when COLSS becomes inoperable the added margin associated with CPC uncertainty is not immediately required and a 4-hour ACTION is provided for appropriate corrective action.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE (Continued)

When operating with the COLSS out of service there is a possibility of a slow undetectable transient that degrades the DNBR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. To remedy this, the CPC calculated values of DNBR are monitored every 15 minutes when the COLSS is out of service. The increased monitoring of DNBR during the 4-hour ACTION period ensures that adequate safety margin is maintained for anticipated operational occurrences and no postulated accident results in consequences more severe than those described in Chapter 15 of the UFSAR. Also, a maximum allowable change in the CPC calculated DNBR ensures that further degradation requires the operators to take immediate action to reduce reactor power to comply with the Technical Specifications. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a decrease in reactor power and subsequent compliance with the existing COLSS out-of-service TS limits.

Four hours is allowed for restoring the DNBR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of DNBR has been increased, and, if operation is maintained steady, the likelihood of exceeding the DNBR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE

The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limits specified in the CORE OPERATING LIMITS REPORT are not exceeded.

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the maximum linear heat rate calculated by COLSS is conservative with respect to the actual maximum linear heat rate existing in the core. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB, and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the linear heat rate limit can be maintained by utilizing any operable CPC channel. The above listed uncertainty and penalty factors plus those associated with the CPC startup test acceptance criteria are also included in the CPCs.

The core power distribution and a corresponding POL based on LHR are more accurately determined by the COLSS using the incore detector system. The CPCs determine LHR less accurately with the excore detectors. When COLSS is not available the TS LCOs are more restrictive due to the greater power distribution uncertainty of the CPCs. However, when COLSS become inoperable the added margin associated with CPC uncertainty is not immediately required and a 4-hour ACTION is provided for appropriate corrective action.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE (Continued)

When operating with the COLSS out of service there is a possibility of a slow undetectable transient that degrades the LHR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. To remedy this, the CPC calculated values of LHR are monitored every 15 minutes when the COLSS is out of service. The increased monitoring of LHR during the 4-hour ACTION period ensures that adequate safety margin is maintained for anticipated operational occurrences and no postulated accident results in consequences more severe than those described in Chapter 15 of the UFSAR. Also, a maximum allowable change in the CPC calculated LHR ensures that further degradation requires the operators to take immediate action to reduce reactor power to comply with the Technical Specifications. Implementation of this requirement ensures that reductions in core thermal margin are quickly detected and, if necessary, results in a decrease in reactor power and subsequent compliance with the existing COLSS out-of-service TS limits.

Four hours is allowed for restoring the LHR to within limits if the COLSS is not restored to OPERABLE status. This duration is reasonable because the Frequency of the CPC determination of LHR has been increased, and, if operation is maintained steady, the likelihood of exceeding the LHR limit during this period is not increased. The likelihood of induced reactor transients from an early power reduction is also decreased.

The primary consideration in extending the COLSS out-of-service time limit is the possibility of a slow, undetectable transient that degrades the LHR and/or DNBR slowly over the 4-hour period and is then followed by an anticipated operational occurrence or an accident. Prior to implementing the new TS, the licensee will revise the procedure for operating when the COLSS is out of service (OOS). In general, when the COLSS becomes out of service (OOS), LHR and DNBR values will be recorded from each operable CPC channel within 15 minutes. An adverse trend limit for LHR and DNBR limits will be calculated and recorded for each operable CPC channel to define the acceptable area of operation for each parameter. The adverse trend limit is defined as a decrease in DNBR of 0.1 units or an increase in LHR of 0.2 kW/ft relative to the initial values recorded. At least once per 15 minutes, LHR and DNBR values will be recorded from each operable CPC channel. The DNBR and LHR values will be compared to the adverse trend limit calculated values. If an adverse trend is identified, then corrective action will be taken within 15 minutes to ensure that the COLSS OOS LCO criterion for the parameter(s) exhibiting an adverse trend (DNBR or LHR) is satisfied within 1 hour of adverse trend identification. If LHR and/or DNBR cannot be restored to within the COLSS OOS LCO limits, thermal power will be reduced to less than or equal to 20 percent rated thermal power within the next 6 hours, in accordance with the LCO action. A comparison of LHR and DNBR to the LCO limits will be made each time data is taken. If the DNBR or LHR LCO for COLSS OOS is met (i.e., the more restrictive LCO limits can be met), the parameter will be monitored every 2 hours using CPCs in accordance with TS Surveillance Requirement (SR) 4.3.2.1, and 15 minute monitoring will no longer be performed for that parameter. SR 4.3.2.1 only applies for COLSS OOS when operating within the COLSS OOS limit lines (either the 4-hour allowance has been exceeded or the COLSS OOS limits can be met). If no adverse trend is identified, appropriate action will be taken to ensure that both the LHR and the DNBR TS LCOs are satisfied within 4 hours of when the COLSS became OOS and that the COLSS is returned to service within 4 hours.

The staff concluded that 4 hours is a reasonable time to attempt to restore the COLSS to service prior to taking corrective action to restore the LHR and DNBR to within their limits. This duration is reasonable because the frequency monitoring of the CPC determination of LHR and DNBR is increased (as discussed above) and, if operation is maintained steady, the likelihood of exceeding the LHR and/or DNBR limit during this period is not increased. Additionally, the likelihood of induced reactor transients from an early power reduction is decreased. The proposed amendments do not alter the current power operating limits or change COLSS or CPC software.

The licensee will make no physical change to plant systems, structures, or components nor will the proposed amendment affect any safety-related equipment used in the mitigation of anticipated operational occurrences or design-basis accidents. The proposed changes distinguish between the ACTION requirements applicable when the COLSS is out of service and revise the TS to replace the requirement to initiate corrective action within 15 minutes. Instead, the TS would require restoration of LHR and DNBR within 4 hours and the LHR and DNBR will be monitored every 15 minutes during the 4-hour period if adverse trends are identified. Therefore, for the reasons stated above, the staff concludes

The COLSS uses incore detectors to accurately determine core power distribution and calculate the core power operating limits (POLs) corresponding to the allowable LHR and DNBR. These calculations are then used to accurately monitor TS limiting conditions for operation for DNBR margin and LHR. The parameters required to maintain the operating limit power level based on linear heat rate, margin to DNBR, and total core power are also monitored by the CPCs. The CPCs calculate operating-limit-based LHR and DNBR from excore detectors and other inputs. The CPC method for calculating LHR and DNBR is less accurate than the COLSS method and requires additional safety margin. Due to the CPC uncertainties, the TS LCOs are accordingly more restrictive when the CPCs are used to determine LHR and DNBR. Therefore, during normal operations at full power, with the COLSS calculated core power below the COLSS POLs, the CPCs typically indicate a DNBR margin outside the TS LCO.

Presently, if the COLSS is out of service, TS 3.2.1, "Linear Heat Rate (LHR)," and TS 3.2.4, "Departure from Nucleate Boiling Ratio (DNBR) Margin," require that LHR and DNBR be maintained with a more restrictive set of limits based on the CPCs. If these limits are not maintained, corrective action (power reduction) must be initiated within 15 minutes and LHR and DNBR must be restored to within the prescribed limits within 1 hour; otherwise, thermal power must be reduced to less than or equal to 20-percent rated thermal power within the next 6 hours.

During normal operations, core power distribution is continuously monitored by the COLSS to verify that the LHR and DNBR margin are within TS limits. When the COLSS is not available, the TSs allow LHR and DNBR margin to be monitored using the CPCs. The core power distribution is more accurately determined with the incore detector system used by the COLSS than with the excore detectors used by the CPCs. Therefore, the TS LCOs are more restrictive when the CPCs are used (i.e., TS require larger margins of safety when the COLSS is out of service).

With the COLSS out of service, the proposed amendment replaces the current 15-minute time limit for initiating corrective action with a requirement to restore the specified LHR and DNBR margin limits using any operable CPC channel within 4 hours. The licensee stated that this will provide a reasonable opportunity for restoration of the COLSS and will minimize unnecessary power reductions.

3.0 EVALUATION

The intent of TS 3.2.1 and 3.2.4 is to maintain the reactor within the range of initial conditions that was assumed in the licensee's safety analysis. Maintaining the LHR and DNBR within the specified limits ensures that, during normal operation and anticipated operational occurrences (AOOs), the fuel cladding will not exceed the limit set forth in 10 CFR 50.46 and the consequences of an accident will be bounded by the Updated Final Safety Analysis Report (UFSAR) Chapter 15 analysis.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 90 TO FACILITY OPERATING LICENSE NO. NPF-41,
AMENDMENT NO. 77 TO FACILITY OPERATING LICENSE NO. NPF-51,
AND AMENDMENT NO. 61 TO FACILITY OPERATING LICENSE NO. NPF-74
ARIZONA PUBLIC SERVICE COMPANY, ET AL.
PALO VERDE NUCLEAR GENERATING STATION, UNIT NOS. 1, 2, AND 3
DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

1.0 INTRODUCTION

By letter dated November 20, 1992, as supplemented by letters dated October 22, 1993, and November 30, 1994, Arizona Public Service Company (APS or the licensee) submitted a request for changes to the Technical Specifications (TS) for the Palo Verde Nuclear Generating Station, Units 1, 2, and 3 (Appendix A to Facility Operating License Nos. NPF-41, NPF-51, and NPF-74, respectively). The Arizona Public Service Company submitted this request on behalf of itself, the Salt River Project Agricultural Improvement and Power District, Southern California Edison Company, El Paso Electric Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority. The proposed changes would revise TS 3.2.1 and 3.2.4 and the associated Bases for the Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3. These amendments would increase the time limit that the core operating limit supervisory system (COLSS) may be out of service before the action requirements based on the more restrictive core protection calculator (CPC) limits apply. The proposed amendments would also differentiate the actions required for operating with and without the COLSS.

The October 22, 1993, and November 30, 1994, letters responded to the staff's March 16, 1993, request for additional information. These supplemental letters provided certain revised TS pages for clarification purposes and did not change the original no significant hazards determination.

2.0 DISCUSSION

The COLSS and the CPCs provide two different methods of monitoring the core power distribution. The COLSS and CPCs that monitor the core power distribution are capable of verifying that the departure from nucleate boiling ratio (DNBR) and the linear heat rate (LHR) do not exceed their limits.

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that the proposed changes to TS 3.2.1 and 3.2.4 and the associated Bases are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arizona State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (58 FR 591). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: February 14, 1995