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Document Control Branch (Document Control Desk) See Proposed Change to T/S

SUBJECT: Application for amends to licenses NPF-41,NPF-51 & NPF-74, adding listed analytical method & associated NRC SER to TS 6.9.1.10, "COLR." Prorpietary "PVNGS-3 Cycle 6 ECCS Performance Analysis" encl.Proprietary analysis withheld.

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WILLIAM L. STEWART
EXECUTIVE VICE PRESIDENT
NUCLEAR

102-03435-WLS/SAB/JRP
August 3, 1995

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Proposed Amendment to Technical Specification Section 6.9.1.10

Pursuant to 10 CFR 50.90, Arizona Public Service Company (APS) submits herewith a proposed amendment to Technical Specification (TS) Section 6.9.1.10, Core Operating Limits Report. This proposed amendment is requested to add the analytical method supplement entitled "Fuel Rod Maximum Allowable Gas Pressure," CEN-372-P-A, dated May 1990, and its associated Nuclear Regulatory Commission Safety Evaluation Report, dated April 10, 1990, to the list of analytical methods in TS 6.9.1.10 used to determine the PVNGS core operating limits. Approval of this amendment is requested by November 27, 1995, in order to support startup of PVNGS Unit 3 following the refueling outage. For PVNGS Units 1 and 2, it is requested that this amendment be implemented prior to startup from their next refueling outages (Refueling 6, scheduled for September 21, 1996, and March 16, 1996, respectively).

Provided in the enclosure to this letter are the following:

A. Description of the Proposed Amendment
B. Purpose of the Technical Specification
C. Need for the Technical Specification Amendment
D. Safety Analysis of the Proposed Technical Specification Amendment
E. No Significant Hazards Consideration Determination
F. Environmental Consideration
G. Marked-up Technical Specification Pages

In accordance with Technical Specification Section 6.5, the Plant Review Board and Offsite Safety Review Committee have reviewed and concur with this proposed amendment.

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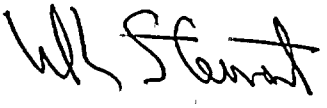
Ltr. Encl.
Change: NRC RDC 1 INP

The attachment to the enclosure contains the PVNGS Unit 3 Cycle 6 (U3C6) ECCS Performance Analysis. This analysis contains information which is proprietary to ABB-CE, for which an affidavit is provided. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and specifically addresses the considerations listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations. Accordingly, it is respectfully requested that the attachment be withheld from public disclosure in accordance with Title 10 of the Code of Federal Regulations, Section 2.790.

Pursuant to 10 CFR 50.91(b)(1), a copy of this request is being forwarded to the Arizona Radiation Regulatory Agency.

Should you have any questions, please contact Scott A. Bauer at (602) 393-5978.

Sincerely,



WLS/SAB/JRP/rv
Enclosure

cc: L. J. Callan
K. E. Perkins
B. E. Holian
K. E. Johnston
A. V. Godwin (ARRA)

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, W. L. Stewart, represent that I am Executive Vice President - Nuclear, Arizona Public Service Company (APS), that the foregoing document has been signed by me on behalf of APS with full authority to do so, and that to the best of my knowledge and belief, the statements made therein are true and correct.

W. L. Stewart

Sworn To Before Me This 3 Day Of August 1995.

Roxanna VanBelle
Notary Public

My Commission Expires

My Commission Expires June 12, 1997

ENCLOSURE

PROPOSED AMENDMENT TO TECHNICAL SPECIFICATION

SECTION 6.9.1.10

A. DESCRIPTION OF THE PROPOSED AMENDMENT

Arizona Public Service Company (APS) proposes to modify the list of analytical methods used to determine the Palo Verde Nuclear Generating Station (PVNGS) core operating limits, identified in Technical Specification (TS) Section 6.9.1.10, by adding the following references:

6.9.1.10.j "Fuel Rod Maximum Allowable Gas Pressure," CEN-372-P-A, May 1990 (Methodology for Specification 3.2.1, Linear Heat Rate).

6.9.1.10.k Letter from A.C. Thadani, (NRC), to A. E. Scherer ABB-Combustion Engineering (ABB-CE), dated April 10, 1990, "Acceptance for Reference ABB-CE Topical Report," CEN-372-P.

B. PURPOSE OF THE TECHNICAL SPECIFICATION

Technical Specification Section 6.9.1.10 lists the analytical methods previously reviewed and approved by the NRC that are used to determine the core operating limits. Plant operation is limited in accordance with the values of cycle specific parameter limits that are established using these NRC approved analytical methods.

C. NEED FOR THE TECHNICAL SPECIFICATION AMENDMENT

The reload analyses for U3C6 indicate that internal fuel rod pressure will exceed Reactor Coolant System (RCS) pressure during Cycle 6. The increased internal fuel rod pressure is a result of many factors including burnup time for fuel assemblies, utilization of low leakage cores, mechanical modifications to fuel pellets and rod configuration, and the use of Erbia as a burnable absorber.

ABB-CE Topical Report CEN-372-P-A, "Fuel Rod Maximum Allowable Gas Pressure," provides technical justification for rod internal pressure exceeding RCS pressure. The NRC, in their Safety Evaluation Report (SER) dated April 10, 1990, approved the use of this methodology by Licensees. However, Licensees referencing the Topical Report are required to 1) provide plant specific LOCA analysis to determine the impact of maximum calculated rod pressures on cladding rupture timing and peak cladding temperatures; and 2) provide analysis for DNB propagation in postulated accidents if the bounding 14 x 14 steam line break is not applicable for calculating maximum cladding rupture strain and percent flow blockage.

ABB-CE has completed LOCA analysis for U3C6 to determine the impact of maximum calculated rod pressures on cladding rupture timing and peak cladding temperature. It is requested that this proposed change to modify the list of

analytical methods used for determining core operating limits be approved for all 3 units at PVNGS on the basis of the Unit 3 analysis methodology and results which would be similar for all 3 units. Actual analyses for future PVNGS cycles will be performed as part of reload analyses as required. The attachment to this enclosure contains the PVNGS Unit 3 Cycle 6 ECCS Performance Analysis as required by item 1. DNB propagation was examined for postulated accidents and was verified not to occur, as described in more detail below.

Implementation of the requested TS amendment is requested for U3C6. The Unit 1 and Unit 2 amendments will be implemented as part of their next cycles reload (Refueling 6, scheduled for September 21, 1996, and March 16, 1996, respectively).

D. SAFETY ANALYSIS OF THE PROPOSED TECHNICAL SPECIFICATION AMENDMENT

The proposed amendment to Section 6.9.1.10 would add a new methodology to the analytical methods used to determine the core operating limits. This analytical method (Topical Report) has been approved by the NRC staff (as documented in a letter dated April 10, 1990, from Ashok C. Thadani, Director, Division of Systems Technology, Office of Nuclear Reactor Regulation, to A.E. Scherer, Director, Nuclear Licensing, Combustion Engineering, "Safety Evaluation of Combustion Engineering Topical Report CEN-372-P, Fuel Rod Maximum Allowable Gas Pressure") as an acceptable basis for new fuel rod internal pressure criterion. The NRC approval letter directs Licensees to 1) provide plant specific LOCA analysis to determine the impact of maximum calculated rod pressure on cladding rupture timing and peak cladding temperatures; and 2) provide analysis for DNB propagation in postulated accidents if the bounding 14 x 14 steam line break is not applicable for calculating maximum cladding rupture strain and percent flow blockage.

ECCS PERFORMANCE

ABB/CE performed an evaluation of the maximum calculated fuel rod pressure in the PVNGS U3C6 ECCS performance analysis. The peak cladding temperature of the ECCS performance analysis is determined by the large break LOCA analysis. The large break LOCA analysis for U3C6 was performed with the NRC approved model. This is the same version that was used to perform the large break LOCA reference cycle analysis.

In order to evaluate the impact of the maximum calculated fuel rod gas pressure on ECCS performance for Cycle 6, STRIKIN-II cases were run at burnups ranging from 1,000 MWd/MTU, the burnup corresponding to the maximum initial fuel

stored energy, to 61,000 MWd/MTU, the highest burnup analyzed in the fuel performance analysis. The specific burnups analyzed were selected based on an evaluation of the fuel stored energies and gas pressures calculated by FATES3B. The STRIKIN-II analysis explicitly includes the impact of high fuel rod gas pressure on the timing of cladding rupture and consequently, on the cladding temperature at and above the location of cladding rupture.

The following four cases summarize results for four burnups analyzed for Cycle 6. The four burnups presented are:

Case 1	1,000 MWd/MTU	Burnup with the maximum initial fuel stored energy;
Case 2	26,300 MWd/MTU	Highest burnup that can sustain the peak linear heat generation rate;
Case 3	40,500 MWd/MTU	Burnup that combines a gas pressure near the critical gas pressure and a maximum linear heat generation rate near the peak linear heat generation rate;
Case 4	61,000 MWd/MTU	Highest burnup analyzed in the fuel performance analysis.

The results show that the high initial fuel gas pressure for Cases 2 and 3, cause cladding rupture to occur earlier than for Case 1, the maximum stored energy case. Despite having the highest initial fuel gas pressure, Case 4 had a cladding rupture time comparable to that of Case 1 because of the significantly reduced peak linear heat generation rate at 61,000 MWd/MTU. The results show that Case 1 results in the highest peak cladding temperature. By comparing the results for the limiting burnup for Cycle 6, Case 1, with the results for the reference cycle analysis, it can be shown that the results for Cycle 6 are bounded by those of the reference cycle (see Table B-2 in the Attachment).

DNB PROPAGATION

The bounding cladding strain calculated for the 14 x 14 steam line break was applied to the Palo Verde 16 x 16 fuel. A mechanistic evaluation of the potential for DNB propagation was performed by means of the ABB-CE INTEG computer code which calculates the fuel cladding strain as a function of time. The fuel cladding strain model for the INTEG computer program is described in CEN-372-P-A.

Assumptions made in the INTEG models include:

1. The cladding temperature was assumed to instantaneously reach the value predicted by the Condie-Bengston correlation at the onset of DNB.
2. To maximize the amount of ballooning, the circumferential cladding temperature variation was neglected by the INTEG model in applying the strain rate model.
3. INTEG assumes that the internal gas pressure of the fuel rod is unaffected by cladding ballooning.

A parametric study was performed to establish the time necessary to reach the cladding strain limit by variation of differential rod pressure, local heat flux, local quality, and local mass flux. The ranges were selected to vary from a normal value to a more conservative one.

Ranges used were:

Heat Flux	250 to 800 E+3 Btu/hr-ft^2
Mass Flux	1.4 to 2.5 E+6 lbm/hr-ft^2
Quality	-0.1 to 0.4
Differential Pressure	700 to 1200 psid

The parametric study cases were run until the total circumferential strain reached the limit of 29.3% or 1,000 seconds, which ever came first. The results were organized as tables of time to reach the strain limit and, to facilitate interpolation, graphical dependence of time to the strain limit for each of the four independent variables. Therefore, the time to reach the cladding strain limit may be determined for any combination of thermal hydraulic parameters.

For any postulated accident, the most limiting value for each of the thermal hydraulic parameters is determined from the transient results at the axial location of DNB. This set of conditions is used to enter the parametric figures and a time to the strain limit is determined.

The time necessary to reach the strain limit is compared with the time limit that the fuel rod is calculated to be in DNB. If the time in DNB for a given transient is less than the time to reach the cladding strain limit, DNB propagation will not occur.

For a sheared shaft event as an example, the time to reach the strain limit using bounding values for each of the four thermal hydraulic parameters was 60 seconds. Since the fuel is in DNB for only 5 seconds, DNB propagation will not occur. Comparisons of postulated accidents for Palo Verde U3C6 yield the same conclusion. Similar comparisons for future PVNGS cycles will be performed as required.

DNB propagation in ABB-CE 16 x 16 fuel does not occur for Palo Verde Nuclear Generating Station using the described methodology.

In conclusion, the impact of the maximum fuel rod gas pressure calculated for Cycle 6 was evaluated as part of the Cycle 6 ECCS performance analysis. Except for the highest burnup analyzed, the time of cladding rupture decreased as the initial fuel rod gas pressure increased with burnup. However, the peak cladding temperature occurred at the burnup with the maximum initial fuel stored energy. The analysis also determined that the ECCS performance for Cycle 6 is bounded by that of the reference cycle analysis. The results of the evaluation also demonstrates that the degree of cladding deformation is no more than the limit defined by the fuel rod maximum pressure Topical Report (CEN-372-P-A). Thus, DNB is shown not to propagate.

E. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10 CFR 50.92. A proposed amendment to an operating license for a facility involves a no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: 1) involve a significant increase in the probability or consequences of an accident previously evaluated; 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. A discussion of these standards as they relate to this amendment request follows:

Standard 1 -- Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

The proposed change does not involve any change to the configuration or method of operation of any plant equipment that is used to mitigate the consequences of an accident. The proposed change adds an NRC approved methodology and its associated Safety Evaluation Report (SER), to the list of analytical methods used to determine the core operating limits. The use of this methodology ensures that the consequences of an accident remain within the limits established by existing analyses. They do not alter any of the assumptions or bounding conditions currently in the UFSAR.

The U3C6 ECCS performance analysis included the analysis of the impact of the maximum calculated fuel rod gas pressures on the timing of cladding rupture and on the peak cladding temperature. This analysis concluded that the peak cladding temperature for Cycle 6 remained below that of the analysis of record and that the peak cladding temperature continued to occur at low burnup, specifically the burnup corresponding to the maximum initial fuel stored energy.

In addition to the LOCA analysis a DNB propagation analysis was performed to demonstrate that DNB propagation does not occur during postulated accidents that experience DNB when pressure in a fuel pin is higher than the system pressure. This analysis was performed using the fuel rod strain model described in CEN-372-P-A.

Based on these analyses, there is no increase in the probability or consequences of an accident previously evaluated.

Standard 2 -- Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

The proposed change does not involve any change to the configuration or method of operation of any plant equipment that is used to mitigate the consequences of an accident. Accordingly, no new failure modes have been defined for any plant system or component important to safety nor has any new limiting failure been identified as a result of the proposed change. The intent of the proposed change is to utilize a new analytical method to ensure that the consequences of any equipment malfunction remain within the limits of existing analyses resulting in no impact on radiological consequences.

The impact of the maximum fuel rod gas pressures calculated for U3C6 was evaluated as part of the Cycle 6 ECCS performance analysis. Except for the highest burnup analyzed, the time of cladding rupture decreased as the initial fuel rod gas pressure increased with burnup. However, the peak cladding temperature occurred at the burnup with the maximum initial fuel stored energy. The analysis also determined that the ECCS performance analysis for U3C6 is bounded by that of the reference cycle analysis.

An evaluation was conducted to ensure that fuel would not experience DNB propagation when the pressure in a fuel pin is higher than the system pressure. DNB was shown not to propagate by demonstrating that the degree of cladding deformation is no more than the limit defined by the fuel rod maximum pressure Topical Report (CEN-372-P-A).

Therefore, it can be concluded that the proposed change to Section 6.9.1.10 does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Standard 3 -- Does the proposed amendment involve a significant reduction in a margin of safety?

The proposed change adds an NRC approved Topical Report (methodology) and its associated SER, to the list of analytical methods used to determine core

operating limits. The use of the new methodology ensures that safety margins are maintained within the results of existing calculations. Since the core operating limits will continue to be established by an NRC approved methodology and will provide adequate core protection, the proposed amendment does not involve a significant reduction in the margin of safety.

Analyses were conducted to determine the impact of higher fuel rod pressure on ECCS performance and DNB propagation. The results of the analyses show that the effects of higher fuel rod pressure are bounded by previous results.

F. ENVIRONMENTAL CONSIDERATION

The proposed amendment adds an NRC approved Topical Report and its associated SER, which provides an acceptable basis for fuel rod internal pressure exceeding RCS pressure during U3C6 and future cycles in the three PVNGS units.

The impact of the maximum fuel rod gas pressure calculated for Unit 3 cycle 6 was evaluated as part of the Cycle 6 ECCS performance analysis. The analysis determined that the U3C6 ECCS performance analysis bounded by that of the reference cycle analysis. Additionally, DNB propagation will not occur.

APS has determined that the proposed amendment involves no changes in the amount or type of effluent that may be released offsite, and that there is no increase in the individual or cumulative radiation exposure.

G. MARKED-UP TECHNICAL SPECIFICATION PAGES

UNIT 1	UNIT 2	UNIT 3
6-20b	6-20b	6-20b