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SUBJECT: Forwards NRC questions & util responses re power update.Encl 2 calculation summary of radiological doses for SG tube rupture w/loss of offsite power & stuck open atmospheric dump valve responses to questions.

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AA2

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102-03692-JAB/AKK/GAM
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References 1. Letter No. 102-03578, dated January 5, 1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Proposed Amendments to Facility Operating Licenses and to Technical Specifications and Various Bases, Related to Power Uprate"

2. Letter No. 102-03678, dated April 19, 1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Responses to Questions Related to Power Uprate Amendment Request"

3. Letter No. 102-03687, dated May 1,1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Responses to Questions Related to Power Uprate Amendment Request, Supplement 1"

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Responses to Questions Related to Power Uprate Amendment Request, Supplement 2

In Reference 1, Arizona Public Service Company (APS) submitted to the NRC a request to amend the PVNGS Operating Licenses and Technical Specifications to increase the plants' rated thermal power (RTP) from 3800 megawatts thermal (Mwt) to 3876 Mwt. Responses to NRC questions related to the proposed amendment were provided in References 2 and 3. Enclosure 1 contains additional NRC Staff questions with APS responses.

In response to a question from the NRC Staff related to the proposed power uprate amendment, enclosure 2 is a calculation summary of radiological doses for steam generator tube rupture with loss of offsite power and stuck open atmospheric dump valve

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(ADV). This calculation summary was performed for the 3876 Mwt RTP power uprate conditions.

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

Sincerely,

Jack A. Bailey

WLS/AKK/GAM/rv

Enclosures
1. NRC Questions and APS Responses Related to Power Uprate
2. Calculation Summary of Radiological Doses for Steam Generator Tube Rupture with Loss of Offsite Power and Stuck Open Atmospheric Dump Valve (ADV)

cc: L. J. Callan
K. E. Perkins
C. R. Thomas
K. E. Johnston
A. V. Godwin (ARRA)

ENCLOSURE 1

NRC Questions and APS Responses Related to Power Uprate

1. **Provide clarification of the operating feedwater temperature following power uprate implementation.**

Response:

As stated in Reference 1, analyses were performed to support plant operation at 3876 Mwt RTP (power uprate) at both the original design feedwater temperature (about 445° F) and at the reduced feedwater temperature (about 425° F). This was done to provide PVNGS management the option of operating the plants at 3876 Mwt RTP, following approval and implementation of the power uprate license amendment, at either the original design feedwater temperature or at the reduced feedwater temperature. The decision of when to operate each PVNGS unit at the original design feedwater temperature or the reduced feedwater temperature will be made by PVNGS management based on economic considerations, including potential impacts to steam generator life and electrical generation needs. The reduced feedwater temperature results in improved thermohydraulics in the steam generator dry out region. The reduction in the number of tubes in the dry out region correlates to a reduction in the potential for stress corrosion cracking of the steam generator tubes. Operation at the original design feedwater temperature results in slightly poorer steam generator thermohydraulics (slightly increased dry out region) but increases megawatt output due to improved thermodynamic efficiency.

2. **Provide clarification of the high energy line break analyses performed for power uprate for the main steam and feedwater line breaks in the main steam support structure (MSSS).**

Response:

The aspects of the high energy line break analyses considered were: break locations, structural pressurization, and environmental qualification (EQ). These three aspects are discussed below.

a. Break Locations:
Branch Technical Position 3-1, Section B.1.b, establishes the criteria for break exclusion zones. The main steam and feedwater piping located in the MSSS building satisfies the criteria for a break exclusion zone and is documented as such in the Palo Verde Updated Final Safety Analysis Report Section 3.6.2.1.C, and Figures 3.6-20 and 3.6-21. As such, there are no break locations postulated from a piping stress standpoint for the main steam and feedwater piping in the MSSS.

b. Structural Pressurization:
In accordance with Branch Technical Position ASB 3-1, Appendix C, Attachment 1, Section A.2.c (page 3.6.1-26 of NUREG-0800, Revision 1, July 1981), a minimum of one break location was to be postulated in the MSSS for the purpose of ensuring that a structure containing essential equipment can withstand the resultant loadings. A feedwater line guillotine break was selected since it would result in the maximum building pressurization. This was analyzed as a part of the original Palo Verde design and licensing basis. This case was then updated to incorporate the effects of power uprate to support the power uprate amendment request. The results of this updated case were provided in Section D.3.2 of Reference 1.

c. Environmental Qualification:
Branch Technical Position ASB 3-1, Section B.1.a(1) (page 3.6.1-10 of NUREG-0800, Revision 1, July 1981), establishes that even though portions of main steam and feedwater lines meet the break exclusion requirements, a longitudinal break of one square foot shall be postulated to occur at a location that has the greatest effect on essential equipment. Such cases were analyzed for the power uprate conditions. The results were provided in Section D.3.2 of Reference 1, and supplemented by response B to Question 10 in Reference 2 and the response to Question 1 in Reference 3.

3. What effect would power uprate have on the emergency diesel generator?

Response:

Section D.7.10 of Reference 1 states that the spray pond system temperatures following a postulated design basis event have been confirmed to adequately remove heat from the Emergency Diesel Generator. The evaluation addressed both the spray pond systems ability to remove the diesel generator heat loads and the diesel generators ability to function with the nominally higher spray pond system temperatures.

There are no other changes to the emergency diesel generator system or its interfaces with supporting mechanical systems as a result of the increase in RTP. The diesel generator load sequencing and electrical loads are not affected as a result of the increased RTP.

4. What effect would power uprate have on control room ventilation?

Response:

There are no changes to the control room ventilation system as a result of the increased RTP. The control room heat loads and ventilation requirements are unaffected. The radiological aspects of control room habitability associated with the increased RTP were reported in Reference 4 to be bounded by those submitted in Reference 5, as revised by Reference 4.

5. What effect would power uprate have on internal flooding?

Response:

There are two types of internal flooding addressed as a part of the PVNGS design and licensing bases. These are flooding resulting from postulated high energy line breaks, such as LOCA, and flooding resulting from postulated moderate energy line breaks. Neither of these types of flooding analyses are affected as a result of the increase in RTP, as discussed below.

a. Internal Flooding Resulting From High Energy Line Breaks:
Sections D.3.1 and D.3.2 of Reference 1 address the impact of the increased RTP on postulated high energy line breaks. These included, specifically, the postulated main steam line breaks inside containment and in the Main Steam Support Structure (MSSS), a postulated LOCA, and a postulated feedwater line break in the MSSS. The existing containment flooding analysis is unaffected since it is based on the entire RWT volume being pumped into the containment. The flood level resulting from a postulated feedwater line break in containment remains bounded by the post-LOCA flood level. No additional sources of water for in-containment flooding have been introduced as a result of the increased RTP. The predicted blowdown flow rate resulting from a postulated feedwater line break in the MSSS remains bounded by the flow rate predicted in the original design and will, therefore, not result in an increase in the MSSS flood level.

b. Internal Flooding Resulting From Moderate Energy Line Breaks:
Section.3.6.2.1.2 of the Palo Verde UFSAR discusses the criteria used to postulate moderate energy line break locations, the resultant crack sizes, and release rates. None of the system design or operating parameters that are inputs to these moderate energy line break or flooding analyses have changed as a result of the increase in RTP, or the reduction in feedwater temperatures when operating in the high pressure feedwater heater bypass mode.

6. What effect would power uprate have on mechanical equipment qualification?

Response:

There are no specific commitments to formally address mechanical equipment qualification (EQ) at PVNGS. However, the potential for the revised post high energy line break environments in the containment and the MSSS have been reviewed for power uprate to determine if the increased temperatures could adversely affect the ability of safety related mechanical equipment or components to perform their intended safe shutdown function following a postulated design basis event.

The revised in-containment main steam line break (MSLB) profile exceeds the existing profile by a maximum of 7° F, as described in Section D.3.2 of Reference 1. The existing profile temperatures are exceeded for the approximately 20 second period prior to the peak, which occurs at 84 seconds following the event, as shown in Figure 1 of Response A to Question 10 in Reference 2. During this time, the heat transfer rate is governed by the temperature of the water condensing onto the mechanical component and not by the vapor temperature itself. Since the postulated containment pressure following a MSLB has slightly decreased (Reference 1, Section D.3.2), the condensing water temperature will be at a slightly lower saturation temperature and the resultant mechanical equipment temperatures remain bounded by the existing MSLB profile.

A comparison of the new and old loss of coolant accident (LOCA) EQ profiles was provided in Figure 2 of Response A to Question 10 in Reference 2. Based on a comparison of these profiles, the existing LOCA profile would result in nominally higher mechanical equipment temperatures and is, therefore, bounding.

The safety related mechanical equipment in the main steam support structure (MSSS) required to function following a MSLB or feedwater line break (FWLB) are all thick walled valves and valve accessories. The valve internal process fluid and design temperatures are well in excess of the MSLB peak temperature. As these valves are all at temperatures in excess of the MSLB peak temperature under normal operating conditions, and the duration of the MSLB accident environment is short, the increase in post MSLB peak temperature was determined not to affect the valves ability to perform their required design basis function. The valve accessories were reviewed in conjunction with the thermal lag analyses performed for the thinner walled components included within the 10 CFR 50.49 EQ program. This review determined that the valve accessories will perform their required design basis function(s) at temperatures they would experience as a result of a MSLB.

References

1. Letter No. 102-03578, dated January 5, 1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Proposed Amendments to Facility Operating Licenses and to Technical Specifications and Various Bases, Related to Power Uprate"

2. Letter No. 102-03678, dated April 19, 1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Responses to Questions Related to Power Uprate Amendment Request."

3. Letter No. 102-03687, dated May 1,1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Responses to Questions Related to Power Uprate Amendment Request, Supplement 1."

4. Letter No. 102-03620, dated March 7, 1996, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Supplement to Loss of Coolant Accident (LOCA) Dose Consequences."

5. Letter 102-03345, dated May 2, 1995, from W. L. Stewart, Executive Vice President - Nuclear, APS, to USNRC, "Request for NRC Review of LOCA Dose Consequences."

ENCLOSURE 2

Calculation Summary of Radiological Doses for Steam Generator Tube Rupture with Loss of Offsite Power and Stuck Open Atmospheric Dump Valve (ADV)