10 CFR 50.90

Palo Verde Nuclear
Generating Station

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102-05452-CDM/SAB/GAM
March 31, 2006

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1
Docket No. STN 50-528
Request for Amendment to Unit 1 Facility Operating License under Exigent Circumstances to Allow the Use of Compensatory Measures During Certain Reactor Coolant Pump Operation

Pursuant to 10 CFR 50.90, Arizona Public Service Company (APS) hereby requests a PVNGS Unit 1 facility operating license amendment under exigent circumstances to change the Updated Final Safety Analysis Report (UFSAR), Section 3.1.11, "Criterion 15 – Reactor Coolant System Design." The proposed UFSAR change would allow the use of an operator action as a compensatory measure to prevent exceeding the train A shutdown cooling (SDC) system vibration operability limit if a loop 2 reactor coolant pump (RCP) should trip or have a sheared shaft during four-RCP operation. This compensatory measure would only be used during a one-time 12 hour period for SDC system vibration root cause data collection in Mode 3. After the root cause data collection is completed, a modification will be implemented to reduce the SDC system vibration.

APS believes that this condition is exigent because Unit 1 is prevented from correcting the SDC vibration problem and returning to power operation until the root cause data collection is completed. The condition described in this amendment request was revealed during implementation of the testing and data collection activities during the current Unit 1 planned shutdown. Therefore, APS was unaware of this condition and could not have anticipated the need for the amendment request.

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A notarized affidavit is provided in Enclosure 1. Enclosure 2 contains APS' evaluation of the proposed amendment. Regulatory commitments being made by this letter are listed in Attachment 1 to Enclosure 2.

In accordance with the PVNGS Quality Assurance Program, the Plant Review Board and the Offsite Safety Review Committee have reviewed and concurred with this proposed amendment. By copy of this letter, this submittal is being forwarded to the Arizona Radiation Regulatory Agency (ARRA) pursuant to 10 CFR 50.91(b)(1).

APS requests approval of the proposed amendment as soon as possible. Once approved, the amendment shall be implemented within five days.

If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

David Mauldin

CDM/SAB/GAM/

Enclosures:
1. Notarized affidavit
2. Licensee's evaluation of the proposed change(s)
   Attachments:
   1. Regulatory Commitments
   2. Updated Final Safety Analysis Changes (mark-up)

cc:	B. S. Mallett	NRC Region IV Regional Administrator
	M. B. Fields	NRC NRR Project Manager
	G. G. Warnick	NRC Senior Resident Inspector for PVNGS
	A. V. Godwin	Arizona Radiation Regulatory Agency (ARRA)

ENCLOSURE 1
AFFIDAVIT

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, David Mauldin, represent that I am Vice President, Nuclear Engineering, 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.

David Mauldin

Sworn To Before Me This 31st Day Of March, 2006.

Cassandre Justiss
Notary Public

OFFICAL SEAL
Cassandre Justiss
NOTARY PUBLIC - STATE of ARIZONA
MARICOPA COUNTY
MY COMM. EXPIRES October 30, 2006

Notary Commission Stamp

ENCLOSURE 2

ARIZONA PUBLIC SERVICE COMPANY'S EVALUATION

Subject: **Request for Amendment to Unit 1 Facility Operating License under Exigent Circumstances to Allow the Use of Compensatory Measures During Certain Reactor Coolant Pump Operation**

1.0 DESCRIPTION

This is a request from Arizona Public Service Company (APS) to amend Operating License NPF-41 for Palo Verde Nuclear Generating Station (PVNGS) Unit 1.

Pursuant to 10 CFR 50.90, Arizona Public Service Company (APS) hereby requests a PVNGS Unit 1 facility operating license amendment under exigent circumstances to make a change to the Updated Final Safety Analysis Report (UFSAR), Section 3.1.11, "Criterion 15 – Reactor Coolant System Design." The proposed UFSAR change would allow the use of an operator action as a compensatory measure to prevent exceeding the train A shutdown cooling (SDC) system line vibration operability limit if a loop 2 reactor coolant pump (RCP) should trip or have a sheared shaft during four-RCP operation. This compensatory measure would only be used during a one-time 12 hour period for root cause data collection in Mode 3. After the root cause data collection is completed, a modification will be implemented to reduce the SDC system vibration. This license amendment is being requested in accordance with 10 CFR 50.59(c)(2)(ii) since the proposed change could result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the final safety analysis report (as updated).

2.0 PROPOSED CHANGE

The proposed license amendment would allow APS to add the following requirements to the Updated Final Safety Analysis Report (UFSAR), Section 3.1.11, "Criterion 15 – Reactor Coolant System Design":

> *In Unit 1, until the cause of the train A shutdown cooling line high vibration is corrected, all four RCPs may only be operated simultaneously during a one-time 12 hour period in support of the root cause data collection for SI-651 vibration in April 2006. During the data collection activity, whenever all four RCPs are operating, a dedicated reactor operator must be stationed in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft.*

3.0 BACKGROUND

The PVNGS units are pressurized water reactor Combustion Engineering System 80 designs. The RCS configuration for heat transport uses two RCS loops (loops 1 and 2). Each RCS loop contains a steam generator (SG) and two Reactor Coolant Pumps (RCPs 1A and 1B in loop 1, and RCPs 2A and 2B in loop 2). A single hot leg connects each SG to the reactor vessel. The shutdown cooling (SDC) system train A suction line is connected to the RCS loop 1 hot leg. The train A SDC isolation valve closest to the RCS nozzle is the normally-closed motor operated valve SI-651.

During power ascension of Unit 1 in December 2005 following a refueling outage in which the steam generators (SGs) were replaced, the vibration level of the train A shutdown cooling (SDC) line and valve SI-651 was found to reach approximately two

inches per second (ips) at approximately 32% rated thermal power (RTP). In order to prevent exceeding the SDC line vibration administrative limit of 2.0 ips and design limit of 2.25 ips, power ascension was stopped. Since that time, Unit 1 reactor power was limited to keep the SDC line vibration within the administrative limit. The SDC line vibration is hypothesized to be the result of a flow induced excitation of the fundamental acoustic frequency of the SDC suction line. The system is believed to be excited by a pressure disturbance originating at the suction line nozzle resulting from a coupled interaction between instabilities within the flow shear layer over the nozzle and the refracted standing wave in the line.

On March 18, 2006, Unit 1 was in Mode 3 (Hot Standby) at normal operating pressure and temperature (NOP/NOT) to collect data for a modification to reduce the SDC line vibration. With four reactor coolant pumps (RCPs) operating, RCP 2A was stopped. The remaining three RCP operating combination resulted in an approximate 7% flow increase in the loop 1 hot leg. This caused the vibration of the SDC line, which is connected to RCS loop 1, to increase from approximately 1.3 ips to an observed average amplitude of approximately 2.8 ips, with an instantaneous maximum observed amplitude of 3.05 ips. These vibration levels occurred for approximately one minute. RCP 2A was subsequently restarted and the vibration amplitude dropped to approximately 1.3 ips. In order to prevent a recurrence of this scenario, a loop 1 RCP (RCP 1B) was subsequently stopped, and simultaneous operation of both RCS loop 1 RCPs (RCP 1A and 1B) has been administratively restricted in Unit 1 until the potential future impact is reviewed and evaluated.

This concern does not exist in the Unit 1 RCS loop 2 (train B) SDC line and in Units 2 and 3 SDC lines because those SDC line vibration levels are significantly lower than in Unit 1 RCS loop 1 (train A).

Need For the Proposed Amendment

PVNGS Unit 1 is currently in Mode 3, Hot Standby, with all control element assemblies fully in the core, at NOP/NOT, with three RCPs operating, one in loop 1 and two in loop 2. APS is planning to implement a modification to reduce the Unit 1 train A SDC line vibration by relocating isolation valve SI-651 in the SDC line to a position in the line closer to the nozzle in the RCS. This will change the fundamental acoustic frequency of the SDC suction line. However, before the modification is implemented, SDC line pressure data collection with four RCPs operating is needed for the following purposes:

- to support the SDC line vibration root cause analysis;
- to assist in the validation of the extent of condition of the SDC line vibration; and
- to provide additional confirmation of the modification to reduce the SDC line vibration.

The data collection will consist of operating four RCPs during a one-time 12 hour period while pressure is being monitored in the train A SDC line. During this time, a dedicated reactor operator will be stationed in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft.

Summary of Proposed Data Collection Activity and Compensatory Measure

Approval of this proposed amendment would allow the following data collection activity and compensatory measure in Unit 1:

- During a one-time period of up to 12 hours, four RCPs would be operated while the plant is in Mode 3 at normal operating pressure and temperature with all control element assemblies fully inserted in the core. The purpose of operating four RCPs in Mode 3 is to collect SDC system pressure data to support the SDC line vibration root cause analysis, to assist in the validation of the extent of condition of the SDC line vibration, and to provide additional confirmation of the modification to reduce the SDC line vibration.

- The SDC system vibration limits are as follows:
  - administrative limit: 2.0 ips for an unlimited time (controlled by procedure)
  - design limit: 2.25 ips for an unlimited time
  - vibration operability limit: > 2.25 ips to ≤ 5.27 ips for up to 10 minutes
  - vibration operability limit: > 5.27 ips to ≤ 6.0 ips for up to 3 minutes

- During the time that four RCPs are operating for data collection, the SDC system vibration is expected to be between approximately 0.8 ips and 1.3 ips based on previous operating experience, which is within the administrative limit and design limit for unlimited-time operation.

- If a loop 2 RCP should inadvertently trip or have a sheared shaft during the four RCP operation, the SDC system vibration would be expected to be approximately 3.05 ips based on previous experience and calculations.

- In order to assure that the SDC system would remain within its vibration operability limit in the unexpected event of an inadvertent loop 2 RCP trip or sheared shaft during the four RCP operation, this amendment would allow an operator action as compensatory measure. The compensatory measure would be a dedicated reactor operator stationed in the control room during four RCP operation to stop a loop 1 RCP if a loop 2 RCP should trip or have a sheared shaft. This action was demonstrated on the simulator and was accomplished in approximately two minutes, well within the 10 minutes to keep the SDC system within vibration operability limits under the anticipated conditions.

- After data collection is completed, Unit 1 will be cooled down and a modification will be implemented to reduce the SDC system vibration.

4.0 TECHNICAL ANALYSIS

The proposed amendment would change the UFSAR to allow the use of operator action as a compensatory measure to prevent exceeding the train A shutdown cooling (SDC) system line vibration operability limit if a loop 2 reactor coolant pump (RCP) should trip or have a sheared shaft during four-RCP operation during a one-time 12 hour period for root cause data collection.

Unit 1 SDC suction line vibration data collected over the past three operating cycles indicates that the "baseline" vibration amplitude, or the vibration amplitude at normal operating temperature and pressure and at zero power, varies from almost no appreciable vibration to levels as high as 1.3 ips, measured following the recent shutdown to Mode 3. For reference, vibration levels at NOP/NOT following U1R12 (December, 2005), during which the Unit 1 steam generators were replaced, the baseline vibration amplitude was approximately 0.8 ips. With restart of the fourth RCP in Mode 3, as proposed herein, the SDC system vibration is expected to be between approximately 0.8 and 1.3 ips, and not exceed the 2.0 ips administrative limit.

While the vibration level is expected to be well within the design limit during four RCP operation, it is expected that if a loop 2 RCP should trip or have a sheared shaft when two loop 1 RCPs are operating, the SDC line vibration could go up to approximately 3.05 ips, consistent with the maximum instantaneous amplitude observed during plant testing while in this configuration on March 18, 2006. Analyses have shown that the SDC line and valve SI-651 will remain within their operability limits when subjected to a vibration of 5.27 ips for up to 10 minutes. The proposed license amendment would station a dedicated reactor operator in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft. This operator action was demonstrated on the simulator and was accomplished in approximately two minutes, well within the 10 minutes needed to keep the SDC line vibration within its operability limit if a loop 2 RCP should trip or have a sheared shaft during four-RCP operation.

No credible single failure would cause the loss of two loop 2 RCPs without also causing the loss of two loop 1 RCPs, which would not result in the SDC system exceeding its vibration operability limits.

Existing Condition

The Unit 1 train A SDC line has experienced higher than normal vibration levels since the start-up of U1C9 (November 1999). Data collected as part of root cause evaluations support the hypothesis that the vibration is the result of a flow induced excitation of the fundamental acoustic frequency of the SDC suction line. The system is believed to be excited by a pressure disturbance originating at the suction line nozzle resulting from a coupled interaction between instabilities within the flow shear layer over the nozzle (i.e. vortex shedding) and the refracted standing wave in the line.

Unit 1 Short Notice Outage Work (SNOW)

Test data acquired during the Unit 1 March, 2006 SNOW revealed an increased vibration level on the train A SDC suction line as a result of increased flow in the Loop 1 reactor coolant system hot leg when RCP 2A was stopped. The vibration level increased from approximately 1.3 ips to an observed average amplitude of approximately 2.8 ips, with an instantaneous maximum observed amplitude of 3.05 ips.

Vibration Levels

Analytical Approximation for Vibration Levels

Significant research has been documented regarding the coupled interaction resulting in large amplification of the pressure disturbance at the branch line (SDC suction line) nozzle. APS has performed scaled model tests for the Unit 1 design and operating conditions in an attempt to substantiate the phenomenological hypothesis. The results of those scaled model tests are documented in PVNGS study 13-MS-B046 (Ref. 1). These results have been applied in order to quantify the relative change in vibration as a function of flow rate changes in loop 1 hot leg. PVNGS study 13-MS-B046 (Ref. 1) contains an evaluation that attempts to quantify the increase in pressure amplitude in the suction line, and hence the vibration amplitude, given initial flow conditions and a corresponding increase in hot leg velocity.

During the Unit 1 March, 2006 SNOW, RCP 2A was stopped with RCPs 1A, 1B, and 2B in operation. Initial vibration amplitude immediately before RCP 2A was stopped was approximately 1.3 ips. Flow subsequently increased in the Unit 1, loop 1 hot leg by approximately 7% (Ref. 1) when RCP 2A was stopped. Though an increase in vibration amplitude was expected, this magnitude was not. Subsequent evaluation (Ref. 1) indicates that an increase in hot leg flow velocity of 7% would produce a two-fold increase in vibration. This is consistent with the vibration amplitudes noted during the evolution where the amplitude increased from 1.3 ips to an average of 2.8 ips (maximum observed instantaneous amplitude of 3.05 ips).

Since the test data acquired during the Unit 1 SNOW is consistent with the analytical approximation, the maximum vibration level in the event of an unexpected loss of a loop 2 RCP during the proposed data collection activity would be considered repeatable given the same system conditions (i.e. pump configuration). Specifically, with Unit 1 in Mode 3 at NOP/NOT, should either RCP 2A or RCP 2B fail, the resultant vibration level should be approximately twice the original baseline vibration level. Unit 1 Cycle 13 vibration data indicates an initial vibration level at NOP/NOT (with four RCPs operating) to be between 0.8 ips and 1.3 ips. Hence, maximum vibration levels in the three-RCP configuration should be consistent with those observed during the Unit 1 March 18, 2006 tests.

It is noted that vibration levels were expected to increase during performance of the tests in Unit 1 on March 18, 2006 when flow was increased during three pump

operation. Consideration of the relative change in amplitude was based on similar arguments developed in Reference 1. However, the initial vibration baseline condition was judged to be closer to the point of maximum coupling (i.e., peak vibration amplitude). It was thought that if the baseline condition was close to the peak, it was possible that the increase in flow could have resulted in a decrease in coupling had the flow increase been significant enough to move past the point of maximum coupling. However, without any initial data, the baseline condition could not be established beforehand with certainty. The original estimate of coupling was based on the presumption that the driving pressure pulsations in the suction line were close to the maximum value given the results from the scaled model tests.

Operating Vibration Levels

The existing design vibration limit has been established such that the valve SI-651 actuator acceleration does not exceed a value of 1.25 g's which is equivalent to a velocity of 2.25 ips at the valve yoke (V1H measurement). It should be understood that references to vibration velocity (ips) and its corresponding acceleration (g) in this submittal pertain to the range of frequencies from 24 to 25 hertz measured at the SI-651 valve.

The acceptability of vibration levels greater than 2.25 ips has been considered based on the assessment of the modes of failure that can occur due to vibration aging. That is, inspection of the actuator parts and mode of operation of the valve (i.e., closed position) and the use of Loctite in various parts and fasteners to harden the actuator. In addition, credit is taken for the vibration seismic testing that was performed as part of the seismic qualification of the actuator performed by Limitorque where an actuator was tested for approximately 11 minutes at 3 to 4.5 g's (Ref. 2).

In order to further validate that no significant aging of the actuator occurred during the short elevated vibration excursion on March 18, 2006, APS performed a non-intrusive inspection of the limit switch compartment components for evidence of fastener loosening, wear of contacts, gaskets, and nonmetallic components. The inspections revealed no anomalies or damage caused by the elevated vibration condition.

The Limitorque seismic qualification report documents testing that was performed by National Technical Systems (NTS/Acton) Company. The report indicates that the sine sweep (operating basis earthquake) was performed in the vertical, horizontal (H1) direction, and in the horizontal (H2) direction for the actuator. The actuator was exposed to two sinusoidal sweeps from 2 to 35 Hz to 2 Hz, at a rate of one octave per minute. The level of input was 3.0 g's except for the range from 2 to 4 Hz which was at the shaker table displacement limits (well outside the 24-25 Hz frequencies of interest). The first sweep was conducted with the actuator in the closed position and the second sweep was conducted with the actuator in the open position. This test was performed for a duration of 8 minutes in each axis at a level of 3 g's except for the range from 2 to 4 Hz (shaker table displacement limits).

The report indicates that the dwell test (safe shutdown earthquake) consisted of 15 second sinusoidal dwell at 1/3 octaves. The acceleration during each dwell was 4.5 g except where limited at the 4 Hz and lower frequencies. During each dwell the actuator was operated through one complete stroke-open stroke cycle. This test was performed for a duration of 195 seconds in each axis at a level of 4.5 g's except for the range from 2 to 4 Hz (shaker table displacement limits).

The actuator for valve SI-651 is qualified for short term elevated vibration excursions of a maximum duration of 10 minutes. The average allowed vibration for the period of 10 minutes, at the valve yoke location called V1H, is 5.27 ips with a maximum excursion of 6 ips for a duration of 3 minutes within the 10 minute interval. The vibration level of 5.27 ips at V1H is equivalent to 3.0 g's at the actuator. Similarly, 6 ips at V1H is equivalent to 3.41 g's which are within the range of test values and less than the maximum test value of 4.5 g's.

Note that the shaker table test referenced above was performed at frequencies below 25 hertz. This test was very conservative. The relative displacements that the actuator experienced when subjected to an acceleration level of 3 g's were significantly greater than those that would be achieved at 25 hertz. For example, the displacement from zero to peak at 5 hertz and 3 g's was approximately 1.2 inches as compared to a displacement of approximately 0.05 inch at 25 hertz (Ref. 1).

The local accelerations at the MOV SI-651 actuator are predominantly in the pipe longitudinal axis (H1) with the other two orthogonal axis (H2 and V) being significantly smaller. The above seismic tests were performed at 3 g's for a duration of eight minutes and 4.5 g's for three minutes at each orthogonal axis. The actuator has no cross coupling or resonance below 33 Hz, and as such can be mounted at any orientation. Therefore, imposing a predetermined operability limit of 5.27 ips at V1H (3 g's at the actuator) for 10 minutes and 6 ips at V1H (3.41 g at the actuator) for three minutes within the 10 minute interval at a frequency range of 24 to 25 Hz is conservative.

The acceptability of vibration levels greater than 2.25 ips has also been considered for the reactor coolant pressure boundary piping.

IPS	Allowable no. of Cycles	Allowable Duration in Minutes
3.005	Infinite	Infinite
3.7	1000000	666.7
3.9	400000	266.7
4	130000	86.7
4.2	90000	60.0
4.4	83000	55.3
4.6	75000	50.0
4.8	65000	43.3
5	47000	31.3
5.2	40000	26.7
5.4	35000	23.3
5.6	30000	20.0
5.8	25000	16.7
6	18000	12.0

Table of Vibration Magnitude (ips) at V1H vs. Allowable No. of Minutes

Note that at 5.2 ips the allowable duration is 26.7 minutes. Therefore, the actuator vibration operability limit of 5.27 ips for 10 minutes, with a maximum excursion of 6.0 ips for a duration of 3 minutes within the 10 minute interval, is more limiting.

Conditions for Crediting Operator Action

Similar to the March SNOW, Unit 1 is in Mode 3 at NOP/NOT. During the data collection, all four RCPs would be in operation. Operator action would be credited for stopping a loop 1 RCP if a loop 2 RCP should trip or have a sheared shaft in order to minimize the duration of increased flow in hot leg 1 and corresponding increased vibration levels in the Train A shutdown cooling line.

Human Factors

Written Procedures

The proposed operator actions will be controlled through written instructions. Prior to starting the fourth RCP for the data collection activity, procedures 40OP-9ZZ24, "SNOW Outage," and 41AL-1RK5A, "Panel B05A Alarm Responses," will be revised to implement the proposed changes to the UFSAR to station a dedicated reactor operator in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft during the four-RCP operation for data collection.

Control Room Staffing

In addition to the required control room staff, a dedicated reactor operator will be stationed in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft during the four-RCP operation for data collection.

Instrumentation and Controls

The RCP 1A and 1B hand switches in the control room will be flagged. If a loop 2 RCP should trip or have a sheared shaft during the four RCP operation for data collection, the dedicated control room reactor operator will be able to quickly and easily recognize and trip one of the loop 1 RCP switches as required.

Training

Prior to starting the fourth RCP for the data collection activity, the control room staff and the dedicated reactor operator will conduct a pre-job brief to ensure that all personnel understand the evolution and the procedural requirements.

Simulator

The required operator action was demonstrated on the simulator and was accomplished in approximately two minutes, well within the 10 minutes to keep the SDC system within vibration operability limits under the anticipated conditions.

Work Control

Prior to and during the performance of four-RCP operation for data collection, the work schedule for PVNGS Units 1, 2 and 3 (including the switchyard) will be reviewed and managed to minimize the potential of affecting the operation of the RCPs in Unit 1.

<u>Risk Insight</u>

APS has evaluated the probability (Q) of one loop 2 RCP failing during a 12 hour period.

$$Q_{total} = IE_{RCP} * \text{Time}$$

PVNGS data has been evaluated to support the PRA Model initiating event (IE) frequencies. Within a period of 34 critical reactor years (cRxYr) ending June 1, 2001, there were 11 events which resulted in RCP trips as the initiating event. Eleven events per 34 critical reactor years represents a loss of flow frequency of 0.32/yr. This is significantly greater than the industry data, and indicates that Bayesian updating the generic industry value would result in a frequency close to the PVNGS value. Therefore, PVNGS specific data will be used to evaluate the change in frequency of the events.

Only two of the 11 noted events were single RCP trips; the others were primarily loss of electrical buses NAN-S01 or NAN-S02 which would fail RCPs associated with both RCS loops. Since the event which would lead to an increased SDC line vibration is an increase in RCS Loop 1 flow, then the event must be initiated by a loss of either RCP 2A or 2B, and therefore the frequency is halved.

IE_{RCP} = (2 events / 34 cRxYr) / 2
= 0.0294/yr

Exposure duration; Time:

Time = 12 hours (1yr / 8760 hrs)
= 0.00137 yr

Conclusion

The probability of a Loop 2 RCP trip during a 12 hour exposure time is:

Q_{total} = IE_{RCP} * Time = 0.0294/yr * 0.00137yr
= 4.0E-5

This low probability of the occurrence of a loop 2 RCP stopping during the 12 hour data collection, combined with the high likelihood of successful action of the dedicated reactor operator to stop a loop 1 RCP within 10 minutes after a loss of a loop 2 RCP, provide high assurance that the proposed change would prevent the SDC line from exceeding its vibration operability limits.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

The proposed PVNGS Unit 1 facility operating license amendment under exigent circumstances would change the Updated Final Safety Analysis Report (UFSAR), Section 3.1.11, "Criterion 15 – Reactor Coolant System Design." The proposed UFSAR change would allow the use of operator action as a compensatory measure to prevent exceeding the train A shutdown cooling (SDC) system line vibration operability limit if a loop 2 reactor coolant pump (RCP) should trip or have a sheared shaft during four-RCP operation. This compensatory measure would only be used during a one-time 12 hour period for root cause data collection in Mode 3. After the root cause data collection is completed, a modification will be implemented to reduce the SDC system vibration.

APS has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The purpose of the proposed change is to allow the use of an operator action as a compensatory measure to prevent exceeding the train A shutdown cooling (SDC) system line vibration operability limits. Exceeding the SDC system line vibration operability limits for an extended period of time could ultimately result in a loss of coolant accident (LOCA), which is evaluated in UFSAR Sections 6.3 and 15.6.5.

The compensatory measure would be needed only during a period of up to 12 hours in Mode 3 during data collection. During operation of four RCPs in Mode 3, the expected SDC line vibration is not expected to exceed the administrative limit of 2.0 ips. If a loop 2 RCP should trip or have a sheared shaft when two loop 1 RCPs are operating, the SDC line vibration could go up to approximately 3.05 ips, as observed on March 18, 2006 when such a pump configuration occurred. Analyses have shown that the SDC line and valve SI-651 will remain within their operability limits when subjected to a vibration of 5.27 ips for up to 10 minutes. The proposed compensatory measure would station a dedicated reactor operator in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft. This operator action has been demonstrated on the simulator and was accomplished in approximately two minutes, well within the 10 minutes needed to keep the SDC system vibration within its vibration operability limit if a loop 2 RCP should trip during four-RCP operation.

In addition, the probability of a loop 2 RCP stopping during the 12 hour period of data collection which would require operator action is 4.0E-5. The low probability of the occurrence of a loop 2 RCP stopping during the 12 hour data collection, combined with the high likelihood of successful operator action to stop a loop 1 RCP within 10 minutes of the loss of a loop 2 RCP, and the margin in the SDC vibration limits assure that the proposed change does not involve a significant increase in the probability of a LOCA. The consequences of a LOCA would not be affected because the proposed change does not affect the UFSAR LOCA radiological dose analysis. The proposed change has no effect on the consequences of a postulated LOCA, because it does not change any of the methodologies or input values used in the UFSAR radiological dose analyses. The

compensatory action would ensure that a vibration-induced failure would not occur, the RCS pressure boundary would remain intact and the potential radiological consequences of a LOCA would be averted.

If credible design basis events (DBEs) other than a LOCA occur in Mode 3, emergency operating procedures (EOPs) would require control room operators to trip one or more RCPs if certain RCP trip criteria are met. These events include postulated steam generator tube rupture (SGTR) and excess steam demand events such as main steam line breaks (MSLBs). If a loop 2 RCP is tripped or has a sheared shaft, the proposed compensatory action would also require the tripping of a loop 1 RCP (if a loop 1 RCP has not already tripped). The resultant two-RCP operation is bounded by existing UFSAR analyses, such as those for SGTRs in Mode 1 and MSLBs in Mode 3, which consider both loss of offsite power (LOP) and no-LOP cases with either zero or four RCPs running, respectively. Additionally, the EOPs already allow for two-RCP operation (one RCP in each loop) when pressurizer pressure remains below the safety injection actuation signal setpoint. Likewise, other UFSAR analyses remain bounding for two-RCP operation in Mode 3, particularly because control element assemblies will be fully inserted in the core during the data collection activity and because of the relatively low decay heat levels in Unit 1 at this time.

The proposed change has no other effects on plant operations, any design function or any Mode 3 analysis that verifies the capability of an SSC to perform a design function. Therefore, the proposed amendment would not change any of the previously evaluated accidents in the updated final safety analysis report (UFSAR).

There is no credible single failure that would cause the loss of two loop 2 RCPs without also causing the loss of two loop 1 RCPs. Therefore, credible single failures would not result in exceeding the vibration operability limit for the SDC system.

By ensuring that the SDC system vibration operability limits are not exceeded, the SDC system will be able to perform its function as needed.

The proposed change and associated compensatory operator action do not affect any of the postulated initiators for credible design basis events in Mode 3, and therefore does not involve a significant increase in the probability of an accident previously evaluated. Likewise, the proposed change does not affect any of the radiological dose analyses in the UFSAR for postulated events, and therefore does not involve a significant increase in the consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed amendment to allow operator action to prevent exceeding the SDC line vibration operability limits by stopping a loop 1 RCP if a loop 2 RCP trips or has a sheared shaft will not change the design function or operation of the RCS or SDC, and will not affect the ability of the RCS and SDC to perform their design functions. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated. The possibility of a LOCA, which is a previously evaluated accident that could be affected by high SDC line vibration, is discussed in the response to question 1.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change does not exceed or alter a design basis or safety limit (i.e., the controlling numerical value for a parameter established in the UFSAR or the license), therefore it does not significantly reduce the margin of safety. The proposed change would allow the use of compensatory operator action in Mode 3 to trip a loop 1 RCP, in the event that a loop 2 RCP tripped or had a sheared shaft during four-pump operation. Tripping a loop 1 RCP would reduce the flow rate of coolant through the core and thereby reduce the departure from nucleate boiling ratio (DNBR). However, UFSAR safety analyses for postulated design basis events in Mode 3 (e.g., main steam line break), show that fuel centerline melting and fuel clad damage would not occur, even under natural circulation conditions with no RCPs in operation. Likewise, the proposed change and compensatory operator action would not adversely affect other safety analysis conclusions with regard to maintaining subcriticality and limiting peak RCS pressure to acceptable values, such that design basis or safety limits would be exceeded or require alteration.

Based on the above, APS concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

10 CFR Part 50, Appendix A, General Design Criteria (GDC) 15, "Reactor Coolant System Design," requires that the reactor coolant system and

associated auxiliary, control, and protection systems shall be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences. The temporary compensatory measure to allow the use of an operator action to prevent exceeding the train A shutdown cooling (SDC) system line vibration operability limits in case a loop 2 RCP should trip or have a sheared shaft during a 12 hour data collection period when 4 RCPs are operating will assure compliance with GDC-15.

In conclusion, based on the considerations discussed above, (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.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 EXPLANATION OF EXIGENT CIRCUMSTANCES

In accordance with 10 CFR 50.91(a)(6)(vi), APS is providing the following explanation regarding the exigency and why it could not be avoided, and why APS has used its best efforts to make a timely application for the amendment.

Unit 1 shut down on March 18, 2006 for SDC suction line vibration testing and data gathering by engineering to support development of the modification originally scheduled to be implemented in May 2006. The results of the testing and data gathering are also needed as input to the root cause and extent of condition determinations. Due to the concern described in section 3.0 of this enclosure, APS has determined that the vibration problem needs to be resolved prior to restart of Unit 1. The Unit 1 reactor needs to be defueled before RCS water level can be reduced to a level allowing the required modifications to SDC suction line. Currently Unit 1 is in Mode 3 at normal operating pressure and temperature. Completing the data collection is required prior to Unit 1 completing the shutdown and defueling the reactor.

APS believes that this condition is exigent because Unit 1 is prevented from correcting the SDC vibration problem and returning to power operation until the root cause data collection is completed. The condition described in this amendment request was revealed during implementation of the testing and data gathering activities during the current Unit 1 planned shutdown. Therefore, APS was unaware of this condition and could not have anticipated the need for the amendment request.

As soon as it was recognized that the modification was needed, during the current Unit 1 outage, APS began preparing this amendment request. In addition, there have been several conversations between APS and NRC personnel regarding the exigent circumstances associated with this amendment request.

8.0 REFERENCES

1. Appendix F to PVNGS Study 13-MS-B046, Experimental Investigation of Acoustic Coupling of the PVNGS Unit 1 SDC Suction Line, Revision 1, March 31, 2006.

2. Nuclear Power Station Qualification Type Test Report "Limitorque Valve Actuators with Type LR Motor for Combustion Engineering PWR" (SDOC 13-N001-1.01-0829-1), March 17, 1986.

Enclosure 2,
Attachment 1
Regulatory Commitments

The following table identifies those new actions committed to by APS in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Thomas N. Weber at (623) 393-5764.

REGULATORY COMMITMENT	DUE DATE
1. Prior to starting the fourth RCP for the data collection activity, procedures 40OP-9ZZ24, "SNOW Outage," and 41AL-1RK5A, "Panel B05A Alarm Responses," will be revised to implement the proposed changes to the UFSAR to station a dedicated reactor operator in the Unit 1 control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft during four-RCP operation for data collection.	Prior to starting the fourth RCP for the data collection activity.
2. In addition to the required control room staff, a dedicated reactor operator will be stationed in the Unit 1 control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft during four-RCP operation for data collection.	Prior to starting the fourth RCP for the data collection activity.
3. The RCP 1A and 1B hand switches in the Unit 1 control room will be flagged. If a loop 2 RCP should trip or have a sheared shaft during four-RCP operation for data collection, the dedicated control room reactor operator will be able to quickly and easily recognize and trip one of the loop 1 RCP switches as required.	Prior to starting the fourth RCP for the data collection activity
4. Prior to starting the fourth RCP for the data collection activity, the control room staff and the dedicated reactor operator will conduct a pre-job brief to ensure that all personnel understand the evolution and the procedural requirements.	Prior to starting the fourth RCP for the data collection activity
5. Prior to and during the performance of four-RCP operation for data collection, the work schedule for PVNGS Units 1, 2 and 3 (including the switchyard) will be reviewed and managed to minimize the potential of affecting the operation of the RCPs in Unit 1.	Prior to starting the fourth RCP for the data collection activity

Updated Final Safety Analysis Report Changes (markup)

Pages:

3.1-15 (for information only)
3.1-16

No changes to this page - for information only.

anticipated transients, and maintain the stresses within applicable limits.

Piping and equipment pressure parts of the reactor coolant pressure boundary are assembled and erected by welding unless applicable codes permit flanged or screwed joints. Welding procedures are employed which produce welds of complete fusion and free of unacceptable defects. All welding procedures, welders, and welding machine operators are qualified in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code for the materials to be welded. Qualification r ecords, including the results of the procedure and performance qualification tests and identification symbols assigned to each welder; are maintained.

The pressure boundary has provisions for inservice inspection in accordance with Section XI of the ASME Boiler and Pressure Vessel Code, to ensure continuance of the structural and leaktight integrity of the boundary (see response to GDC No. 32, also). For the reactor vessel, a material surveillance program conforming with the requirements of Appendix H to 10CFR Part 50 is provided.

3.1.11 CRITERION 15 -- REACTOR COOLANT SYSTEM DESIGN

The reactor coolant system and associated auxiliary, control, and protection systems shall be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences.

RESPONSE:

The design criteria and bases for the reactor coolant pressure boundary are described in the response to Criterion 14.

The operating conditions for normal steady state and transient plant operations are established conservatively. Normal operating limits are selected so that an adequate margin exists between them and the design limits. The plant control systems are designed to ensure that plant variables are maintained well within the established operating limits. The plant transient response characteristics and pressure and temperature distributions during normal operations are considered in the design as well as the accuracy and response of the instruments and controls. These design techniques ensure that a satisfactory margin is maintained between the plant's normal operating conditions, including design transients, and the design limits for the reactor coolant pressure boundary.

Plant Control Systems function to minimize the deviations from normal operating limits in the event of most anticipated operational occurrences. Where control systems response would be inadequate or fail upon demand, the Plant Protection System functions to mitigate the consequences of such events.

The Plant Protection System functions to mitigate the consequences in the event of accidents. Analyses show that the design limits for the reactor coolant pressure boundary are not exceeded in the event of any ANSI N18.2 Conditions.

3.1.12 CRITERION 16 -- CONTAINMENT DESIGN

Reactor containment and associated systems shall be provided to establish an essentially leaktight barrier against the

Add Insert

INSERT FOR UFSAR SECTION 3.1.11

In Unit 1, until the cause of the train A shutdown cooling line high vibration is corrected, all four RCPs may only be operated simultaneously during a one-time 12 hour period in support of the root cause data collection for SI-651 vibration in April 2006. During the data collection activity, whenever all four RCPs are operating, a dedicated reactor operator must be stationed in the control room to stop a loop 1 RCP if any loop 2 RCP should trip or have a sheared shaft.