April 6, 2006

Mr. James M. Levine
Executive Vice President, Generation
Arizona Public Service Company
P. O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNIT 1 - ISSUANCE OF EXIGENT AMENDMENT RE: USE OF COMPENSATORY MEASURES DURING CERTAIN REACTOR COOLANT PUMP OPERATION (TAC NO. MD0704)

Dear Mr. Levine:

The Commission has issued the enclosed Amendment No. 159 to Facility Operating License No. NPF-41, for the Palo Verde Nuclear Generating Station, Unit 1. The amendment authorizes revisions to the Updated Final Safety Analysis Report (UFSAR) in response to your application dated March 31, 2006, as supplemented by letters dated March 31 and April 4, 2006.

The implementation of this amendment includes incorporating in the UFSAR the allowed use of an operator action as a compensatory measure to prevent exceeding the Train A shutdown cooling (SDC) system design basis vibration 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 amendment is being issued under exigent circumstances in accordance with Section 50.91(a)(6) of Title 10 of the *Code of Federal Regulations*. The exigent circumstances and the final no significant hazards considerations are addressed in Sections 5.0 and 6.0 of the enclosed Safety Evaluation.

The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Mel B. Fields, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-528

Enclosures: 1. Amendment No. 159 to NPF-41
2. Safety Evaluation

cc w/encls: See next page

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ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-528

PALO VERDE NUCLEAR GENERATING STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 159
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 March 31, 2006, as supplemented by letters dated March 31 and April 4, 2006, 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, by Amendment No. 159, the license is amended to authorize revision of the Updated Final Safety Analysis Report (UFSAR), as set forth in the application for amendment by APS dated March 31, 2006, as supplemented. APS shall update the UFSAR to incorporate the description of the approved change to allow the use of an operator action as a compensatory measure on a one-time basis as described in the amendment application of March 31, 2006, as supplemented, and the NRC staff's safety evaluation enclosed to this amendment, and shall submit the revised description authorized by this amendment with the next update of the UFSAR.

3. This license amendment is effective as of the date of issuance and shall be implemented within five days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

David Terao, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Date of Issuance: April 6, 2006

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 159 TO FACILITY OPERATING LICENSE NO. NPF-41,

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNIT 1

DOCKET NO. STN 50-528

1.0 INTRODUCTION

By application dated March 31, 2006 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML060930054), as supplemented by a second letter dated March 31 (ADAMS Accession No. ML060940258) and a letter dated April 4 (ADAMS Accession No. ML060950084), 2006, Arizona Public Service Company (APS or the licensee) requested a change to the Updated Final Safety Analysis Report (UFSAR) for Palo Verde Nuclear Generating Station (Palo Verde), Unit 1. In its supplemental letter dated March 31, 2006, the licensee provided the references used to justify the requested changes to the UFSAR. In its supplemental letter dated April 4, 2006, the licensee provided additional information related to plant operator activities.

The proposed change would allow the use of an operator action as a compensatory measure to prevent exceeding the Train A shutdown cooling (SDC) system design basis vibration 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.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.91(a)(6), the licensee requested that the proposed amendment be issued under exigent circumstances in order to promptly complete the root cause evaluation and begin implementation of the necessary modifications to reduce SDC system vibration. A detailed explanation of the exigent circumstances of this issue is contained in Section 6.0 of this evaluation. The staff published a public notice in the local newspaper *Arizona Republic* on April 3 and 4, 2006.

Specifically, the licensee is proposing to add the following paragraph to Section 3.1.11 of the UFSAR:

> 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.

2.0 BACKGROUND

The Palo Verde units are pressurized-water reactor Combustion Engineering System 80 designs. The reactor coolant system (RCS) configuration for heat transport uses two RCS loops (Loops 1 and 2). Each RCS loop contains a steam generator (SG) and two RCPs (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 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 SGs were replaced, the vibration level of the Train A SDC line and valve SI-651 was found to reach approximately two inches per second (ips) at approximately 32 percent 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 by the licensee 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 RCPs operating, RCP 2A was stopped. The remaining three RCP operating combination resulted in an approximate 7 percent 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 by the licensee for 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).

3.0 REGULATORY EVALUATION

Title 10 of the CFR establishes the fundamental regulatory requirements with respect to the integrity of the RCS. Specifically, 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 15, “Reactor Coolant System Design,” requires that the RCS 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.

In order to comply with GDC 15, the licensee proposes to implement a temporary compensatory measure to allow the use of an operator action to prevent exceeding the Train A 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 four RCPs are operating.

4.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's technical and regulatory analyses in support of its proposed license amendment, which are described in Sections 4.0 and 5.0, respectively, of the licensee's submittal. The detailed evaluation below will support the conclusion 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.

The NRC staff focused primarily on three elements in its review of the licensee's proposal. These elements are (1) the maximum expected vibration levels for the worst-case scenario, (2) the length of time the RCS and its components would be subjected to the above normal vibration (which is based on credit for operator action), and (3) the impact of the vibrational loads on the RCS and its components. These three elements are discussed in detail in the following subsections.

In addition, the licensee has provided information to show that the likelihood of vibrational levels exceeding the design vibration levels is remote. The worst-case scenario for maximizing SDC line vibration is for a Loop 2 RCP to inadvertently stop during the 12-hour test period. Based on the operational history of the RCPs at the three Palo Verde units, the licensee calculated that the probability of a Loop 2 RCP stopping is 4.0E-5. While the staff is not using this value in its decision making, it does provide useful context as to the remote likelihood that the unit will be subject to higher-than-design vibration loads during the proposed 12-hour test.

4.1 Maximum Expected Vibration Levels

While the vibration level is expected to be well within the operational 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 would increase significantly. The maximum expected vibration levels are based on data collected as part of root cause evaluations conducted in early March 2006, and subsequent evaluations conducted by the licensee.

Test data acquired during the early March 2006 testing revealed an increased vibration level on the Train A SDC suction line, as a result of increased flow (approximately 7 percent) in the Loop 1 RCS hot leg when RCP 2A was stopped. Though the licensee expected an increase in vibration amplitude, the licensee did not expect the observed high magnitudes. Subsequent evaluations by the licensee indicate that an increase in hot-leg flow velocity of 7 percent 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).

The licensee has conducted research regarding the coupled interaction resulting in large amplification of the pressure disturbance at the branch line (SDC suction line) nozzle. The

licensee performed scale model tests for the Unit 1 design and operating conditions in an attempt to substantiate the phenomenological hypothesis. The results of these tests have been evaluated to quantify the relative change in vibration as a function of flow rate changes in the Loop 1 hot leg. In addition, these results have been used 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.

The scale model testing did not correctly predict the magnitude of the vibration, which is in part the basis for the licensee's proposal to collect additional data during the proposed 12-hour test. The licensee did not have an accurate initial baseline condition and misjudged the vibration condition, based on the presumption that the driving pressure pulsations in the suction line were close to the maximum value given the results from the scale model tests. The currently predicted higher vibrations, in the range of 2.8 to 3.0 ips, reflect the information collected by the licensee from additional analysis and the early March testing on Unit 1.

The NRC staff has reviewed the data collected by the licensee as well as the evaluations performed to predict vibration increases in the SDC line following a loss of a Loop 2 RCP. The NRC staff's expectation is that, for the worst-case scenario, the vibration level will not significantly exceed 3.0 ips in the SDC line.

4.2 Credit for Operator Action

During the scheduled 12-hour test, all four RCPs will be in operation and vibration limits are expected to be well below the administrative limit of 2.0 ips. Vibration limits would only be expected to exceed this limit should a RCP in Loop 2 inadvertently trip or have a sheared shaft. Operator action within 10 minutes is credited by the licensee for stopping a Loop 1 RCP if this occurs, in order to minimize the duration of the increased vibration levels.

Using the guidance contained in NRC Information Notice 97-78, ANSI 58.8, and NUREG-0800, the NRC staff found acceptable the crediting of the operator actions to trip a Loop 1 RCP within 10 minutes, based on the following:

1. The operator actions have been placed in plant procedures.

The requirements during the 12-hour period of four-RCP operation have been placed in plant procedures, namely procedure 40OP-9ZZ24, “SNOW Outage,” and 41AL-1RK5A, “Panel B05A Alarm Responses.” The NRC has reviewed these procedures, and found that the procedures establish adequate controls and direction to allow four-RCP operation to occur, including direction for tripping a Loop 1 RCP should a Loop 2 RCP trip or have a sheared shaft.

2. While in four-RCP operation, a dedicated operator will monitor RCP status and take action if required.

In accordance with procedure 40OP-9ZZ24, “SNOW Outage,” during four-RCP operation, a dedicated licensed operator will be stationed at all times in the control room at the RCP monitoring and control panel. During the 12-hour period of four-RCP operation, the dedicated operator will have no other duties but to monitor RCP status, RCS loop flows and alarms, and to take action with respect to RCPs as required. In response to NRC staff questions and by letter dated April 4, 2006, the licensee has plans in place to ensure that crew staffing will be

adequate to allow for frequent relief of the dedicated operator to prevent fatigue from affecting alertness over the 12-hour period.

3. The alarms and indications used to prompt operator action are straightforward with reliable power supplies, and are located on the RCP monitoring and control panel.

Low RCS loop flow alarms will prompt operator action to investigate RCP status and take corrective action as required. In conjunction with the low RCS loop flow alarms, operators will utilize RCP amperage, RCS loop differential pressures, and RCP breaker indicating lights to assess RCP status, and to manually trip a Loop 1 RCP if required. All of the above alarms and indications receive electrical power from reliable supplies, and are located in the main control room on the RCP monitoring and control panel.

4. The operator action to trip a Loop 1 RCP is a simple task.

To trip a Loop 1 RCP requires the operation of a single hand switch at the RCP monitoring and control panel. As a contingency, should tripping the selected Loop 1 RCP be unsuccessful, procedure 41AL-1RK5A directs the dedicated operator to trip the other Loop 1 RCP. Both Loop 1 RCP hand switches will be flagged for easy identification.

5. The indications used to verify success of the operator action are straightforward with reliable power supplies.

The primary means for the dedicated operator to ensure that a Loop 1 RCP has been successfully tripped is to check the RCP breaker indicating lights. Other indications to be used include checking RCP amperage and RCS loop differential pressures. All of these indications receive electrical power from reliable supplies, and are located in the main control room on the RCP monitoring and control panel.

In addition, during four-RCP operation, there will be a dedicated technician in the plant monitoring SDC Train A suction line vibrations in continuous communications with the control room. This will provide verification that, if required, tripping a Loop 1 RCP was successful and that SDC Train A suction line vibrations have lowered.

6. The operator action has been time validated on an operating crew, using the control room simulator.

Using the newly revised plant procedures, the licensee conducted a validation run in the plant-referenced control room simulator on a crew of one senior reactor operator and two reactor operators. A briefing of the crew was provided prior to the validation run of the newly revised procedures. Initial conditions for the validation run in the simulator were established to replicate the plant conditions that will occur during the 12-hour test period: plant in Mode 3, normal operating temperature and pressure, four-RCPs in operation. After the simulator was placed in run, the crew responded to a sheared shaft on RCP 2B, by placing the hand switches to sequentially trip both Loop 1 RCPs in 2 minutes and 2 seconds. This was well within the allowed time of 10 minutes to manually trip a Loop 1 RCP if a Loop 2 RCP trips or has a sheared shaft, to prevent excessive SDC Train A suction line vibrations.

This validated time of 2 minutes and 2 seconds for operator action is considered a conservative response time, due to:

a. The Loop 1 RCP hand switches were not flagged for easy identification during the validation run. During the actual 12-hour test period, the Loop 1 RCP hand switches will be flagged, which should lessen the response time.

b. The operating crew did not have the newly revised procedures in-hand during the validation run, but had to locate them in binders. During the actual 12-hour testing period, the dedicated operator will have the procedures pre-staged for ready use, which should lessen the response time.

7. The simulator was verified to accurately model expected plant performance.

In response to NRC staff questions and by letter dated April 4, 2006, the licensee verified that the simulator conditions used during the timed validation run accurately models expected plant performance. In particular, the licensee verified the accuracy of the initial plant conditions, and the plant indications and alarms associated with a sheared shaft of RCP 2B and the tripping of a Loop 1 RCP. During the time validation run and subsequent debrief, there were no negative comments regarding simulator performance, and the simulator performed as expected.

8. Control room staff, including the dedicated operator, will conduct a pre-job brief.

Prior to starting a fourth RCP and beginning the 12-hour testing period, the control room staff and the dedicated operator will conduct a pre-job brief, to ensure that all personnel understand the evolution and the procedural requirements.

9. Work Control

Prior to and during the performance of the 12-hour testing period, with four RCPs in operation, 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 on Unit 1.

NRC Staff Conclusions

The NRC staff has reviewed the compensatory manual operator actions associated with operating 4 RCPs during a one-time only 12-hour test period on Palo Verde, Unit 1, and has found the operator actions acceptable. Specifically, the NRC staff has found that while Palo Verde, Unit 1 is in four-RCP operation during the 12-hour test period, there is reasonable assurance that plant operators, in response to a Loop 2 RCP trip or sheared shaft, will trip a Loop 1 RCP within 10 minutes, and prevent excessive vibrations of the SDC Train A suction line. The staff found the compensatory manual operator actions acceptable, based on:

1. The operator actions have been properly developed and placed in plant procedures.
2. While in four-RCP operation, a dedicated operator will monitor RCP status and take action if required.
3. The alarms and indications used to prompt operator action and verify success are straightforward with reliable power supplies, and readily available to the dedicated operator in the main control room.

4. The operator action to trip a Loop 1 RCP is a simple task.
5. The operator action has been time validated on an operating crew, using a properly modeled control room simulator. Operators performed the action in 2 minutes and 2 seconds, well within the allotted time of 10 minutes.
6. Control room staff, including the dedicated operator, will conduct a pre-job brief.
7. The licensee has appropriate plans in place for work control during the 12-hour test.

4.3 Impact of Vibration Loads

The most limiting component in the SDC line with regard to the vibration issue, which is the subject of this Safety Evaluation, is the actuator on valve SI-651. The existing operational vibration limit for the SDC line 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) pertain to frequencies from 24 to 25 hertz measured at the SI-651 valve.

In support of the exigent amendment request, the licensee also took credit for the dynamic testing that was performed by Limitorque as part of the seismic qualification of the actuator. The actuator was successfully tested for approximately 11 minutes at 3 to 4.5 g's. Details of this testing are discussed in the licensee's March 31, 2006, application and in Enclosure 2 of the supplemental letter also dated March 31, 2006.

The results of this testing demonstrated that 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 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 is within the range of test values and less than the maximum test value of 4.5 g's. The NRC staff also considered the implications of the valve orientation, as installed in the Palo Verde, Unit 1, SDC line versus the valve orientation used in the test assembly. The licensee indicated that the local accelerations at the motor-operated valve (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 8 minutes and 4.5 g's for 3 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, the NRC staff finds that 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 3 minutes within the 10-minute interval at a frequency range of 24 to 25 Hz is conservative.

The NRC staff has reviewed the details of the seismic testing conducted on the test assembly valve actuator and finds the testing is applicable to the plant-specific design of Palo Verde, Unit 1. The seismic test was performed at frequencies below the 25 hertz value that is currently observed in the SDC line. This test is conservative, because 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, based on a 3g acceleration, from zero to peak at 5 hertz was approximately 1.2 inches, as compared to a displacement of approximately 0.05 inch at 25 hertz. Therefore, the NRC staff concludes that

the vibration excursions detailed in the above paragraph are applicable to the actuator for valve SI-651.

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

The acceptability of vibration levels greater than 2.25 ips has also been considered for the reactor coolant pressure boundary piping. At 5.2 ips, the allowable duration is 26.7 minutes for the reactor coolant pressure boundary piping. 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 than that for the reactor coolant pressure boundary piping.

4.4 Conclusions

The licensee has demonstrated to the NRC staff's satisfaction that the vibration levels expected during the planned 12-hour test evolution, even assuming the worst-case scenario should a Loop 2 RCP trip or have a sheared shaft, will not exceed the operational limits of the RCS and its components for a sufficiently long period of time, such that operator action can be credited to effectively mitigate any abnormal situations. Therefore, the NRC staff finds acceptable the licensee's proposal to modify the UFSAR, as stated in Section 1.0 of this Safety Evaluation, to allow the operation of the four Palo Verde, Unit 1, RCPs simultaneously during a one-time, 12-hour period in support of the root cause data collection for SI-651 vibration in April 2006.

5.0 REGULATORY COMMITMENTS

Prior to starting the fourth RCP for the data collection activity, the licensee will implement the following commitments as contained in Attachment 1 to Enclosure 2 of the March 31, 2006, application:

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.

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.

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.

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.

5. Prior to and during the performance of four-RCP operation for data collection, the work schedule for Palo Verde, 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.

The above compensatory measures have been entered as regulatory commitments in the licensee's Commitment Management System, which complies with Nuclear Energy Institute's Document 99-04, Revision 0, "Guidelines for Managing NRC Commitment Changes." The NRC staff has reviewed the compensatory measures and how they will be controlled, and finds that the licensee's commitments provide adequate assurance that the operator actions to trip a Loop 1 RCP will occur within 10 minutes, should a RCP in Loop 2 inadvertently trip or have a sheared shaft.

6.0 EXIGENT CIRCUMSTANCES

The regulations at 10 CFR 50.91 contain provisions for issuance of amendments when the usual 30-day public comment period cannot be met. One type of special exception is an exigency. An exigency is a case where the NRC staff and licensee need to act promptly. In this case, there is insufficient time to process the license amendment request within the normal time frame. Pursuant to 10 CFR 50.91(a)(6), the licensee requested the proposed amendment on an exigent basis.

Under such circumstances, the Commission notifies the public in one of two ways: (1) by issuing a *Federal Register* notice providing an opportunity for hearing and allowing at least 2 weeks for prior public comments, or (2) by issuing a press release discussing the proposed changes, using local media. In this case, the Commission used the second approach and published a public notice in the local newspaper, *Arizona Republic,* on April 3 and 4, 2006.

In its March 31, 2006, submittal, the licensee provided the following as basis for the need for an exigent review of proposed license 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.

Based on the above circumstances, the NRC staff finds that there is insufficient time to process a normal license amendment request to support timely data collection and that the importance of understanding the root cause underlying the higher-than-normal vibrations observed in the SDC line as soon as practical merits the exigent issuance of an amendment to the UFSAR. Therefore, the NRC staff has determined that a valid need exists for issuance of the license amendment with the exigent provisions of 10 CFR 50.91(a)(6).

7.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission's regulations in 10 CFR 50.92 state that the Commission may make a final determination that a license amendment involves no significant hazards considerations if operation of the facility in accordance with the amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in the margin of safety. Based on its analysis, the NRC staff has concluded that:

1) The amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

The purpose of the amendment is to allow the use of an operator action as a compensatory measure to prevent exceeding the Train A 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 the UFSAR Sections 6.3 and 15.6.5.

The compensatory measure will 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 anticipated 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 both 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. Licensee 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 compensatory measure will 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 2 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 amendment does not involve a

significant increase in the probability of a LOCA. The consequences of a LOCA would not be affected, because the amendment does not affect the UFSAR LOCA radiological dose analysis. The amendment will have no affect 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 will 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 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 (LOOP) and no-LOOP 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 at this time.

The amendment will have no other affects on plant operations, or any design function or Mode 3 analysis that verifies the capability of structures, systems, or components to perform a design function. Therefore, the proposed amendment will not change any of the previously evaluated accidents in the 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.

2) The amendment will not create the possibility of a new or different kind of accident from any previously analyzed.

The 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 system, and will not affect the ability of the RCS and SDC system to perform its design functions. Therefore, the amendment will 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 above.

3) The proposed amendment will not involve a significant reduction in a margin of safety.

The amendment will 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) and, therefore, will not significantly reduce the margin of safety. The amendment will 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-RCP 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. However, UFSAR safety analyses for postulated DBEs in Mode 3 (e.g., MSLB), show that fuel centerline melting and fuel clad damage would not occur, even under natural circulation conditions with no RCPs in operation. Likewise, the amendment and compensatory operator action will 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.

8.0 STATE CONSULTATION

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

9.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves 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 made a final finding that the amendment involves no significant hazards consideration. Accordingly, the amendment meets 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 amendment.

10.0 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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