10 CFR 50.90

Palo Verde Nuclear Generating Station

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102-05454-CE/SAB/GAM
April 4, 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
Response to NRC Request for Additional Information Regarding 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

In letter no. 102-05452, dated March 31, 2006, Arizona Public Service Company (APS) submitted a request for 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.

By e-mails dated April 3, 2006, the NRC provided to APS several questions requesting additional information (RAI) regarding the proposed operating license amendment. Provided in the Enclosure 2 are APS' responses to the NRC RAI. Enclosure 1 is a notarized affidavit.

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No commitments are being made to the NRC by this letter. If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

CE/SAB/GAM/

Enclosures: As stated

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
Notarized Affidavit

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Cliff Eubanks, represent that I am Vice President, Nuclear Operations, 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.

Cliff Eubanks

Sworn To Before Me This 4th Day Of April, 2006.

Notary Public

SUSIE LYNN ERGISH
Notary Public - Arizona
Maricopa County
My Comm. Expires Jul 14, 2007

Notary Commission Stamp

ENCLOSURE 2

APS' RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING 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

NRC Question 1

On March 18, 2006, with 4 RCPs running, you manually tripped the 2A RCP, SDC line A vibrations increased, and then the 2A RCP was restarted. What indications and/or communications occurred to prompt the operators to restart the 2A RCP? Was the 2A RCP restarted in response to a report from the field that SDC line A vibrations were above the design limit?

APS Response

On March 18, 2006, a technician was stationed at the 120' East Wrap directly monitoring real time vibration levels. This technician was reporting vibration levels to the control room via the plant radio system. When the 2A RCP was stopped, the technician provided a running commentary on the vibration levels to the control room. The Shift Manager was in the control room monitoring the evolution. The Shift Manager directed restart of the 2A RCP when vibrations levels exceeded the administrative limit of 2.0 IPS.

NRC Question 2

During your planned 12 hour test with 4 RCPS running, exactly what indications and alarms will be used by the dedicated operator to diagnose a loop 2 RCP trip? What exact indications and alarms will be used to diagnose a loop 2 RCP shaft shear? Are these alarms and indications safety grade? Are these alarms and indications powered from safety grade electrical supplies (DC, uninterruptible)?

APS Response

Per procedures 40OP-9ZZ24, "SNOW Outage," and 41AL-1RK5A, "Panel B05A Alarm Responses," the dedicated reactor operator in the control room will continuously monitor the channel pre-trip and channel trip alarm windows for low reactor coolant flow (steam generator differential pressure) (windows 5A11D, 5A12D, 5A11C, and 5A12C) during four RCP operation. If there should be any RCS low flow pre-trip or trip alarms, the dedicated operator would perform the following steps in procedure 41AL-1RK5A:

2. Compare **ALL** RCPs amperage.
   - Amperage on a RCP with a sheared shaft will be lower than the amperage of the operating RCPs.

3. Check for low or decreasing reactor coolant D/P by observing indicators RCA-PDI-125A, RCA-PDI-125B, RCA-PDI-125C, and RCA-PDI-125D on B05.

4. **IF** it is determined that the RCP with the sheared shaft is a Loop 1 pump, **THEN** perform **ALL** of the following:

    1. Stop the RCP motor with the sheared shaft.

    2. **IF** the selected RCP motor did **NOT** stop,
    THEN direct the Operator in the switchgear room to locally trip the RCP motor at its breaker.

    3. Go to step 7.

5. **IF ONE** of the following conditions exists:

    - **ANY** Loop 2 RCP indicates a sheared shaft
    - Less than four RCPs are in operation

    THEN perform **ALL** of the following:

    1. **IF** two RCPs are running in Loop 1,

        THEN stop **ONE** of the following:

        - 1A RCP
        - 1B RCP

    2. **IF** the selected RCP did **NOT** stop
    THEN STOP the other Loop 1 RCP

    3. **IF** two RCP's remain running in LOOP 1,

        THEN direct the Operator in the switchgear room to locally trip a RCP at its breaker.

        - Breaker 1-NAN-S01M for 1A RCP
        - Breaker 1-NAN-S02L for 1B RCP

6. Stop the RCP motor with the sheared shaft.

7. Inform the Control Room Staff of the RCP configuration.

The instruments that provide input to the reactor coolant low flow alarm functions are safety grade instruments and have four redundant channels with identical instruments. The alarm system is provided with redundant DC and AC sources and is considered

reliable but is not a class 1E system. The S/G differential pressure instruments are class 1E systems and have analog indicators available to the operator to aid their diagnosis of conditions. Each RCP has indications of breaker position (open and closed) and an ammeter to indicate motor current. There are also non-class reactor vessel and RCP D/P instruments on Board 4 which provide the operator with additional information.

NRC Question 3

Please provide more information about the dedicated operator. Will his or her only duties consist of monitoring RCP status and alarms and take action trip a loop 1 RCP if required? Will the dedicated operator be stationed at the RCP control and monitoring panel at all times during the 12 hour test? Explain how you plan on ensuring that the dedicated operator remains alert, i.e., plans for watch relief, how long will any single individual be assigned the duties of the dedicated operator, etc.

APS Response

The dedicated operator will have no other duties. This person will be a licensed operator stationed at Board 4/5 continuously during four RCP operation. Crew staffing will be adequate to allow for frequent relief of the dedicated operator to prevent fatigue from affecting operator alertness. It is expected that the dedicated operator will be relieved at least every two hours.

The dedicated operator will directly monitor RCP ammeters and RCS loop flow conditions. This person will be thoroughly briefed on the procedures and expected indications for a loss of a loop 2 RCP. He will be instructed to perform the alarm response procedure to secure a loop 1 RCP immediately upon receipt of indications that a loop 2 RCP has tripped or had a sheared shaft event.

NRC Question 4

Describe in detail how the simulator validation run was performed, including simulator set up, initial conditions, malfunction(s) inserted, crew makeup that the validation run was performed on. Was the crew briefed before the simulator run on the need to trip a loop 1 RCP should a loop 2 RCP trip? Did the simulator validation run only model a RCP trip, or did it include a RCP shaft shear? Did the crew respond to the alarms and indications as expected?

APS Response

A simulator scenario was performed with a Control Room Supervisor and two reactor operators to determine response times to a low reactor coolant flow alarm. A briefing of the procedure changes to 41AL-1RK5A, "PANEL B05A ALARM RESPONSES," and

40OP-9ZZ24, "SNOW Outage" was performed for the crew. Initial conditions were established in Mode 3 at normal operating pressure and temperature with four RCPs operating. The event began with the simulation of a sheared shaft on RCP 2B and the crew responded to the alarms using the draft procedure changes to 41AL-1RK5A for the dedicated reactor operator. The sheared shaft as the initiator was chosen to maximize response time to complete the actions.

The crew had completed the control room actions in two minutes and two seconds from the time that the sheared shaft scenario was inititiated. Specifically, the following steps currently in draft procedure 41AL-1RK5A were completed:

- Compare **ALL** RCPs amperage.
- Check for low or decreasing reactor coolant D/P by observing indicators RCA-PDI-125A, RCA-PDI-125B, RCA-PDI-125C, and RCA-PDI-125D on B05.
- **IF** it is determined that the RCP with the sheared shaft is a Loop 1 pump, **THEN** perform **BOTH** of the following:

    1. Stop the RCP motor with the sheared shaft.
    2. **IF** the selected RCP motor did **NOT** stop,
       THEN direct the Operator in the switchgear room to locally trip the RCP motor at it's breaker.
    3. Inform the Control Room Staff of the RCP configuration.

- **IF ONE** of the following conditions exists:
    - **ANY** Loop 2 RCP indicates a sheared shaft
    - Less than four RCPs are in operation

  THEN perform **ALL** of the following:

    1. **IF** two RCPs are running in Loop 1,
       THEN stop **ONE** of the following:
       1A RCP
       1B RCP
    2. **IF** the selected RCP did **NOT** stop
       THEN STOP the other Loop 1 RCP

In order to simulate the actions that may be needed to locally open an RCP circuit breaker, RCPs 1A and 1B would not stop (in the simulated scenario) by using control room handswitches with simulated malfunctions to force the crew to contact the operator in the switchgear room.

The response time is expected to be reduced in the Unit during the data collection by performing a more thorough pre-job briefing, having the applicable alarm response pages withdrawn from the binder and controlled by the dedicated reactor operator, and flagging of the loop 1 RCP handswitches.

NRC Question 5

What actual actions are required to trip a loop 1 RCP? (The NRC wishes to verify that operating a single hand switch is the only operator action). Is there any credible event or malfunction that would physically prevent tripping a loop 1 RCP (e.g., loss of control power, an interlock)? Should your revised procedures include tripping other RCPs, in case the first RCP selected does not trip?

APS Response

Procedures 40OP-9ZZ24, "SNOW Outage," and 41AL-1RK5A, "Panel B05A Alarm Responses," will direct the dedicated reactor operator in the control room to trip either RCP 1A or 1B upon indication that a loop 2 RCP has tripped or has a sheared shaft (see response to Q2 regarding indications). Each RCP is provided with a control room pistol-grip hand switch that provides the continuity to the RCP circuit break trip circuit when rotated. Loss of control power would result in the inability to trip the RCP from the control room. If the first loop 1 RCP does not stop when the switch is tripped, then the dedicated operator will trip the switch for the other loop 1 RCP. It is not expected that any single failure would cause both loop 1 RCPs to not respond to tripping from the control room.

Although not credited in the exigent license amendment request, procedures 40OP-9ZZ24, "SNOW Outage," and 41AL-1RK5A, "Panel B05A Alarm Responses," will require a dedicated operator to be stationed in the switchgear room and to be in communication with the control room during four-RCP operation so that a loop 1 RCP circuit breaker would be tripped locally if both loop 1 RCPs should fail to stop when tripped from the control room. The local action has been simulated but not timed. It is expected that the local RCP 1A or 1B circuit breaker would be able to be tripped within 10 minutes of a loop 2 RCP tripping or having a sheared shaft.

NRC Question 6

What alarms and indications will the dedicated operator use to indicate that the action(s) to trip a loop 1 RCP were successful? Are these alarms and indications safety grade? Are these alarms and indications powered from safety grade electrical supplies (DC, uninterruptible)?

APS Response

Indications in the control room that the dedicated operator use to indicate that the action(s) to trip a loop 1 RCP were successful include:

- RCP breaker position indication lamps (power supplied by reliable non-class DC bus)
- RCP motor ammeter (self powered instrument by current transformer)
- RCS loop D/P instruments (class 1E instruments, four redundant channels, class DC power supply via class Inverters)
- SDC line vibration indication (control room indications have non-class power from lighting circuits, locally monitored instruments are portable instruments reported via plant radio system)

In addition to the indications in the control room, during the four RCP operation there will be continuous monitoring of the vibration levels performed by a technician on a qualified circuit located in the 120' east wrap room to provide the control room with a real time update of vibrations on valve SI-651 before and after the loop 1 pump trip. This will provide verification that tripping the loop 1 RCP lowered vibration.

NRC Question 7

During the 12 hour test period, will SDC line A vibration levels be indicated or communicated to the control room and the dedicated operator? Perhaps operator actions to change the running RCP configuration should be based on SDC line A vibration levels in addition to actions based on a loop 2 RCP trip or sheared shaft?

APS Response

During all operating conditions, including during the four-RCP data collection activity, the normal control room operators monitor the SDC line vibration levels on a temporary vibration monitoring/alarming computer in Unit 1 control room (which updates every ten minutes). Continuous monitoring of the vibration levels will also be performed by a technician on a qualified circuit during the four RCP operation located in the 120' east wrap room. The technician will be in continuous radio communications with the control room and will provide real time information on valve SI-651 vibrations to assist in decisions and to validate results (as was the case on March 18, 2006). Procedure 41TP-1SI02, "Unit 1 SIA-UV-651 Vibration Alarm Response," requires the control room operators to take the actions described below whenever there is a valid indication that the SDC line vibration has exceeded the 2.0 ips administrative limit. This procedural requirement is in place now, and will remain in place when four RCPs are operating for data collection. As stated in the amendment request, based on operating experience

and supporting calculations, operating four RCPs in Mode 3 is not expected to result in the SDC vibration exceeding the 2.0 ips administrative limit. If the SDC vibration should exceed the 2.0 administrative limit at any time, the normal control room operators will take the following action in accordance with procedure 41TP-1SI02:

- **IF** the unit is tripped, **AND** vibration is greater than or equal to 2.0 IPS on the V1H point, **THEN** perform **ANY** of the following:
  - Stop any evolution in progress that may be affecting vibration. (i.e: stop pressurizer level changes; restart RCP; restore the plant to conditions before vibration increase, etc.)
  - Ensure RCP 1A or 1B is secured.
  - Initiate a normal plant cooldown.

As stated in the amendment request, the manual action that is to be credited for operability during four-RCP operation is specifically to trip a loop 1 RCP if a loop 2 RCP should trip or have a sheared shaft. Operating experience and supporting calculations conclude that two loop 1 RCPs/one loop 2 RCP operation is the only credible scenario that is expected to result in SDC line vibration to be greater that the administrative limit of 2.0 ips. The dedicated reactor operator to be stationed in the control room during four-RCP operation will be focused only on the proper operation of two loop 2 RCPs in order to take prompt action to trip a loop 1 RCP if indications show that a loop 2 RCP has tripped or had a sheared shaft. The dedicated operator is not directed to monitor SDC line vibrations because that could distract the dedicated operator and delay the required compensatory function.

NRC Question 8

For the simulator validation run performed, please verify use best available data or system experts that the simulator accurately modeled plant conditions: Initial conditions, alarms and indications received for a tripped RCP/sheared shaft in loop 2, the switch manipulations for the manual tripping of an RCP in loop 1, alarms and indications received after the loop 1 RCP was manually tripped.

APS Response

The simulation of a sheared shaft on RCP 2B was used as the initiator to maximize response time to complete the compensatory actions. The simulators are referenced to Unit 1 and therefore accurately model the Unit 1 plant conditions.

The simulator is designed and tested to conform to 10 CFR 55.46 and ANSI 3.5 1985 criteria. Malfunctions are tested over a four year period and transient tests are

performed annually by the Simulator Support Group (SSG). The SSG also investigates operator feedback on simulator performance and corrects performance deficiencies. The simulator's reference unit is Unit 1 with replacement steam generators and power uprate.

The initial condition (IC) used was created from a normally maintained IC for a reactor startup under NOP/NOT conditions with group 2 CEAs at 60 inches withdrawn (sub critical). The simulator test operator tripped the reactor to create the 0% power, all rods in, hot standby, turbine tripped initial conditions for validation. The crew checked the lineup and plant conditions during turnover. There were no reports of any abnormalities. In addition the simulator has no open discrepancy reports for the reactor startup IC used to create the validation IC.

The validation scenario used the RCP 2A sheared shaft malfunction. The crew received the appropriate pre-trip and trip alarms for RCS D/P (low flow) and confirm with low D/P indication. A check of RCP amps showed RCP 2B sufficiently lower than the running RCPs. In addition, the simulator has no open discrepancy reports for this malfunction.

There were simulator overrides inserted for RCP 1A and 1B handswitches preventing them from being tripped from the control room. The operator was able to determine from hand switch and other indications that the RCP did not trip. The auxiliary operator was sent to trip the breaker locally. This was successful using the local switchgear control switch. The control room was able to confirm the tripped condition by observing handswitch indication, 0 amps, and no flow.

During the validation and debrief there were no negative comments regarding simulator performance with regard to the alarms and indications available to the crew to diagnose the plant condition, take appropriate action and verify the plant response.