

Arizona Public Service Company

April 13, 1984  
ANPP-29293-BSK/TRB

U. S. Nuclear Regulatory Commission  
Region V  
Creskide Oaks Office Park  
1450 Maria Lane - Suite 210  
Walnut Creek, CA 94596-5368

Attention: Mr. T. W. Bishop, Director  
Division of Resident  
Reactor Projects and Engineering Programs

Subject: Interim Report, Revision 1 - DER 83-61  
A 50.55(e) Potentially Reportable Deficiency Relating to Unit  
1 LPSI Pumps Failed To Start And Do Not Produce The Required  
Head  
File: 84-019-026; D.4.33.2

Reference: A) Telephone Conversation between P. Johnson and R. Tucker on  
September 14, 1983  
B) ANPP-28001, dated October 13, 1983 (Interim Report)  
C) ANPP-28627, dated January 16, 1984 (Time Extension)  
D) ANPP-28883, dated February 15, 1984 (Time Extension)

Dear Sir:

The NRC was notified of a potentially reportable deficiency in Reference (A), an Interim Report was transmitted by Reference (B), and Time Extensions were requested by Reference (C) and (D). At that time, it was estimated that a Final Report would be available by April 17, 1984.

Due to the extensive investigation and evaluation required, a revised Interim Report is attached. It is now expected that this information will be finalized by June 29, 1984, at which time a complete report will be submitted.

Very truly yours,



E. E. Van Brunt, Jr.  
APS Vice President, Nuclear  
ANPP Project Director

EEVB/TRB:ru  
Attachment

cc: See Page Two

8404240159 840413  
PDR ADOCK 05000528  
S PDR

1E-27 11

Mr. T. W. Bishop  
DER 83-61  
Page Two

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INTERIM REPORT - DER 83-61  
POTENTIAL REPORTABLE DEFICIENCY  
ARIZONA PUBLIC SERVICE COMPANY (APS)  
PVNGS UNITS 1, 2, & 3

I. Potential Problem

The Low Pressure Safety Injection (LPSI) Pumps and the Containment Spray (CS) Pumps are supplied by Combustion Engineering (C-E) and are manufactured by Ingersoll-Rand (IR). The LPSI pumps are 8 x 20 type WDF and are driven by Westinghouse (W) 500 hp electric motors. The CS pumps are 8 x 23 type WDF and are driven by Westinghouse (W) 800 hp electric motors. Both pumps are similar in design (close-coupled to motors) and are identified by the following tag numbers:

<u>LPSI</u>	<u>CS</u>
1MSIA-PO1	1MSIA-PO3
1MSIB-PO1	1MSIB-PO3
2MSIA-PO1	2MSIA-PO3
2MSIB-PO1	2MSIB-PO3
3MSIA-PO1	3MSIA-PO3
3MSIB-PO1	3MSIB-PO3

While performing preoperational testing at PVNGS Unit 1 on March 18, 1983, the LPSI pump, tag number 1MSIB-PO1 was run for approximately three (3) minutes with the pump suction valve 1PSIB-UV-652 closed. This was a violation of Preoperational Test Procedure 91PE-1SIO8. A restart of the pump was attempted approximately three(3) hours later and the motor tripped out on the time overcurrent protection circuit. The pump was disassembled and inspection revealed surface damage to the pump lower case wear ring and mating surfaces of the impeller. This condition was reported on DER 83-21. The corrective action was to repair the rough surfaces by smoothing with a stoning operation. The pump was retested successfully at this time.

During the period of May 16 to May 19, 1983, two (2) more failures to restart the LPSI pump occurred, due to the (W) motor time overcurrent trip. Disassembly and inspection revealed surface damage had occurred again on the case wear ring and impeller mating surfaces. As before, the corrective action was to smooth the surfaces by the stoning operation.

Subsequently, this Deficiency Evaluation Report (DER 83-61) documented that on June 14, 1983, LPSI pump 1MSIBPO1 again failed to restart during the continuation of the preoperational testing after running for approximately twenty (20) minutes. This condition was investigated as an electrical problem, hence the LPSI Unit 1 (W) motor was replaced with a LPSI Unit 3 pump (W) motor, S/N 76F605781S079, by direction of APS.

On June 19, 1983, the LPSI pump failed to restart again, after running successfully for two hours. On June 26, 1983, with the IR representative present, the pump was disassembled and inspected; the galling had occurred again. Under the IR representative's direction, the pump was reworked to smooth all galled areas and reassembled. Ten successful test starts were recorded on June 26. On July 6, 1983, the LPSI pump failed to restart.

On October 8, 1983, the Unit 2 LPSI pump identified as tag number 2MSIA-P01 failed to restart after 41 successful starts and accumulation of 66 hours of running time, this was documented on NCR SM-3026.

Nonconformance Reports SM-2756 and SM-2757 are also included in this Deficiency Evaluation Report (DER 83-61) to document that Unit 1 LPSI pumps 1MSIAP01 and 1MSIBP01 did not meet pump performance requirements for head pressure as specified in Purchase Order Specification 13-NM-001.

On December 3, 1983, while effecting repairs to Unit 1 LPSI pump, tag number 1MSIB-P02, the impeller from Unit 3 LPSI pump, tag number 3MSIA-P01, was removed for installation in LPSI Pump 1MSIB-P01 to replace the damaged Unit 1 LPSI pump impeller. During inspection of the Unit 3 impeller, it was revealed that impeller bore is out of tolerance per vendor drawing C-8X20A3DX1A. The bore should be  $2.5005" + .0005"$ . The actual bore measurement is from  $2.5050"$  to  $2.5015"$ , this condition is documented on NCR SM-3418.

Due to the similarity of their design, the above reported deficient conditions on the LPSI pumps render the Containment Spray Pumps suspect also. Therefore, the required corrective action will address both LPSI and CS pumps.

## II. Approach To and Status of Proposed Resolution

Upon recommendation by Combustion Engineering and Ingersoll-Rand and with Bechtel Engineering concurrence, the following corrective action plan has been implemented on the LPSI and CS pumps for Unit 1 and will be considered for Units 2 and 3. The attached Figure 1 represents a generic cross sectional view of the LPSI 8 x 20 and CS 8 x 23 WDF pumps, and is provided to identify by item number, corrective action modifications.

### A. LPSI & CS

1. The upper and lower Monel K-500 case wear rings (Item 6) have been replaced with new rings using Armco Nitronic 60 material, which is known for its gall-resistant properties.

2. To assure centralization of the upper case wear ring, the allowable run-out on the male rabbet of the stuffing box extension (Item 264) will be decreased from .005 inches to .002 inches TIR. Location fits will also be doweled to limit movement after alignment is achieved.
3. The impeller (Item 3) ring fit areas have been serrated (grooved) to make this area less sensitive to any contact and to minimize loss of pump head due to increasing clearances between this area and the case wear rings.
4. The running clearances between the impeller (Item 3) and casing rings (Item 6) on the LPSI pumps have been increased to .029"-.036" diametrical. The running clearances between the impeller (Item 3) and the casing rings (Item 6) on the CS pumps will be .025" - .032" diametrical.
5. The (W) motor bearings (not shown) will be inspected to ensure there will be no out-of-tolerance movement. The bearings may be replaced at the discretion of the vendor.
6. During testing of LPSI 1B with its 500 hp motor and with above Items 1-5 implemented, another failure to start occurred on January 29, 1984. It was concluded that the shaft flexibility in combination with transient magnetic starting forces for this particular motor, make it unsuited for reliable use with the WDF type pump.
7. An 800 hp containment spray pump motor from Unit 3 was installed on the LPSI 1B pump. The unit was operated for 3 hours to stabilize bearing temperatures. It was then started 5 times (20 minutes run time for the first four to satisfy motor cooling requirements). Subsequent disassembly and inspection revealed light contact at the lower impeller clearance (360°) with corresponding contact at approximately 270° of the lower case ring (on the side away from the pump discharge connection).
8. The pump was reassembled and 100 additional starts were made. All runs were approximately 20 minutes duration and at 2000 to 2100 gpm valve alignment. The first run (after refilling and venting) started at approximately 100 gpm thru the minimum flow line, same as above in Paragraph 7. Subsequent disassembly and inspection (March 8, 1984) disclosed no evidence of contact at the upper ring clearance and no obvious additional contact at the lower ring clearance, as noted in Paragraph 7. The contact surfaces of the Nitronic 60 case rings were smooth with a light intermittent film transfer to the four impellers running surface lands.

9. At a March 9, 1984 meeting, APS, Bechtel, CE and IR agreed that the light rubs were normal and within acceptable limits. The significance of no evidence of contact on 90° of the lower case ring would indicate startup deflections are not resulting in contact. The 270° contact probably resulted from the brief operation at minimum flow where pumps characteristically run rougher. It was further agreed that this particular 800 hp motor (frame 5809 with 6" diameter shaft) configuration has been demonstrated to operate reliably in combination with the WDF type pumps.
10. 500 hp motors (frame 5808 with 6" diameter shaft) are available and would also be reliable for use with the LPSI pumps based on operating history with WDF type LPSI and CS pumps at the SONGS plant.

II. Projected Completion of Corrective Action and Submittal of the Final Report

Evaluation of this condition and submittal of the Final Report is forecast to be completed by June 29, 1984.



FIGURE 1

DER 83-61

shaft sleeve

shaft

81 inches to shaft

gland stud

supporting head

gland nut

mechanical seal

O-ring

stuffing box

locking

lock screw

Gasket

impeller

A296 CAGN1 \*

antirotation pin

Gasket

casin

suction ring

casin

washer

Key-impeller shaft

lock screw

cap screw 4 ea

stud

nut (24 ea)

stuffing box extension

casin

pump feet

lock screw

diffuser

cap screw

tab washer

impeller nut

tab washer

62A3

172

38A4

429

456

88

410 3521 - 415 3000

82

363A

3

26A13

363B

6 23

26

1

246A

\* \* K-500 MODEL 265 BNAI (265-280 ACTUAL)  
SYSTEM 80

CUSTOMER COMPONENT CODE NO. 31-15-54-4322-00

FOR PARTS LIST SEE  
P.L. 8x20 WDF500X25 PAI