Arizona Nuclear Power Project
P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

February 27, 1985
ANPP-32013-TDS/TRB

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

Attention: Mr. D. F. Kirsch, Acting Director
Division of Reactor Safety and Projects

Subject: Final Report - DER 84-106
A 50.55(e) Reportable Condition Relating
to Spurious Load Shed Of BOP ESFAS
File: 85-019-026; D.4.33.2

Reference: A) Telephone Conversation between P. Narbut and
T. Bradish on December 27, 1984
B) ANPP-31792, (Interim Report) dated January 24, 1985

Dear Sir:

Attached is our final written report of the deficiency referenced above, which has been determined to be Not Reportable under the requirements of 10CFR50.55(e).

Very truly yours,

E. E. Van Brunt

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

EEVB/TRB/plk

Attachment

cc: See Page Two

IE27
1/1

cc: Richard DeYoung, Director
Office Of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

T. G. Woods, Jr.
D. B. Karner
W. E. Ide
D. B. Fasnacht
A. C. Rogers
L. A. Souza
D. E. Fowler
T. D. Shriver
C. N. Russo
B. S. Kaplan
J. R. Bynum
J. M. Allen
D. Canady
A. C. Gehr
W. J. Stubblefield
W. G. Bingham
R. L. Patterson
R. W. Welcher
H. D. Foster
D. R. Hawkinson
R. P. Zimmerman
M. L. Clyde
M. Matt
T. J. Bloom
D. N. Stover
J. D. Houchen
J. E. Kirby

Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, GA 30339

FINAL REPORT - DER 84-106
DEFICIENCY EVALUATION 50.55(e)
ARIZONA PUBLIC SERVICE COMPANY (APS)
PVNGS UNITS 1

I. DESCRIPTION OF DEFICIENCY

Two spurious load sheds and sequencer lock-up events of the Unit 1 Train B BOP ESFAS occurred on December 13, 1984. The loads that were shed were the Train B 4160V switchgear 304 feeder breaker and associated 480V load center breakers. These events occurred prior to fuel load. The plant was in normal operating configuration and alignment and no testing or change of operating conditions were being performed. The two events occurred four hours apart.

EVALUATION

Immediately after the first load shed and sequencer lock-up event, several unsuccessful attempts were made to reset the processor in the load sequencer module. Then the BOP ESFAS was deenergized and allowed to cool for approximately 30 minutes. When the system was reenergized and the processor reset, the sequencer operated normally. Then after a period of approximately four hours, the sequencer module went into load shed mode and locked up. This indicated that one or more components were no longer performing to capacity and were failing after a short period of operation.

The sequencer module was removed from the Unit 1 Train B BOP ESFAS, installed in a Unit 2 system, and retested. After a short period of operation, it failed in the same manner, indicating that the problem was within the sequencer module itself and not attributable to the rest of the ESFAS.

The sequencer module was then removed and put into a test area for further investigation and troubleshooting. It was found that three components, two integrated circuits and one voltage regulator were failing after a period of time in their normal operating environment.

The sequencer functions associated with the two integrated circuit failures are (1) the test enable lines, which control special testing functions of the Loss of Power/Load Shed (LOP/LS) module, and (2) the one second pulse output to the LOP/LS module. The function of the voltage regulator is to supply +5 V-dc to a portion of the integrated circuit modules.

A review of these component failures by the BOP ESFAS vendor was conducted (see referenced letter) and it was verified that the root cause of the problem was random failures of the components. These failures do not indicate any inadherent design deficiencies and are evaluated as an isolated component failures under the plant maintenance program.

The BOP ESFAS failure mode addressed herein cannot go undetected because it is readily recognized by alarms on the station annunciator, and immediate action can be taken by the operator to rectify the condition by replacement of the sequencer module with a spare.

II. ANALYSIS OF SAFETY IMPLICATIONS

This condition is evaluated as not reportable under the requirements of 10CFR 50.55(e) and 10 CFR Part 21 since the condition does not consitute a safety significant condition. Should this failure remain uncorrected for some finite period of time, Technical Specificaitons require that the plant will be brought to shutdown conditions.

Specifically, instrumentation affected by the loss of the Train B BOP ESFAS is covered by Technical Specification 3/4.3.2. For the most vital instrumentation, the operator is allowed a minimum of one hour prior to taking action to secure power operation. Further, the loss of power is covered by Technical Specification 3/4.8.3, which allows the operator a minimum of eight hours prior to taking action to secure power operation.

III. CORRECTIVE ACTION

The corrective action for the Unit 1 Train B BOP ESFAS was to replace sequencer module with a unit from spares and put the system back into service. The failed sequencer module has been repaired by replacing the two integrated circuits and voltage regulator, retested and returned to spares.

IV. REFERENCE

Letter, Sorrento Electronics to Bechtel Power Corporation, February 20, 1985, MIC No. 239867.

Sorrento Electronics

11045 Sorrento Valley Cou
San Diego, California 9212
(619) 457-882

February 20, 1985

Bechtel Power Corporation
12440 East Imperial Highway
Norwalk, CA 90650

Attn: Mr. W.G. Bingham
Project Engineering Manager

Subject: Arizona Nuclear Power Project
BOP ESFAS Reliability and Maintenance Support

Reference: Your letter dated December 28, 1984, same subject

Dear Mr. Bingham:

The primary purpose of this letter is to provide you with the results of our reliability investigation regarding several BOP ESFAS Module failures which have occured at the Palo Verde Nuclear Generating Station. Additionally, it presents recommendations to enhance long term supportability of the equipment

A. Module Failures

During the period of December 18-20, 1984 and January 8-17, 1985, Mr. Zvi Rendel, GA Support Engineer, provided onsite troubleshooting and repair assistance to ANPP maintenance personnel. A summary of the module failures which he encountered and his corrective action is presented in the Table 1.

Based on a thorough review of these failures by the BOP ESFAS designer and our reliability engineer, we conclude that the failures are clearly random and do not indicate any inherent design deficiencies. This conclusion is also supported by the fact that the system may have been subjected to abnormal conditions during a lengthy start up, including extremely high temperatures, high ground noise, and an incident of ground connected to power.

B. Equipment Supportability

In response to your referenced letter, the following provides two maintenance strategies which will optimize the long term supportability of the equipment.

1. Maximum onsite maintenance support - a strategy of high ANPP self-reliance, including:
   a. Test Set(s)
      A complete test cabinet that simulates the total BOP ESFAS operation for test and comprehensive troubleshooting capability to the piece part level. It utilizes a bank of spare modules (7) which is left in the auto test mode until a replacement module is required. The test set can also be used as hands-on learning device.

   b. Spare Modules
      Two spare modules for each design (four) per train, or 24 total for the station. This considers a one module insurance level against incorrect troubleshooting, and assumes independent parts storage for each unit (Train A and B).

   c. Spare Parts
      Five year spare part stock for each unit, based on an analysis of the equipment design, including identification of critical/non-critical parts, part count, part availability (e.g. high threshold logic), failure rates, etc. Initial recommendation is 30% of total part count for critical items 20% for non-critical, and 10% for low failure rate or readily obtainable parts or components.

   d. Training and Publications
      Onsite training for ANPP personnel concerning test set operation and module troubleshooting and repair techniques. An operational and maintenance manual would also be included with each test set.

   e. Technical Support
      GA Field Service Support as required.

2. Minimum onsite maintenance support - A strategy of minimum ANPP self-reliance by only stocking modules onsite and relying on GA's San Diego facility for module repair and test.

We recommend that the first strategy of maximum onsite maintenance support capability be given serious consideration, in view of the availability requirements at Palo Verde.

In summary, the results of our reliability investigation indicate no deficiency in the design of the equipment. We also recommend a plan to provide maximum onsite maintenance support.

Mr. Bingham, I look forward to further communications with you to address our recommendations for increasing availability of the BOP ESFAS at Palo Verde.

Regards,

A.L. Chandler
Manager, Logistice Support

cc: Ted Chandler
Milt Jones
Dennis Nau
Zvi Rendel
Bob Weddel
Jim Winso

MODULE	NO. OF FAILURES/EVENTS	CAUSE	CORRECTIVE ACTION
LOAD SEQUENCER - 002	1	CRYSTAL MALFUNCTION	UNKNOWN
LOAD SEQUENCER - 003	1	ULN2003A (DARLINGTON PAIR) FAILED	REPLACED
LOAD SEQUENCER - 006	1	POOR RIBBON CABLE CONNECTION	TO BE REPLACED
LOAD SEQUENCER - 010	2	1 7406N (HEX INVERTER) FAILED VOLTAGE REGULATOR FAILED	REPLACED REPLACED
FBEVAS - 016	1	R-S FLIP-FLOP FAILED	REPLACED
LOP/LS - 002	1	ULN 2002A (DARLINTON PAIR) FAILED	IC AND SOCKET TO BE REPLACED
TOTAL.........	7		

TABLE 1 SUMMARY OF MODULE FAILURES/EVENTS