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SUBJECT: Forwards response to NRC 810831 Question 492.1 & amended FSAR Section 7.7.c. Info will be incorporated into FSAR in future amend.

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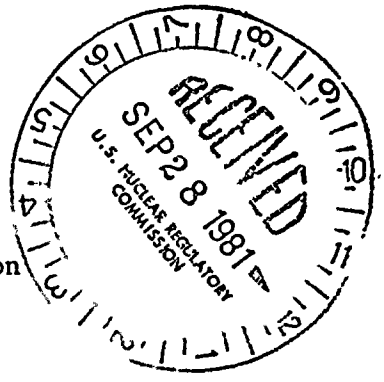


Mr. R. L. Tedesco
Assistant Director for Licensing
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3
Docket Nos. STN-50-528/529/530
File: 81-056-026; G.1.10

Reference: Letter from R. L. Tedesco, NRC to EEVB, Jr. Dated August 31, 1981; Subject: PVNGS Request for Additional Information (CPB)

Dear Mr. Tedesco:

Attached is a response to NRC question 492.1 and amended FSAR section 7.7.c for your use. These will be incorporated into the FSAR in the upcoming amendment.

Please contact me if you have any further questions on this matter.

Very truly yours,

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

EEVBJr/TFQ/bj

Attachment

cc: J. Kerrigan (w/a)
P. L. Hourihan "
A. C. Gehr "

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1/1

STATE OF ARIZONA )
) ss.
COUNTY OF MARICOPA)

I, Edwin E. Van Brunt, Jr., represent that I am Vice President Nuclear Projects of Arizona Public Service Company, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority so to do, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

Edwin E. Van Brunt, Jr.

Sworn to before me this 25th day of September, 1981.

Connie Lou Armstrong
Notary Public

My Commission expires:

June 24, 1983

NRC QUESTION 492.1

Regulatory Guide 1.70, Revision 2 for Section 4.4.6, Instrumentation Requirements, states that vibration and loose parts monitoring equipment to be provided in the plant should be described and that the procedures to be used to detect excessive vibration and the occurrence of loose parts should be discussed. You had provided applicable information for loose parts monitoring in the PSAR, but no information is provided in the FSAR.

With regard to the Vibration and Loose Parts Monitoring System to be provided for Palo Verde Units 1, 2 and 3, the description should include a discussion of the capability of the components inside containment to remain operational following the seismic events up to and including the Operating Basis Earthquake. A discussion should also be provided of any analysis and/or tests to demonstrate that the system will be adequate for the normal operating radiation, vibration, temperature and humidity environment of the reactor system. The staff requires the Loose Parts Monitoring System be evaluated for conformance to the guidelines of Regulatory Guide 1.133 and that there are a minimum of two sensors at each natural collection region. Also provide the following information relative to the operation of the system:

1. A description of how alert levels will be determined;

2. A description of the diagnostic procedures to be used to confirm the presence of loose parts, and the ability to distinguish it from background noise;

3. A description of plans for a signature analysis during initial startup testing;

4. Quantification of the online sensitivity of the system in terms of mass and kinetic energy; and

5. Discussion of the training program for plant personnel.

RESPONSE

The Loose Parts Monitoring System (LPMS) is described in amended section 7.7.c. The components of the LPMS which are inside the containment will be capable of remaining operational following the seismic events up to and including the Operating Basis Earthquake (OBE). The LPMS components will be qualified to meet the environmental parameters of the areas in which they are installed. The LPMS is not a safety-related system, thus it is not qualified to Class IE requirements. These components are tested for the applicable temperature, humidity and vibration environments, and they are qualified by analysis for the radiation and seismic environments. The LPMS has been evaluated to determine conformance to the guidelines of Regulatory Guide 1.133, revision 1. The evaluation is shown on Table 4A-1.

1. See amended section 7.7.c
2. See amended section 7.7.c
3. The initial signature traces for the LPMS will be taken during the Pre-core Hot Functional Test. Analysis of the traces will be made at this time with the exception of the ex-core signals for core movement which will not be operational. The signatures for the ex-core signals will be done during power ascension testing.
4. See amended section 7.7.c
5. PVNGS will include in its operator training program, instructions to recognize an alarm on the Loose Parts Monitoring System, take appropriate action if necessary, and reset the alarm.

TABLE 4A-1

| Regulatory Guide 1.133, rev.1 Regulatory Positions | PVNGS Conformance to the Regulatory Positions |
|---|---|
| 1. System Characteristics | |
| a. Sensor Locations | No exception |
| b. System Sensitivity | No exception |
| c. Channel Separation | No exception |
| d. Data Acquistion System | A four channel tape recorder with switchable automatic channel selection is provided. Separate tape recorder channels are not provided for each sensor. |
| e. Alert Level | No exception |
| f. Capability for Sensor Channel Operability Test | No exception |
| g. Operability for Seismic and Environmental conditions | The LPMS components will be qualified to meet the environmental parameters of the areas in which they are installed. |
| h. Quality of System | No exception |
| i. System Repair | No exception |
| 2. Establishing the Alert Level | No exception |
| 3. Using the Data Acquisition Modes | No exception |
| 4. Content of Safety Analysis Reports | Technical Specifications are not applicable. |
| 5. Technical Specification for the Loose Parts Detection System | Technical Specifications are not applicable to the LPMS. The LPMS does not perform a safety function, and failure of the LPMS will not affect the safe operation of the plant. |
| 6. Notification of a Loose Part | No exception |

B. Steam Bypass Control System

Refer to CESSAR Section 7.7.1.1.5.

The CESSAR system is modified for PVNGS to dump steam to atmosphere through two of the turbine bypass valves. These valves are the last to open and first to close during steam bypass operation.

C. Loose Parts Monitoring System

Refer to CESSAR Section 4.2.5.H.2

A loose parts monitoring system (LPMS) will be installed at PVNGS. The LPMS is designed to detect and record signals resulting from impacts occurring within the reactor coolant system. Eight transducers will be located in the areas where loose parts are most likely to become entrapped. These are:

1. Two redundant transducers will be clamp mounted on the in-core instrument guide tubes on the reactor vessel lower head, diametrically opposed
2. Two redundant transducers will be stud mounted on the reactor vessel upper head service structure flange, diametrically opposed
3. Two redundant transducers on the lower head region of each steam generator. One transducer will be clamped to the primary inlet pipe and the other will be clamped to the primary outlet pipe.

Experience has shown that the exact location of the accelerometers is not critical since the acoustic wave that results from an impact propagates throughout the entire head. The transducers will be high temperature piezoelectric accelerometers.

A high temperature, low noise, radiation hardened, flame retardant coaxial cable will connect the accelerometer to a preamplifier located in a junction box outside of the biological shield. From the preamplifier the signals are sent via suitable wires, such as twisted shielded pair, to the data acquisition panel in the control room. Cabling between redundant sensor channels from the sensor to the preamplifier located outside the secondary shield wall will be physically separated from each other.

A data acquisition panel located in the control room area contains alarm modules that continually monitor the incoming signals from the preamplifier for the presence of impacting.

The alarm level for each accelerometer is determined by a set point adjustment. The occurrence of a loose part impacting on the inside of the structure causes bursts of signals that exceed the alarm set point and trigger the alarm. The data acquisition panel includes tape recorders with playback and an audio monitor.

Alarm levels will be set above background levels established during baseline "signature" testing. The system sensitivity is better than 0.05 ft-lb at the sensors. Initial alarm setting is 0.5 ± 0.25 ft-lb

Recording

Two tape recorders are provided to record all loose parts data and to play back baseline tapes for audio comparison. Both recorders automatically start on any alarm condition. One recorder is dedicated to recording the loose parts channels for recording. Manual recording control is also provided. The second recorder is provided with selector switches for recording any of the LPMS channels either through individual track selection or in convenient groupings.

Audio Monitoring

The audio monitoring shall consist of a speaker, independent volume control and a selector switch for monitoring the loose parts channels.

Spectral Analysis Unit

The spectral analysis unit is a portable cart-mounted unit consisting of a playback unit, spectrum analyzer, and an X-Y plotter. It is capable of receiving input from a cassette tape and is capable of real time analysis including an amplitude and frequency cursor with digital readout on an oscilloscope type display.

Sensor Channel Operability and Functional Tests

A preoperational calibration and functional test will be performed. Provision is made for channel operability tests and for channel functional tests. System calibration shall be performed at least once each 18 months or at each refueling.

Baseline "signatures" of each channel will be obtained to establish background levels.

Operability for Seismic Conditions

Diagnostic procedures to confirm the presence of loose parts will make use of the baseline "signatures" to verify that recorded impact signals are above background.

The loose part detection system shall be capable of performing its function following an operating basis earthquake. The systems have been shown to be adequate for the OBE by test. Power will be supplied from a 120V ac normal instrument bus.

All components of the system are high reliability items. They are to remain operable under normal environmental conditions of the plant and are readily accessible for servicing (except sensors). Replacement of components, if any, at full power operation would be limited to the channel preamplifiers located outside the secondary shield wall. The preamplifiers are replaceable during full power operation. The only other components of the loose parts monitoring system located in containment are cables and the sensors. Equipment located in the control room is not subject to the environment of the containment and is readily accessible and repairable at all times.