Consumers Power Company

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Operating Reactor Branch No 5
Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 -
PALISADES PLANT - NUREG-0737 ITEM II.B.3 - ADDITIONAL INFORMTION

Consumers Power Company letter dated September 7, 1982 committed to a February 1983 submittal date for describing how each criteria of NUREG-0737 Item II.B.3 has been satisfied, as requested by NRC letter dated June 30, 1982. The February 1983 date assumed that 60 days would be available after the Post Accident Sampling System (PASS) was operational to assure proper functioning. Several design modifications were identified in the implementation phase which have delayed full operation of the PASS. The operational date for the PASS system is June 1, 1983 and is documented in Consumers Power Companys submittal dated October 25, 1982. Consumers Power Company will verify that the criteria of Item II.B.3 has been satisfied 60 days after the PASS is fully operational which means an intended response of August 1, 1983. At such time, we will provide full documentation, including system schematics and technical justification, as appropriate, for each criteria. Following is a summary of how Consumers Power Company intends to satisfy each of the criteria of II.B.3:

Criterion: (1) The licensee shall have the capability to promptly obtain reactor coolant samples and containment atmosphere samples. The combined time allotted for sampling and analysis should be 3 hours or less from the time a decision is made to take a sample.

Response: The manufacturer of the PASS (Sentry Equipment Corp) has provided time-motion results which have been verified by Consumers Power personnel. Essentially all analytical facilities are on the same elevation as the PASS and within 50 feet, with a maximum recirculation time of 35 minutes and close proximity of facilities, the 3-hour sampling and analysis time requirement should be satisfied.

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Criterion (2) The licensee shall establish an onsite radiological and chemical analysis capability to provide, within three-hour time frame established above, quantification of the following:

(a) certain radionuclides in the reactor coolant and containment atmosphere that may be indicators of the degree of core damage (e.g., noble gases; iodines and cesiums, and nonvolatile isotopes);

(b) hydrogen levels in the containment atmosphere;

(c) dissolved gases (e.g., H_2), chloride (time allotted for analysis subject to discussion below), and boron concentration of liquids.

(d) Alternatively, have inline monitoring capabilities to perform all or part of the above analyses.

Response: The PASS provides samples of various dilutions which are easily handled and can be diluted further for radionuclide analysis by normal methods.

Hydrogen levels in the containment atmosphere and coolant will be measured onsite by a gas chromatograph. Boron analysis is accomplished by a Mannitol Titration procedure on a 1.0 cc sample, using an automatic titrator behind a lead barricade to minimize exposures. Inline monitoring is not performed.

Criterion: (3) Reactor coolant and containment atmosphere sampling during post accident conditions shall not require an isolated auxiliary system [e.g., the letdown system, reactor water cleanup system (RWCUS)] to be placed in operation in order to use the sampling system.

Response: The PASS does not require an isolated auxiliary system to be placed in operation in order to use the sampling system.

Criterion: (4) Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized reactor coolant samples. The measurement of either total dissolved gases or H_2 gas in reactor coolant samples is considered adequate. Measuring the O_2 concentration is recommended, but is not mandatory.

Response: Oxygen concentrations will be determined by a Leeds and Northrup Polarographic oxygen probe.

Criterion: (5) The time for a chloride analysis to be performed is dependent upon two factors: (a) if the plant's coolant water is seawater or brackish water and (b) if there is only a single barrier between primary containment systems and the cooling water. Under both of the above conditions the licensee shall provide for a chloride analysis within 24 hours of the sample being taken. For all other cases, the licensee shall provide for the analysis to be completed within 4 days. The chloride analysis does not have to be done onsite.

Response: Chloride analysis will be accomplished by ion chromatography. The ion chromatograph is currently located at the corporate office in Jackson. In the event of an accident, samples will either be delivered to the corporate office or the chromatograph will be delivered to the plant site to perform the analysis. Either case would meet the time requirement of 4 days for chloride analysis. An undiluted sample is used in the analysis to ensure the required sensitivity of 150 ppb.

Criterion: (6) The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to otain and analyze a sample without radiation exposures to any individual exceeding the criteria of GDC 19 (Appendix A, 10 CFR Part 50) (i.e., 5 rem whole body, 75 rem extremities). (Note that the design and operational review criterion was changed from the operational limits of 10 CFR Part 20 (NUREG-0578) to the GDC 19 criterion (October 30, 1979 letter from H. R. Denton to all licensees).

Response: Dose rate analyses, consistent with Regulatory Guide 1.4 source terms, have been performed along with time-motion studies by Consumers Power Company and Sentry Equipment Corp. Both analyses indicate that doses are well within the criteria of General Design Criteria 19, for obtaining and analyzing a sample of reactor coolant or containment atmosphere.

Criterion: (7) The analysis of primary coolant samples for boron is required for PWRs. (Note that Rev. 2 of Regulatory Guide 1.97 specifies the need for primary coolant boron analysis capability at BWR plants).

Response: See response to Criterion (2).

Criterion: (8) If inline monitoring is used for any sampling and analytical capability specified herein, the licensee shall provide backup sampling through grab samples, and shall demonstrate the capability of analyzing the samples. Established planning for analysis at offsite facilities is acceptable.

Equipment provided for backup sampling shall be capable of providing at least one sample per day for 7 days following onset of the accident, and at least one sample per week until the accident condition no longer exists.

Response: No inline monitoring is planned for the PASS.

Criterion: (9) The licensee's radiological and chemical sample analysis capability shall include provisions to:

(a) Identify and quantify the isotopes of the nuclide categories discussed above to levels corresponding to the source terms given in Regulatory Guide 1.3 or 1.4 and 1.7. Where necessary and practicable, the ability to dilute samples to provide capability for measurement and reduction of personnel exposure should be provided. Sensitivity of onsite liquid sample analysis capability should be such as to permit measurement of nuclide concentration in the range from approximately 1 μCi/g to 10 Ci/g.

(b) Restrict background levels of radiation in the radiological and chemical analysis facility from sources such that the sample analysis will provide results with an acceptably small error (approximately a factor of 2). This can be accomplished through the use of sufficient shielding around samples and outside sources, and by the use of a ventilation system design which will control the presence of airborne radioactivity.

Response: Samples can be obtained and diluted for onsite gamma spectroscopy measurements assuming Regulatory Guide 1.4 source terms. An analysis was performed to assure that samples could be analyzed in the presence of noble gas contamination. A purge air system is planned for the detector cave to minimize noble gas interference, assuming worst-case conditions.

Criterion: (10) Accurancy, range, and sensitivity shall be adequate to provide pertinent data to the operator in order to describe radiological and chemical status of the reactor coolant systems.

Response: Accuracy of radiological analyses are well within a factor of two since the activity levels can be diluted to levels encountered during normal operations.

Boron analysis accuracy will be within ±5% and accomplished within three hours.

See response to Criterion (5) for chloride analyses.

An accuracy of ±20% for hydrogen analysis will be achieved.

Oxygen analyses will be accurate to within ±10%.

Measurement of pH will be accomplished within 3 hours on an undiluted sample with a combination electrode within the accuracy requirements.

Consumers Power Company (with the help of NUS Corp.) has validated the applicability of the methods for use in the presence of the NRC specified Standard Test Matrix.

Criterion: (11) In the design of the post accident sampling and analysis capability, consideration should be given to the following items:

(a) Provisions for purging sample lines, for reducing plateout in sample lines, for minimizing sample loss or distortion, for preventing blockage of sample lines by loose material in the RCS or containment, for appropriate disposal of the samples, and for flow restrictions to limit reactor coolant loss from a rupture of the sample line. The post accident reactor coolant and containment atmosphere samples should be representative of the reactor coolant in the core area and the containment atmosphere following a transient or accident. The sample lines should be as short as possible to minimize the volume of fluid to be taken from containment. The residues of sample collection should be returned to containment or to a closed system.

(b) The ventilation exhaust from the sampling station should be filtered with charcoal absorbers and high-efficiency particulate air (HEPA) filters.

Response: Provisions exist for purging all sampling lines to reduce plateout and dose rates during operation. An automatic shutoff exists on high temperature in the event of a sample line break to minimize leakage. Recirculation studies have been performed to assure representative samples. The residues of sample collection will be retained in a closed system.

The ventilation exhaust from the PASS is filtered with HEPA filters. An analysis by Consumers Power Company and Sentry Equipment Corp. shows that charcoal absorbers are not needed due to the minimal release of iodines during the expected sampling procedure.

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Palisades Plant
NUREG-0737 ITEM II.B.3
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The PASS was designed by the Sentry Equipment Corp. in accordance with the requirements of NUREG-0737 and has been installed at a number of other plants.

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