August 26, 1985

Docket No. 50-302

DISTRIBUTION

Docket File	RIngram
NRC PDR	HSilver
L PDR	BMozafari
ORB#4 Rdg	Gray File
HThompson	EBrach
OELD	HOrnstein
EJordan	WPaulson
JPartlow	GEdison
ACRS-10	JWing

Mr. Walter S. Wilgus
Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing
& Fuel Management
P. O. Box 14042; M.A.C. H-3
St. Petersburg, Florida 33733

Dear Mr. Wilgus:

We have reviewed the information you submitted with your letter dated March 30, 1984 documenting your conformance with the criteria of Item II.B.3 of NUREG-0737, Post Accident Sampling System (PASS), for Crystal River Unit 3 (CR-3).

Our review indicates that six of the eleven criteria have been satisfied, but that insufficient information has been provided to assure conformance with the other five. The enclosed Interim Safety Evaluation summarizes the results of our review thus far and identifies additional information required to complete our review.

Please provide the required information within 30 days of receipt of this letter. If you feel that further discussion would be helpful in resolving any open issue, please call us to arrange a meeting or conference call.

Sincerely,

"ORIGINAL SIGNED BY
JOHN F. STOLZ"

John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

Enclosure: As Stated

cc w/enclosure:
See next page

8509030222 850826
PDR ADOCK 05000302
P PDR

ORB#4:DL	ORB#4:DL
HSilver;cr	JStolz
8/26/85	8/14/85

Interim Safety Evaluation by
the Office of Nuclear Reactor Regulation
Related to Operation of
Crystal River Plant, Unit No. 3
Florida Power Corporation
Docket No. 50-302

Post-Accident Sampling System (NUREG-0737, II.B.3)

Introduction

Subsequent to the TMI-2 incident, the need was recognized for an improved post-accident sampling system (PASS) to determine the extent of core degradation following a severe reactor accident. Criteria for an acceptable sampling and analysis system are specified in NUREG-0737, Item II.B.3. The system should have the capability to obtain and quantitatively analyze reactor coolant and containment atmosphere samples without radiation exposure to any individual exceeding 5 rem to the whole body or 75 rem to the extremities (GDC-19) during and following an accident in which there is core degradation. Materials to be analyzed and quantified include certain radionuclides that are indicators of severity of core damage (e.g., noble gases, isotopes of iodine and cesium, and nonvolatile isotopes), hydrogen in the containment atmosphere and total dissolved gases or hydrogen, boron, and chloride in reactor coolant samples.

To comply with NUREG-0737, Item II.B.3, the licensee should (1) review and modify his sampling, chemical analysis, and radionuclide determination capabilities as necessary and (2) provide the staff with information pertaining to system design, analytical capabilities and procedures in sufficient detail to demonstrate that the criteria are met.

Evaluation

By letter dated March 30, 1984, the licensee provided information on the PASS.

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 three hours or less from the time a decision is made to take a sample.

The licensee has provided sampling and analysis capability to promptly obtain and analyze reactor coolant samples and containment atmosphere samples within three hours from the time a decision is made to take a sample. The PASS electrical power supply is either from the Engineered Safeguards Supplies (diesel generator backed) or from DC Supplies (battery backed), so that sampling may be performed during a loss of offsite power. We find that these provisions meet Criterion (1) and are, therefore, acceptable.

Criterion (2):

The licensee shall establish an onsite radiological and chemical analysis capability to provide, within the 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 in-line monitoring capabilities to perform all or part of the above analyses.

The PASS provides the on-line monitoring capability to collect liquid and gaseous reactor coolant and containment atmosphere samples and the capability to collect grab samples that can be transported to the offsite radiological and chemical laboratory for verification of the analytical results. Boron, radionuclides, dissolved hydrogen, pH, and chloride concentrations in liquid and hydrogen in air are determined by in-line instruments. We find that these provisions partially meet Criterion (2) of NUREG-0737, Item II.B.3. The licensee should provided a procedure to estimate the extent of core damage based on radionuclide concentrations and taking into consideration other physical parameters, such as local core temperatures, core coolant conditions, hydrogen concentrations, and area radiation levels.

Criterion (3):

> Reactor coolant and containment atmosphere sampling during post-accident conditions shall not require an isolated auxiliary system (e.g., the letdown system or the reactor water cleanup system) to be placed in operation in order to use the sampling system.

Reactor coolant and containment atmosphere sampling during post-accident conditions does not require an isolated auxiliary system to be placed in operation in order to perform the sampling function. The PASS provides the ability to obtain reactor coolant samples from the reactor vessel hot legs and the decay heat loops, and gaseous samples from the containment atmosphere. The licensee's proposal to meet Criterion (3) is acceptable since PASS sampling is performed without requiring operation of an isolated auxiliary system, and PASS valves which are not accessible after an accident are environmentally qualified for the conditions in which they need to operate.

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.

Pressurized reactor coolant samples are cooled and degassed to obtain representative total dissolved gas samples at the PASS sampling station. The hydrogen concentration is at present measured by an interim system installed in accordance with NUREG-0578. We determined that these provisions partially meet Criteion (4) of Item II.B.3 in NUREG-0737. The licensee should discuss the method whereby total dissolved gas or hydrogen and oxygen can be measured and related to reactor coolant system concentrations. Additionally, if chlorides exceed 0.15 ppm, verification that dissolved oxygen is less than 0.1 ppm is necessary. Verification that dissolved oxygen is <0.1 ppm by measurement of a dissolved hydrogen residual of >10 cc/kg is acceptable for up to 30 days after the accident, in accordance with the clarification in our letter to the licensee dated July 12, 1982.

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.

Chloride analysis is performed within 24 hours by an in-line ion chromatographic method which has an analytical range of 0 to 20 ppm in an undiluted sample. An undiluted sample can also be collected in a shielded cask and retained for chloride analysis for 30 days. We determined that these provisions meet Criterion (5) and are, therefore, acceptable.

Criterion (6):

The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to obtain 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.))

The licensee has not provided sufficient information for us to complete our review on this criterion.

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.)

Boron will be analyzed by automatic titration, with an analytical range of 0 to 3000 ppm and an accuracy of ±5%. We find that this provision meets the recommendations of Regulatory Guide 1.97, Rev. 3 and Criterion (7) and is, therefore, acceptable.

Criterion (8):

If in-line 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.

Back-up grab sampling capability is provided for both the liquid and gas sampling systems. Extra shielded containers are provided such that while samples are in transit to the established off-site laboratory, the required daily samples can still be obtained to meet the one sample per day criteria. We find that these provisions meet Criterion (8) and are, therefore, acceptable.

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 Guides 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 1μ Ci/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.

The radionuclides in both the primary coolant and the containment atmosphere will be identified and quantified. The PASS can perform radioisotope analyses at the levels corresponding to the source terms given in Regulatory Guides 1.4, Rev. 2 and 1.7. These analyses will be accurate within a factor of two. We find that these provisions meet Criterion (9) and are, therefore, acceptable.

Criterion (10):

Accuracy, range, and sensitivity shall be adequate to provide pertinent data to the operator in order to describe the radiological and chemical status of the reactor coolant systems.

The licensee has not provided sufficent information for us to complete our review on this criterion.

To demonstrate that the selected procedures and instrumentation will achieve the above accuracies, it is necessary to provide information demonstrating their applicability in the post accident water chemistry and radiation environment. This can be accomplished by performing tests utilizing the standard test matrix provided in our letter dated July 12, 1982 to the licensee, or by providing evidence that the selected procedure or instrument has been used successfully in a similar environment.

All equipment and procedures which are used for post accident sampling and analyses should be calibrated or tested at a frequency which will ensure, to a high degree of reliability, that it will be available if required. Operators should receive initial and refresher training in post accident sampling, analysis and transport. A minimum frequency for the above efforts is considered to be every six months if indicated by testing.

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 line, 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 adsorbers and high-efficiency particulate air (HEPA) filters.

The licensee has addressed provisions for purging to ensure samples are representative, size of sample line, flow restrictions and/or isolation valves to limit reactor coolant loss from a failure of the sample line, and ventilation exhaust from PASS filtered through charcoal adsorbers and HEPA filters. The post-accident reactor coolant samples will be representative of the reactor coolant in the core area. We determined that these provisions partially meet Criterion (11) of Item II.B.3 of NUREG-0737. A detailed review of the PASS in the as-built configuration should be made to determine the necessity for heat tracing on the containment air sampling system.

Conclusion

We conclude that the post-accident sampling system meets six of the eleven criteria of Item II.B.3 of NUREG-0737.

The five criteria which have not been fully resolved are:

Criterion (2) Provide a core damage estimate procedure to include radionuclide concentrations and other physical parameters as indicators of core damage.

Criterion (4) Provide the capabilty of measuring dissolved hydrogen or total gas in liquid samples.

Criterion (6) Describe the shielding provisions to meet GDC-19.

Criterion (10) Provide information demonstrating applicability of procedures and instrumentation in the post-accident water chemistry and radiation environment, and retraining of operators on semi-annual basis. Describe the accuracy, range, and sensitivity of the analytical measurements.

Criterion (11) Provide information regarding heat tracing of containment air sample lines.

Principal Contributor: J. Wing

Mr. W. S. Wilgus
Florida Power Corporation

Crystal River Unit No. 3 Nuclear
Generating Plant

cc:
Mr. R. W. Neiser
Senior Vice President
and General Counsel
Florida Power Corporation
P. O. Box 14042
St Petersburg, Florida 33733

Nuclear Plant Manager
Florida Power Corporation
P. O. Box 219
Crystal River, Florida 32629

Mr. Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
Suite 220, 7910 Woodmont Avenue
Bethesda, Maryland 20814

Resident Inspector
U.S. Nuclear Regulatory Commission
Route #3, Box 717
Crystal River, Florida 32629

Regional Administrator, Revion II
U.S. Nuclear Regulatory Commission
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Mr. Ulray Clark, Administrator
Radiological Health Services
Department of Health and
Rehabilitative Services
1323 Winewood Blvd.
Tallahassee, Florida 32301

Administrator
Department of Environmental Regulation
Power Plant Siting Section
State of Florida
2600 Blair Stone Road
Tallahassee, Florida 32301

Attorney General
Department of Legal Affairs
The Capitol
Tallahassee, Florida 32304

Bureau of Intergovernmental Relations
660 Apalachee Parkway
Tallahassee, Florida 32304

Mr. Wilbur Langely, Chairman
Board of County Commissioners
Citrus County
Inverness, Florida 36250