GPU Nuclear

GPU Nuclear
100 Interpace Parkway
Parsippany, New Jersey 07054
201 263-6500
TELEX 136-482
Writer's Direct Dial Number:

March 25, 1986
RFW-0821

Mr. John A. Zwolinski, Director
BWR Project Directorate No. 1
Division of Boiling Water Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Zwolinski:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
NUREG 0737 Item II.E.4.2(7)
Containment Vent and Purge Valve
Isolation on High Radiation Signal

By letters dated August 27, 1981 and February 25, 1982, we provided our endorsement of the BWR Owners Group (BWROG) position that a radiation signal for isolation of primary containment vent and purge valves is not necessary for General Electric BWRs. Our review of the generic BWROG evaluation concluded that it was applicable to the Oyster Creek Nuclear Generating Station. Additional justification of our position was included in the February 25, 1982 letter.

NRC letters dated October 19, 1981, June 2, 1982 and January 17, 1983 stated our position was not acceptable. GPU Nuclear letters of March 10, 1983 and April 15, 1983 indicated our intent to comply with the NRC staff position when finalized. NRC Order dated June 17, 1983 and the associated SER of August 31, 1983 confirmed our commitment to comply with the subject NUREG 0737 item by startup from our Cycle 11R outage.

We included in Attachment 2 of our July 26, 1985 letter our intent to reaffirm our original position on this issue. The attachment to this letter amplifies our contention that isolation of containment vent and purge valves on a high radiation signal is not warranted. The main concerns of the NRC staff are addressed in the attachment. We have further evaluated the proposed containment vent and purge valve high radiation isolation signal addition from the standpoint of public risk. Our evaluation is that the probability of a radiation release with the current limited opening of existing vent and purge valves is approximately 2.4 X 10^{-8}/year utilizing

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conservative assumptions (i.e., no operator action, no high drywell pressure isolation signal, etc.). While we have not formalized a detailed design incorporating a high radiation isolation signal, as a basis for detailed comparative risk evaluation, it is our judgement that the release probability would not be significantly impacted by the addition of a radiation signal. We conclude that the present design characteristics of the Oyster Creek plant are adequate to reasonably ensure that the intent of the subject NUREG 0737 requirement is achieved. We further request your concurrence in this matter. If there are any questions concerning this correspondence, please contact Mr. Michael W. Laggart of my staff at (201) 299-2341.

Very truly yours,

R. F. Wilson

R. F. Wilson
Vice President and Director
Technical Functions

RFW:gpa
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Attachment

cc: Dr. Thomas E. Murley, Administrator
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Mr. Jack N. Donohew, Project Manager
U.S. Nuclear Regulatory Commission
Phillips Building, Mail Stop No. 314
7920 Norfolk Avenue
Bethesda, Maryland 20014

NRC Resident Inspector
Oyster Creek Nuclear Generating Station
Forked River, New Jersey 08731

ATTACHMENT I

CONTAINMENT VENT AND PURGE VALVES
ISOLATION ON HIGH RADIATION SIGNAL

ITEM II.E.4.2(7) OF NUREG-0737

INTRODUCTION

GPU Nuclear has revaluated the need for automatic closure of the primary containment vent and purge valves on a direct high radiation signal. In previous correspondence we contended that this design feature is not necessary at the Oyster Creek plant. Based upon a revaluation of this issue we wish to maintain our original position. We believe that the conclusions reached in this revaluation adequately address the main NRC staff concerns relative to this issue.

STATEMENT OF PROBLEM

On October 19, 1981, NRC transmitted to Jersey Central Power & Light Company their evaluation of the BWR Owners Group position on item II.E.4.2(7) of NUREG 0737. This evaluation concluded that all containment vent and purge valves in lines greater than three inches in diameter that are used during startup, normal operation, and shutdown of the plant be provided with a high radiation isolation signal. The bases for this conclusion are as follows:

1. The staff believes that since the vent and purge lines provide a direct path from the containment atmosphere to the environs, reliance on "indirect" parameters as isolation signals is insufficient for assuring that these valves will close in a timely manner.

2. The staff believes that since startup and shutdown are "transient" conditions, they would expect a higher likelihood of an accident occurring during these periods than during steady state periods.

3. The staff believes that reliance on operator action to close the large containment vent and purge valves is not desirable because of the delays that could occur while the operator is handling more pressing matters.

4. The staff believes that the setpoint for the radiation isolation signal should be such that any release exceeding normal conditions (i.e., 10CFR 20 levels at the site boundary) results in automatic containment isolation.

DISCUSSION

At Oyster Creek the primary containment vent and purge valves, which are greater than three inches in diameter, perform two major functions: a) Assist in achieving an inerted atmosphere in the primary containment within 24 hours of placing the reactor mode switch to RUN, and b) assist in purging the primary containment atmosphere, to allow personnel entry, up to 24 hours prior to a scheduled shutdown. These functions are controlled by detailed plant operating procedures and the 24 hour periods are in accordance with Oyster Creek Technical Specifications. In addition, the large drywell vent and purge valves are used to reduce drywell pressure to zero and then repressurize during the monthly surveillance of drywell-to-torus vacuum breakers. Except for those periods stated above, the large containment vent and purge valves are normally closed during power operations.

system will trip and redundant inlet and exhaust dampers will close, (2) initiate operation of the Standby Gas Treatment System (SGTS) and (3) divert the reactor building exhaust flow from the normal ventilation exhaust to the SGTS upon sensing a high radiation signal in the vent duct. Finally, for a significant source term to be present in the containment, to be released through the vent and purge valves, a sizeable amount of reactor coolant would have to be discharged to the drywell which would produce either a high drywell pressure or low-low reactor water level signal (or both) and thus automatically isolate the primary containment vent and purge lines.

The design basis of the OCNGS containment isolation system is aimed at achieving closure of all isolation valves before significant amounts of fission products are released from the core. Also, because the amount of radioactive materials in the reactor coolant is maintained at a low level by the Reactor Water Cleanup System, the approach has been to achieve closure of the isolation valves before a significant number of fuel cladding failures have occurred. In order for fuel cladding failure to occur, the fuel must become uncovered. This implies that reactor water level must be well below low-low level, which would have initiated a containment isolation signal and closed the purge and vent valves, before the radiation levels increase enough to isolate the vent and purge valves on a radiation signal alone.

As explained in the OCNGS Technical Specifications (Bases for Specification 3.1, pg. 3.1-4), a steam leak equivalent to about a 15 gpm water leak or a liquid leak of about 35 gpm from the primary system will cause drywell pressure to reach the scram point and isolate the primary containment assuming the purge and vent valves are closed. Therefore, for leaks somewhat larger than these values, it is assured that a high drywell pressure signal will be generated and isolate the primary containment with the valves open.

Leaks in the reactor coolant system below those which would activate the high containment pressure scram and containment isolation setpoint could occur during vent and purge operations. Protection against excessive releases is threefold:

1. By drawing and analyzing a sample of primary containment atmosphere prior to initiation of the deinerting operation, the operator is assured that leakage within the drywell is normal.

2. The procedural requirement to monitor effluent radioactivity during the vent and purge operation and to terminate the release when the count rate reaches the limits set in plant procedures provides reasonable assurance that excessive releases will not occur as a result of leaks taking place after initiation of the operation.

3. A setpoint of 13 mr/hr has been established for the reactor building ventilation exhaust duct radiation monitors to automatically isolate normal reactor building ventilation and divert containment venting through the Standby Gas Treatment System. It should be noted that a trip setting of 17 mr/hr is based upon initiating the SGTS so as not to exceed allowed dose rates of 10CFR20 at the nearest site boundary (Technical Specification Bases, Page 3.1-5).

A conservative analysis has been performed which concluded that there is low risk to the health and safety of the public from severe core damage accidents with the limited opening of the containment vent and purge valves. The frequency of releases from severe core damage accidents has been conservatively calculated at approximately 2.4×10^{-8}/year. This release frequency was calculated utilizing very conservative assumptions. No credit was taken for operator action nor was the high drywell pressure isolation signal assumed to initiate an isolation. The difference between the conservatively assessed release frequency and the release frequency achievable with a perfect actuation signal is small. The difference between a more realistic assessment and the perfect signal case would be smaller yet (less than an order of magnitude). It is our opinion that there is no real benefit in the additional installation.

Concern

The staff believes that since the vent and purge lines provide a direct path from the containment atmosphere to the environs, reliance on "indirect" parameters as isolation signals is insufficient for assuring that these valves will close in a timely manner.

Response

The primary containment atmosphere is not discharged "directly" to the atmosphere. During vent and purge operations, the primary containment atmosphere is drawn to the plant stack via the normal reactor building ventilation exhaust fans. The primary containment atmosphere flow of 6,200 cfm mixes with the 70,500 cfm flow from the reactor building, passes through a vent duct provided with two radiation monitors, enters the suction of the reactor building exhaust fans and is discharged to the stack. At the stack this flow mixes with a minimum flow of 68,670 cfm from the turbine building exhaust and flows of 22,475 and 38,000 cfm from the respective radwaste buildings, travels up the stack and is dispersed prior to reaching the site boundary. The flow rates indicated above are design flow rates. Actual flow rates are not expected to differ significantly.

By the time the containment atmosphere is discharged from the stack, the concentration of radioactive material has been diluted to roughly 3% by volume from its original concentration. If all HVAC systems are operating, this value is conservative since it does not take credit for any decay during the time required for the gas to travel from the containment to the exit of the stack. Plateout of certain radionuclides on containment and duct surfaces is also expected.

This arrangement provides three levels of protection from accident-related releases. First, there is a period of time between a release of radioactivity inside the primary containment and the release to the atmosphere during which the radioactivity would decay and an indication of an abnormal situation would reach the operator so that protective actions can be initiated. Second, the radiation monitors in the reactor building ventilation exhaust duct will (1) isolate the reactor building, i.e., the normal reactor building ventilation

Thus, in consideration of the above discussion, the utilization of a high radiation signal to achieve primary containment isolation is unnecessary. The containment vent and purge valves will close, the normal reactor building ventilation system will isolate and the elevated release will be treated via the SGTS. These mitigating features are initiated without operator action so as not to exceed allowed dose rates of 10CFR20 at the nearest site boundary.

Other features of the containment vent and purge operations should also be considered:

1. Vent and purge lines used for Drywell and Torus nitrogen makeup and pressure control venting during power operation are 2 inches in diameter.

2. A primary containment atmosphere sample is drawn and analyzed prior to initiating a purge. The large containment vent and purge valves are used during a purge.

3. During purging, the operator monitors effluent radioactivity and is directed to terminate purging if the count rate exceeds a preset limit in accordance with Oyster Creek Procedure 312.

4. The large containment vent and purge valves are limited to a 30° maximum opening to ensure closure under accident conditions.

Concern

The staff believes that since startup and shutdown are "transient" conditions, they would expect a higher likelihood of an accident occurring during these periods than during steady state periods.

Response

Although a significant proportion of reactor trips occur during plant startup, they are generally considered to be of little risk significance due to the low decay heat generated by the core. A considerably lesser number of reactor trips occur during shutdowns. The operator has adequate time to mitigate such accidents by closing the vent and purge valves (in the unlikely event that they fail to close due to the existing isolation signals) before core damage occurs and releases significant quantities of radionuclides into the drywell atmosphere. The Oyster Creek plant has been designed with due consideration for shutdown and startup operations, and both administrative and plant operating procedures have been established for maintaining an adequate margin of safety during normal startup and shutdown.

Concern

The staff believes that reliance on operator action to close the large containment vent and purge valves is not desirable because of the delays that could occur while the operator is handling more pressing matters.

Response

As discussed in the response to the first staff concern, operator action is not necessary to initiate mitigating features so as not to exceed 10 CFR 20 release limits at the nearest site boundary.

Concern

The staff believes that the setpoint for the radiation isolation signal should be such that any release exceeding normal conditions (i.e., 10 CFR 20 levels at the site boundary) results in automatic containment isolation.

Response

The ventilation duct radiation monitors' setpoint has been established to isolate the normal reactor building ventilation system and initiate the Standby Gas Treatment System so as to not exceed the allowed dose limits of 10CFR20 at the nearest site boundary.

CONCLUSIONS

As discussed above and summarized below we believe that current Oyster Creek design features provide adequate mitigating action such that the intent of the subject NUREG 0737 requirement is achieved.

1. The vent and purge lines do not provide a direct path from the containment atmosphere to the environment. The containment atmosphere is diluted and dispersed and, in addition, treated during accident conditions (via the SGTS). The high radiation signal will not be received earlier than either a high drywell pressure or low-low reactor water level signal to achieve closure of the isolation valves on a radiation signal alone.

2. Reactor trips during plant startups are considered to be of little risk significance due to the low decay heat generated by the core. A considerably lesser number of reactor trips occur during shutdowns. There is adequate time to mitigate such accidents by closing the vent and purge valves before core damage occurs and significant quantities of radionuclides are released into containment.

3. Operator action is not necessary to ensure mitigating features are initiated so as not to exceed 10CFR20 release limits at the site boundary.

4. The addition of the high radiation isolation signal is of limited benefit from a risk perspective.

From the above, GPUN concludes that the staff should provide Oyster Creek with relief from the requirement that the containment vent and purge lines be isolated on a high radiation signal since adequate measures are already in place to protect the health and safety of the public and to mitigate postulated accidents.