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Writer's Direct Dial Number:

December 15, 1982

Director
Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, DC 20555

Dear Sir:

SUBJECT: Oyster Creek Nuclear Generating Station
Docket No. 50-219
Final Rule on Interim Requirements Related to
Hydrogen Control - Exemption Request dated
August 2, 1982

By letter dated August 2, 1982, the Oyster Creek Nuclear Generating Station requested an exemption from the Final Interim Requirements Related to Hydrogen Control which was published in the Federal Register on December 2, 1981, pp. 58484 - 58486. At this time, it was stated that a site specific evaluation would be performed which will demonstrate that the exemptions and deferral previously requested will not endanger life or property or the common defense and security and are otherwise in the public interest.

This letter transmits the site specific evaluation for Oyster Creek. As mentioned in the evaluation, a change to the Oyster Creek Technical Specifications is currently being analyzed which will limit the oxygen content to 4%. It is anticipated that this change request will be completed and submitted upon approval of the requested exemption.

It has been previously determined that this exemption request is Class III in accordance with 10CFR 170.22.

Enclosed is a check for \$4,000.

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w/check
\$4,000*

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If you have any questions on this, please call Mr. James Knubel
at (201) 299-2264.

Very truly yours,



F. B. Fiedler
Vice President and
Director - Oyster Creek

blf

Enclosures

cc: Ronald C. Haynes, Administrator
Region 1
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

NRC Resident Inspector
Oyster Creek Nuclear Generating Station
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EVALUATION OF OXYGEN GENERATION DURING A HYPOTHETICAL ACCIDENT AT OYSTER CREEK

An evaluation of oxygen during a hypothetical event at Oyster Creek was conducted. Specific areas reviewed were:

- 1) Applicability of the Owner's Group Analysis (NEDO 22155) to Oyster Creek.
- 2) Reactor Vessel vent capability versus the NRC requirement (10CFR50.44C3iii).
- 3) Venting Capability of the Isolation Condenser System.

The conclusions of the evaluation are:

- A)
 - i. Oyster Creek is bounded in the oxygen generation rate by the base case analysis of the limiting plant and limiting event (12 hours boiling time).
 - ii. Oyster Creek cannot take credit for those sensitivity study cases with nitrogen dilution to 30 psig containment pressure or beyond, because Oyster Creek's suppression pool is designed to 35 psig.
- B) Oyster Creek has sufficient venting capability via ERV's for noncondensable gases accumulated in the reactor vessel head. It is highly reliable, remotely controllable and has sufficient redundancy to serve its purpose. Therefore, the requirement for installing additional high point vents should be exempted.
- C) The isolation condenser system at Oyster Creek is equipped with venting lines for noncondensable gases during normal power operation. Once the isolation condenser system is in operation, the vent lines will be automatically shut and further noncondensable gases, if any, will be swept through the system by the circulating fluid and will not jeopardize the function of the system. Therefore, a deferral for investigating the modification of its remote operability should not endanger the unit's overall safety.

Limiting Combustible Gas Determination

For the determination of radiolytic oxygen generation following a LOCA, the limiting parameter is the ratio of core thermal power to drywell volume. The plant with the highest

ratio would result in the highest oxygen concentration in the containment. For Oyster Creek the licensed thermal power is 1930 MW and the drywell volume is 180,000 cubic feet. Using 102% of the licensed power the ratio turns out to be 0.0109 Mwt/ft³, which is well below the corresponding ratio for the limiting plant (Brown's Ferry/Peach Bottom) that the Owner's Group chose for the base case analysis (0.0301) Mwt/ft³). Therefore, the oxygen generation ratio for Oyster Creek is bounded by the generic analysis for Mark I containments.

Limiting Event Determination

For the BWR, the limiting factor that would result in the highest oxygen generation is the time duration and extent of boiling for the reactor water in the core. In the Owner's Group report, extensive evidence has been shown that the oxygen generation in subcooled water is negligible. Consequently, the limiting event was selected such that the time duration and extent of boiling is maximized.

The selected event was an isolation transient with only low pressure core cooling available for a generic BWR/4 plant. A boiling time period of up to 12 hours was assumed, 7 hours of which was taken before the operator took action to depressurize the vessel. Depressurization of the vessel to the pressure at which the Shutdown Cooling System can be initiated was conservatively assumed to take 3 hours. Then an additional 2 hours was assumed for preparing the Shutdown Cooling System to cool the reactor water. Once it is started, the reactor water will be cooled rapidly (within a few minutes) to subcooled.

For Oyster Creek, the same type of containment (Mark I) as the generic analysis is required. Although the Oyster Creek reactor vessel is a different type (BWR/2) from that of the BWR/4, its Low Pressure Core Spray System basically has the same capability and is at least as reliable as was assumed in the generic analysis. Therefore, the limiting boiling time of 12 hours should be applicable to Oyster Creek. In addition, the ECCS of Oyster Creek is composed of another independent Isolation Condenser System which is absent in the generic case. The Isolation Condenser System at Oyster Creek is expected to function for emergency core cooling for any over-pressure/loss of inventory event, even without AC power. By including this system, the limiting boiling time would be greatly reduced. Nevertheless, the 12 hours boiling time was accepted as conservative and bounding for Oyster Creek.

Containment Inerting System

The containment inerting system at Oyster Creek maintains an atmosphere of nitrogen gas in the drywell and suppression chamber during power operation. Oxygen is maintained at a concentration not to exceed 5 percent by volume, to prevent hydrogen-oxygen combustion following a postulated loss-of-coolant accident in which hydrogen is produced by metal-water reaction.

If a loss-of-coolant accident occurs, the ECCS safeguard features will prevent the generation of hydrogen in quantities large enough to ignite in the containment. Thus, the reduction of oxygen in the primary containment is not a technical requirement. However, the containment inerting system is provided to obviate the possibility of an energy release within the primary containment from a hydrogen-oxygen reaction under conditions more severe than those currently analyzed.

Although the containment inerting system of Oyster Creek can be used to dilute the containment following a LOCA in order to preclude a hydrogen combustion event, such dilution will pressurize the containment and the containment's integrity would be jeopardized. NRC's current regulation (10CFR50.44) specifies that containment repressurization be limited to 50 percent of the containment design pressure. For Oyster Creek the suppression chamber was designed to 35 psig and the Pressure Control Valves (PCV) close at 2 psig; thus cases 1, 3, 4, 5 and 6 with nitrogen repressurization, in the generic analysis sensitivity study, do not apply to Oyster Creek. For the reason cited earlier, repressurization by nitrogen injection at Oyster Creek is considered not desirable.

The generic base case analysis and others (cases 2 and 7) with initial oxygen concentration of 4% and no nitrogen repressurization show acceptable results (below the Regulatory Guide 1.7 limit of 5%) up to an extended time period (1000 days after accident). Although the Oyster Creek Technical Specification set the oxygen concentration to be less than 5%, the plant routinely measures oxygen concentration to be below 3%. During power operation the oxygen analyzer is calibrated every week. In addition, there is an automatic annunciator for high oxygen concentration. Pure nitrogen is used for pneumatic operated instrument lines, and the containment atmosphere leakage will also be replaced by pure nitrogen makeup injection.

In order to take credit for the Owner's Group bounding case study, the Oyster Creek Technical Specification on oxygen content should be changed to 4%. Subsequently, all plant operating procedures and alarm setpoint settings should be changed accordingly. This will warrant that oxygen concentration will not reach the flammability limit at Oyster Creek during the hypothetical event postulated.

10CFR 50.44.C 3iii Reactor Vessel High Point Vent

There are five (5) electromatic relief valves (ERV) and sixteen (16) safety valves in the Oyster Creek reactor vessel steam lines that inherently have the capability for venting noncondensable gases. The ERV's are safetygrade and can be operated from the control room. A stuck open relief valve or safety valve has been analyzed in the unit's FSAR. Therefore, installation of more vent valves for high point venting is considered not necessary and should thus be exempted.

Venting Capability of the Isolation Condensers

The operation of isolation condensers is expected in the event of a high reactor pressure or low reactor water level condition. When these conditions occur during non-LOCA transients, the core remains covered and hydrogen generation does not result. During a LOCA, the automatic depressurization system (ADS) and the low pressure core spray will ensure sufficient core cooling is provided to meet the limits of 10 CFR 50.46.

At the high points of each isolation condenser loop steam piping there is a vent line for noncondensibles. The vents are, however, designed and used for venting the noncondensibles continuously to the main turbine steam header when the plant is operating and the isolation condenser system is on standby. This is done to remove noncondensable gases from the system which would otherwise collect at these high points and impair the initial actuation and operating capacity of the isolation condenser system. These vents are automatically shut off when the emergency condenser system goes into operation. The existing high point vent lines in the isolation condenser system partially meet the intent of 10CFR 50.44 C iii. In operation, the system fluid flow will sweep noncondensibles through the system and therefore, no accumulation of noncondensable gases would cause the loss of function of the isolation condenser system.

In the event of a design basis large break LOCA resulting in hydrogen generation in the core, the vent valves cannot be remotely operated from the control room and hence will not be able to vent the post-accident noncondensable gases out of the reactor vessel. GPU Nuclear is currently engaged in investigating the feasibility of modifying the venting system to fully comply with the requirements. A preliminary assessment is expected by the second outage after August 1982, (i.e. Cycle 11).

In conclusion, the ERV's still provide the necessary capability of venting gases from the reactor vessel and they are fully operable from the control room. Also, the isolation condensers are not required to mitigate the effects of LOCA events since the ADS and core spray systems serve this function adequately. Thus, this deferral will not reduce the plant's overall margin of safety.