UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 14 1986

50-219

Docket No. 50-219

Mr. P. B. Fiedler
Vice President and Director
Oyster Creek Nuclear Generating Station
Post Office Box 388
Forked River, New Jersey 08731

Dear Mr. Fiedler:

SUBJECT: RESULTS OF HVAC SYSTEM TEST FOR CONTROL ROOM HABITABILITY (MPA F-70, TAC 63046)

Re: Oyster Creek Nuclear Generating Station

In Amendment 105 dated July 15, 1986, to the Appendix A Technical Specifications (TS) for Oyster Creek, the staff issued its Safety Evaluation (SE) on Control Room Habitability for Oyster Creek. In that evaluation, the staff accepted the analysis and methodology submitted by GPU Nuclear (the licensee) on the chlorine gas and radiological gas transport to the control room and the exposure to the operators. You were required by that letter to (1) revise your plant procedures, (2) provide the results of the minimum air inflow mode tests and (3) submit appropriate TS on control room habitability before the restart from the current Cycle 11 Refueling (Cycle 11R) outage. Based on the licensee's transport analysis, an acceptable minimum air inflow was a flowrate not greater than 450 cfm.

In the submittal dated September 29, 1986, you provided for Oyster Creek (1) the results of the minimum air inflow tests at the control room, (2) the effects of these results on the chlorine gas and radiological gas transport analysis for the control room, (3) the effects on control room habitability of two potential offsite transportation sources of hazardous chemical releases and (4) the numbers of the plant procedures on when the control room is on minimum air. The results of the tests were that the minimum air inflow is slightly less than 960 cfm. The effect on the chlorine gas and radiological gas transport analysis were that the operators would have less than 2 minutes to don protective breathing equipment in only 0.31% of the meteorological conditions but would remain within the guidelines and criteria for radiological exposures within the General Design Criterion (GDC) 19 requirements. The plant procedures require the control room to be on minimum air inflow (1) prior to the transport of chlorine onsite, (2) prior to tank replacement at the chlorine facility onsite and (3) in response to a chlorine release alarm in the control room from the chlorine facility. Control room habitability was not seriously affected by the potential chlorine truck transport accident and the natural gas pipeline rupture.

You also stated in the letter dated September 29, 1986, that the liquid chlorine gas system in the chlorine facility was being replaced by a sodium hypochlorite system by the Spring of 1987. Because the sodium hypochlorite is a relatively stable chemical at ambient temperature and pressure, you propose the control of chlorine storage and usage onsite by plant procedures

until the liquid chlorine tanks are removed. This would be in place of TS as requested by Generic Letter 83-36.

The enclosed SE addresses the staff's evaluation of your letter dated September 29, 1986. Based on this SE, the staff concludes that the minimum air inflow of 960 cfm and the control of chlorine storage and usage by plant procedures, without TS, until the chlorine tanks are removed is acceptable. The staff's conclusions concerning the control room accident radiation doses are limited to the whole body and beta skin exposure. The review of thyroid doses due to radioiodine inhalation in the control room during a design basis Loss-of-Coolant Accident (LOCA) is deferred until the Commission completes its review of the source term for the LOCA.

As required by our letters to you dated July 15, 1986, on Control Room Habitability, and dated November 22, 1985, on NUREG-0737 TS Generic Letter (GL) 83-36, you must still submit TS on the control room ventilation system including the minimum air inflow before the restart from the current Cycle 11R outage. Also, for the procedures on chlorine storage and usage onsite, the procedures must also include (1) the notification of the control room when a chlorine tank car comes onsite, if there is a rupture of a chlorine tank on the car onsite, and before maintenance or repairs at the chlorine facility, and (2) the periodic check on the operability and availability of breathing apparatus in the control room. Acceptable TS are in GL 83-36 dated November 1, 1983.

You are requested to advise us of any changes in the implementation dates for meeting your control room habitability commitments and requirements. This includes the replacement of the chlorine liquid tanks by sodium hypochlorite and the two long term final modifications which were discussed in the staff's letter dated July 15, 1986, and are presently scheduled to be completed in the Cycle 12R outage. The completion of these two final modifications in the Cycle 12R outage is a license condition.

Sincerely,

Jack N. Donohew, Jr. Project Manager
BWR Project Director #1
Division of BWR Licensing

Enclosure: Safety Evaluation

cc: See Next Page

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Oyster Creek Nuclear Generating Station

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO CONTROL ROOM HABITABILITY (MPA F-70)

GPU NUCLEAR CORPORATION

JERSEY CENTRAL POWER AND LIGHT COMPANY

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

1.0 INTRODUCTION

By letter dated September 29, 1986, GPU Nuclear (the licensee) submitted for Oyster Creek (1) the results of the minimum air inflow tests at the control room, (2) the effects of these results on its chlorine gas and radiological gas transport analysis for the control room, (3) the effects on control room habitability of two potential offsite transportation sources of hazardous chemical releases and (4) the number of the plant procedures on when the control room is on minimum air inflow. The licensee uses the term "full recirculation" in its submittal to refer to the minimum air inflow for the control room. Each of the four items listed above will be addressed in a separate subsection of Section 3.0, Evaluation, below.

2.0 DISCUSSION

In Amendment 105 dated July 15, 1986, to the Appendix A Technical Specifications (TS) for Oyster Creek, the staff issued its Safety Evaluation (SE) on Control Room Habitability for Oyster Creek. This is the staff's Multi-Plant Action (MPA) F-70 from the TMI Action Plan requirements in NUREG-0737, Clarification of TMI Action Plan Requirements, dated November 1980. In Section III.D.3.4 of the NUREG, the staff issued requirements on the habitability of the control room during accidents. These requirements were to assure that control room operators will be adequately protected against the effects of accidental release of toxic and radioactive gases, that the nuclear power plant can be safely operated and shut down under design basis accident conditions, and that the licensee met the habitability criteria in Criterion 19, "Control Room," of Appendix A, "General Design Criteria (GDC) for Nuclear Power Plants," to 10 CFR Part 50.

In its SE, the staff accepted the analysis and methodology submitted by the licensee on the chlorine gas and radiological gas transport to control room and the exposure to the operators. For the chlorine hazard with a minimum air inflow of not greater than 450 cfm, the operators had a minimum of 2 minutes to don protective breathing equipment for all meteorological conditions. The 2 minutes is the acceptance criteria in the staff's Standard Review Plan (SRP) 6.4 and the staff concluded that the chlorine hazard to the control room operators was acceptably low and within the requirements of GDC 19.

For the control room accident radiation doses with the minimum air inflow of 450 cfm the calculated whole body and beta skin doses to the operators were within GDC 19 radiation exposure guidelines. This finding was limited to the whole body and beta skin dose. The thyroid doses from radioiodine releases were deferred until the accident source term reevaluation by the Commission was completed and its results were made available. This is the source term for the design basis Loss-of-Coolant-Accident (LOCA).

The staff's SE was based (1) on procedures for chlorine gas releases to have the control room on minimum air inflow and verify the operability and availability of breathing apparatus in the control room; and (2) on TS for the chlorine detection system and its associated alarm in the control room and the control room ventilation system including the minimum air inflow. The procedures would require item (1) above prior to any onsite activities involving the chlorine facility. These activities include chlorine resupply, maintenance and repair of the facility. The control room would be notified before these activities would begin onsite. The chlorine tank car to resupply chlorine would be observed onsite and the control room would be immediately notified if there was a rupture of a chlorine cylinder away from the chlorine facility.

In its letter dated July 15, 1986, the staff required that the licensee revise its plant procedures, provide the results of the minimum air inflow mode tests of the control room and submit appropriate TS on control room habitability before the restart from the Cycle 11R outage. Acceptable TS for control room habitability were stated to be in Generic Letter 83-36 dated November 1, 1983. Based on the licensee's submittals dated June 17, and August 16, 1985, on its control room accident radiation doses and chlorine hazards, respectively, an acceptable minimum air inflow for the control room was a flowrate of not greater than 450 cfm.

The letter dated September 29, 1986, is the licensee's response to the staff's letter dated July 15, 1986, for the following: (1) the results of the minimum air inflow mode tests and (2) the requirement to revise procedures and submit TS on the chlorine hazard at Oyster Creek. The licensee has not submitted TS on the control room ventilation system including the minimum air inflow.

3.0 EVALUATION

3.1 Results of Control Room Ventilation System Test

In its letter dated September 29, 1986, the licensee provided the results of the control room ventilation system tests. The licensee has determined the most limiting infiltration rates which would apply to the chlorine and radiological release scenarios. A test was conducted to demonstrate the capability of the control room ventilation system to maintain a minimum positive pressure of 1/8 inch water gauge in the control room pressure envelope, and to determine the infiltration flow rates. This test was conducted with the system in the partial and full recirculation modes of operation. In the full recirculation mode of operation (chlorine release) the infiltration rate was measured to be slightly less than 960 cfm. For the partial recirculation mode of operation (LOCA radiological release), the total measured makeup plus infiltration air flow was 1830 cfm. For both

modes of operation, the Control Room envelope was held at a minimum of 1/8 inch water gauge positive pressure.

The results of these tests required a revision to the toxic gas and radiological analyses which were previously based on the licensee's submittal on a system design flowrate of 450 cfm minimum air makeup. The original system design was to provide a minimum of 450 cfm makeup air for pressurization and air replacement rather than to restrict the infiltration rate to a maximum of 450 cfm. The resulting changes to the previous analyses are discussed below.

3.2 Chlorine Gas Transport Analysis

The chlorine gas transport analysis was reanalyzed by the licensee to account for the minimum air inflow tests results. This is for the two previously submitted chlorine release accidents at the chlorine facility onsite: the break of a 3/8 inch diameter chlorine transfer tubing line and the rupture of a one ton chlorine tank. These release scenarios were considered to be the limiting Oyster Creek chlorine accidents.

The licensee stated that the reanalysis of the tubing line break showed that, at infiltration rates up to 1100 cfm and for all wind speeds and stability classes analyzed, either the toxicity limit of 15 ppm is never reached in the control room or the operators have greater than two minutes after receiving the alarm to don protective breathing apparatus. Therefore, the licensee concluded that for a 3/8 inch chlorine tubing line break, the control room would be habitable and the operators would be protected with the minimum air inflow of not greater than 950 cfm.

The results of the chlorine tank rupture reanalysis by the licensee were that at infiltration rates up to 680 cfm, for all wind speeds and stability classes analyzed, either the toxicity limit of 15 ppm is never reached in the control room or the operators have greater than two minutes after receiving the alarm to don protective breathing apparatus. For infiltration rates from 680 cfm to 1000 cfm, the operators have less than two minutes to don protective breathing apparatus only for wind speeds of 2.24 and 3.40 mph in stability classes A and B. At Oyster Creek, the meteorological data show that this combination of wind speed and stability classes occurs only 0.31% of the time. In these cases, the operators had at least one minute to respond. The licensee stated that the probability of this chlorine accident occurring simultaneously with those infrequent meteorological conditions is sufficiently low that this scenario should be disregarded. Therefore, it concluded that for a chlorine tank rupture the control room would be habitable and the operators would be adequately protected for a minimum air inflow of not greater than 950 cfm.

3.3 Radiological Analysis

The radiological analysis was also revised by the licensee to determine the effect of the higher control room intake flow rate on the 30-day gamma whole-body and beta skin doses to the operators. The licensee stated

that all assumptions and data other than the control room intake flow rate remain unchanged from those provided to the staff in its June 17, 1985 letter. The dose results remain less than the SRP 6.4 limit of 5 rem and 30 rem for gamma whole body and beta skin doses, respectively. Although the intake rate has increased by as much as a factor of 4, the doses have not increased in the same proportion. The licensee explained that the reason for this was that when the infiltration is increased, the exfiltration from the control room envelope increased at the same rate, thereby having only a small effect on the isotopic concentrations in the control room at any time over the 30-day period. The slightly increased concentrations produce slightly increased doses to the operators; however, the control room remains radiologically habitable for 30 days following a design basis LOCA with the higher control room inflow.

3.4 Toxic Gases Releases Offsite

In letters dated October 8 and 19, 1982, the licensee informed the staff of the offsite manufacturing, storage and transportation of hazardous chemicals within a 5 mile radius of the plant. As a result of the meeting of March 19, 1985, the licensee reviewed two potential transportation sources of hazardous chemical releases. The analysis of the effects of these offsite releases upon control room habitability were submitted by the licensee in its letter dated September 29, 1986. The two offsite release scenarios investigated by the licensee were a chlorine truck transport accident and a natural gas pipline rupture.

The licensee assumed that a truck carrying a one ton tank of chlorine either on Route 9 or the Garden State Parkway is involved in an accident which causes the chlorine tank to rupture. The analysis was performed using the heavier-than-air modification to the "VAPOR" computer code for a postulated offsite accident 423 meters from the control room outside air intake with the ventilation system in the normal ventilation mode.

The submitted results of the "VAPOR" computer runs indicated that chlorine concentrations could reach as high as 0.2 g/m^3 (66.7 ppm) with the ventilation system in the normal operation mode. The licensee calculated the probability of the truck accident occurring simultaneously with the meteorological conditions which would produce the 0.2 g/m^3 chlorine concentration in the control room. This considered the probability of a severe truck accident (1.29×10^{-8} accident per truck mile, NUREG/CR-2650), the frequency of chlorine shipments near the site (20/year), the length of road traveled within 5 miles of the site on both Route 9 (11 miles) and the Garden State Parkway (10 miles), and the frequency of winds that could transport a release toward the site. Using 1982 and 1983 meteorological data from Section 2.3 of the Updated Final Safety Analysis Report (FSAR), which is representative of the general climatic conditions at the site, the highest probability of an operator incapacitation due to a truck accident near the site is 1.7×10^{-7} incapacitation per year. Therefore, the licensee concluded that the operators are protected against such an offsite chlorine release accident.

The licensee also analyzed a postulated natural gas pipeline rupture at the discharge canal using the "VAPOR" computer code. A release rate of

5248 grams/second was assumed to occur for a 1-hour time period which, according to the New Jersey Natural Gas Company, it will take to isolate the leak and manually stop the flow of gas. Again, since this is an offsite accident, the control room HVAC system is assumed to be operating in the normal ventilation mode.

Other assumptions and input parameters used in the analysis by the licensee were as follows:

- The control room fresh air intake is conservatively assumed to be located at ground level.
- The wind direction is such that the centerline of the plume at ground level blows directly toward the outside air intake.
- Pasquill Stability Class G (extremely stable) coupled with a horizontal wind speed of 1.12 mph (0.5 m/s) is assumed.

The licensee stated that the results of the analysis were that the maximum natural gas concentration within the control room from this pipeline rupture was 42.5 g/m^3. The licensee concluded, because this concentration is well below the toxicity limit of 157.1 g/m^3, that a rupture in the natural gas pipeline would not jeopardize the habitability of the control room.

3.5 Technical Specifications and Removal of the Chlorine Liquid Tanks

In its letter dated July 15, 1986, the staff required the licensee to propose appropriate TS for the chlorine detection and Control Room HVAC minimum inleakage for the completion of the interim system upgrades before the restart from Cycle 11 refueling outage. Subsequent to this letter the licensee decided to replace the Fischer & Porter liquid chlorine gas system with a sodium hypochlorite storage and feed system by the Spring of 1987. This was discussed in the April and May 1986 Progress Review Meeting of June 16 and 17, 1986, issued August 1, 1986 and in the June and July 1986 Progress Review Meeting of August 17 and 28, 1986, issued October 1, 1986. The licensee stated that this schedule would allow the implementation of this modification during the winter months when the liquid chlorine system is not required.

The licensee explained that the sodium hypochlorite is a relatively stable chemical at ambient temperature and atmospheric pressure compared to the volatile chlorine liquid tanks now onsite. Therefore, the licensee proposed deletion of the TS requirements for the chlorine storage, and, in their place, control the liquid chlorine storage and usage through the plant procedures until the tanks are removed from the site in 1987. The licensee explained that these procedures provide for Control Room full recirculation (Procedure 331), prior to chlorine transport of cylinder change-out (Procedure 326). and in response to a Control Room alarm (Procedure 2000-ABN-3200.33) from a toxic gas release at the chlorine facility.

The licensee also stated that, because the Control Room ventilation system is also used to limit the dose rates to the operators following a LOCA and this function is still required to complete the interim measures, it will propose appropriate limiting conditions for operation and surveillance requirements for Control Room ventilation system prior to Cycle 11 restart.

3.5 Conclusions

In the Sections 3.1 to 3.4 above, the licensee has discussed the results of the air inflow tests it has conducted at the Oyster Creek control room and the effects of the measured inflow values on its chlorine gas and radiological gas transport and resulting operator exposure analyses. These analyses were submitted by the licensee in its letters dated August 16 and June 17, 1985, respectively and accepted by the staff in its letter dated July 15, 1986.

The results of the reanalyses were (1) that the chlorine exposures still allow the operators a minimum of 2 minutes to don protective breathing equipment except for meteorological conditions which exist only 0.31% of the time at the site and (2) that the radiological exposures remain less than the SRP 6.4 and GDC 19 limits. The results of an analysis of two potential transportation sources of hazardous chemical releases offsite were that the exposure to the operators as well below toxic limits with conservative calculations and the probability of significant chlorine gas in the control room from the rupture of a chlorine tank in a truck accident was about 2×10^{-7} per year.

These results were submitted by the licensee in its letter dated September 29, 1986. The licensee also committed to replace the liquid chlorine system onsite with a sodium hypochlorite system by the Spring of 1987. The licensee stated that this replacement should prevent the need for TS on chlorine storage and usage onsite in the interim until the replacement is completed. The control on chlorine onsite would be by plant procedures.

Based on the above, the staff concludes that the higher minimum air inflow of 960 cfm in the control room for the chlorine gas hazard and the total makeup plus infiltration air inflow of 1830 cfm for the radiological accident doses is acceptable. The exposure to the operators is within acceptable limits and within the requirements of GDC 19. The chlorine liquid tanks will be removed from the site and replaced by sodium hypochlorite in the Spring of 1987 and the staff concludes that, for this interim period until the replacement is complete, plant procedures are sufficient to control chlorine storage and usage onsite. Therefore, TS on chlorine are not needed. The staff also concludes that no action is needed on the two potential transportation sources of hazardous chemical releases discussed in Section 3.4 above.

The staff's conclusions concerning the control room accident radiation doses is limited to the whole body and beta skin exposure. The review of thyroid doses due to radioiodine inhalation in the control room during a

LOCA is deferred until the Commission completes its review of the accident source term for the LOCA.

As required by the staff's letter to the licensee dated July 15, 1986, on control room habitability, the licensee must still submit TS on the control room ventilation system including the minimum air inflow before the restart from the current Cycle 11R outage. Also, for the procedures on chlorine storage and usage onsite, the procedures must (1) include the notification of the control room when a chlorine tank car comes onsite, if there is a rupture of a chlorine tank on the car, and before maintenance or repairs at the chlorine facility, and (2) the periodic check on the operability and availability of breathing apparatus in the control room.

4.0 REFERENCES

1. Letter from J.N. Donohew, Jr. (NRC) to P.B. Fiedler (GPUN), Control Room Habitability, dated July 15, 1986.

2. Letter from R. F. Wilson (GPUN) to J.A. Zwolinski (NRC), Control Room Habitability, dated June 17, 1985.

3. Letter from R. F. Wilson (GPUN) to J.A. Zwolinski (NRC), Control Room Habitability, dated August 16, 1985.

4. April and May 1986 Progress Review Meeting on Licensing Actions, June 16 and 17, 1986, summary dated August 1, 1986.

5. June and July 1986 Progress Review Meeting on Licensing Actions, August 27 and 28, 1986, summary dated October 1, 1986.

6. Letter from P. B. Fiedler (GPUN) to J.A. Zwolinski (NRC), Control Room Habitability, dated September 29, 1986.

Principal Contributor: J. Donohew

Dated: NOV 14 1986