UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

GPU NUCLEAR CORPORATION AND
JERSEY CENTRAL POWER & LIGHT COMPANY

OYSTER CREEK NUCLEAR GENERATING STATION

RESPONSE TO RAI ON CONTROL ROOM HABITABILITY

DOCKET NO. 50-219

1.0 INTRODUCTION

The NRC letter dated February 22, 1984, regarding NUREG-0737, Item III.D.3.4, Control Room Habitability, requested specific information which the staff needed to complete its analysis.

Following this, the GPU Nuclear Corporation (GPUN/licensee) letter dated June 4, 1985, stated that, as a result of its meeting with the NRC staff on March 19, 1985, all previous commitments regarding control room habitability for the Oyster Creek Nuclear Generating Station were superseded by the described new commitments, including design modifications, agreed to by the NRC at the meeting. The letter also provided a response to the questions raised by the NRC's letter of February 22, 1984. The licensee concluded the letter by stating that they understand that the new commitments would satisfy the requirements of NUREG-0737, Item III.D.3.4. In their response to the NRC's request for additional information, the licensee further committed that:

(1) The single failure analysis for the control room ventilation system will be completed for the Cycle 12 outage.

(2) Appropriate technical specifications for the HVAC system will be proposed.

(3) Details for powering the HVAC system will be provided for the Cycle 12 outage.

(4) A detailed listing of the data, assumptions, and results will be available upon finalization of the control room habitability analysis.

(5) A chlorine transport analysis will be performed to demonstrate that the control room operators will have at least two minutes to respond to the chlorine leak alarm.

The licensee letter dated June 17, 1985, provided a summary of the general methodology, assumptions, data, and results of calculations of gamma and beta doses to the control room operators following a design basis loss of coolant accident (LOCA). It was also stated that, as agreed in the March 19, 1985 meeting with the NRC, the thyroid dose would not be addressed at that time since the NRC is evaluating recent industry data on the LOCA iodine source term to determine requirements for licensee response. Therefore, the thyroid dose will be addressed after completion of the NRC review and independent of the commitments contained in the June 4, 1985 submittal.

The NRC stated in its July 15, 1986, letter to the licensee that the Commission has issued an amendment to the licensee for the Oyster Creek Station changing the date to the Cycle 12R outage for the completion of the final measures listed in the licensee's June 4, 1985 letter. It was further stated in the NRC letter that, based on the NRC review, the staff accepted the analysis and methodology submitted by the licensee on the chlorine gas and radiological gas transport to the control room and the exposure to the operators. With an air inflow of no greater than 450 cfm, the operators had two minutes to don protective breathing equipment to protect against a chlorine hazard, which is within the requirements of General Design Criteria (GDC) 19, and the calculated whole body and beta skin doses were within GDC 19 radiation exposure guidelines. The staff, therefore, concluded that the requirements are met concerning NUREG-0737, Item III.D.3.4 for radiological releases and for toxic gas (chlorine gas) releases, except for thyroid doses due to radioiodine inhalation in the control room during a design basis LOCA. The evaluation of thyroid doses due to radioiodine is pending the completion of the Commission's review of source terms for the LOCA. Additional information regarding the radiological analyses was also provided by the licensee's letter dated September 29, 1986.

In the letter dated November 14, 1986, the NRC provided a safety evaluation in response to the licensee's letter dated September 29, 1986. Provided in the licensee's letter were (1) the results of the minimum air inflow tests for the control room, (2) the effects of these results on the chlorine gas and radiological gas transport analyses for the control room, (3) the effects on control room habitability of the two potential offsite transportation sources of hazardous chemical releases, and (4) the identification of the plant procedures for situations where the control room HVAC system is operated on minimum air. It was also stated that the liquid chlorine gas system in the chlorine facility was being replaced by a sodium hypochlorite system in the Spring of 1987. Because the sodium hypochlorite is relatively stable, it was proposed to control the onsite storage and usage of chlorine onsite by plant procedures, in place of technical specifications (TS), until the liquid chlorine tanks are removed. The staff concluded, in the November 14, 1986 letter, that the minimum air inflow of 960 cfm (as determined by the minimum airflow tests) and control of chlorine storage and usage by plant procedures, without TS, until the onsite chlorine tanks are removed is acceptable. The staff also concluded that the calculated whole body and beta skin exposures were acceptable.

The NRC stated in its letter dated March 31, 1987, that the Commission has issued an amendment to the licensee for the Oyster Creek Station authorizing limiting conditions for operation and surveillance requirements pertaining to control room habitability in the TS. These TS were part of the NUREG-0737 TS requested by the staff in Generic Letter (GL) 83-36. In the March 31, 1987 letter, the NRC requested that the licensee propose additional control room habitability TS on the maximum control room temperature and on a plant shutdown if the control room HVAC system (except dampers) is inoperable for more than 7 days.

In the letter dated May 16, 1989, the licensee stated that during the Cycle 12 R outage a modification had been installed that incorporates the final measures listed in the licensee's June 4, 1985 letter. It was further stated that, previously, the licensee deferred a full response to NRC's letter dated February 22, 1984, requesting additional information, to allow time for the development of this modification. GPUN stated that, by submittal of this response, it has complied with the request for additional information and has addressed the design objectives identified in this June 4, 1985 letter.

In the May 16, 1989 response to the NRC request, additional information was provided addressing the following:

(1) Single failure analysis for the control room HVAC system.

(2) A commitment to propose, in a separate submittal, TS revisions to include surveillance requirements for HVAC System B.

(3) Details for powering the HVAC system.

(4) A statement that the NRC had accepted the assumptions for the radiological analysis by Amendment 115, dated March 31, 1987.

(5) A statement that with the removal of the one ton cylinders during early 1987, the probability of an onsite toxic gas release affecting control room habitability was minimized for Oyster Creek.

In addition to the above, however, the licensee further informed the NRC of the following concerning the radiological dose assessment:

1) Since March 1987, two items prompted separate reviews of the radiological analysis for control room habitability. First, the radiological analysis assumed the partial recirculation mode of operation for a design basis LOCA and excluded the effects of a loss of offsite power (LOOP) concurrent with a LOCA pending the implementation of the final measures.

2) The main steam isolation valve (MSIV) leakage rate was determined by outage 12R tests to vary from the leakage rate assumption used in the radiological analysis. The leakage rate is a function of the MSIV air accumulator pressure and the post LOCA containment pressure. The radiological analysis assumed the TS limit for MSIV leakage post LOCA with leakage decreasing as a function of the post LOCA containment pressure. MSIV air accumulator pressures were not accounted for in that analysis. Therefore, the assumed behavior of the MSIV leakage rate differs from the actual behavior observed during the 12R testing.

For the first item, since the system (A or B) trips with a LOOP concurrent with a LOCA, a review of the radiological analysis was performed to account for partial restoration (supply fan only) of a system with 100% outside air to limit the control room maximum temperature (104°F) when ambient temperatures (82°F) permit this mode of operation. The revised calculation assumed the most conservative operation (supply fan only for 30 days). Since GPUN estimates that offsite power and full system (A or B) capability will be

restored within two hours, this calculation is conservative. Also, the coping analysis for Station Blackout (GPUN letter dated April 17, 1989) shows an alternate AC power source within one hour by the end of refueling outage 14R. For the supply of 100% outside air to the control room envelope, the calculated doses increase to 29.1 Rem beta and 3.14 Rem gamma for the assumed 30 days; however, these values are still within the allowable limits of 30 Rem beta and 5 Rem gamma.

For the second item, the MSIV bypass leakage is a function of the air accumulator pressure and the containment pressure post LOCA. The GPUN letter dated March 10, 1989 provides the details of this MSIV leakage assessment. The radiological analysis assumed the containment pressure would decrease to 0 psig in 10 days post LOCA. This assumption equated to 1000 standard cubic feet (SCF) of MSIV bypass leakage for the dose assessment. The MSIV leakage was reassessed considering MSIV leakage as a function of accumulator and containment pressures. GPUN calculated a MSIV bypass leakage of 243 SCF for the first day post LOCA. This calculation assumed that the drywell pressure decays to 1 psig in about 2 1/2 hours and then remains constant until 24 hours after the LOCA. Since the updated FSAR (Figure 6.2-3) shows 0 psig within 6 1/2 hours, this pressure profile was considered conservative for the assessment. The MSIV bypass leakage calculated by the radiological analysis (1000 SCF) exceeds the bypass leakage calculated by the MSIV leakage assessment (243 SCF). Since the MSIV bypass leakage is the major contributor to the control room dose, the assumptions used for the radiological analysis are conservative when compared to the expected MSIV behavior (12R tests) and containment pressure response (FSAR Fig. 6.2-3) during a LOCA. Further, the assumptions used for the main steam line volume (exclusion of main steam line header and piping volume up to the turbine stop valve) and for calculating the beta skin dose (inclusion of iodine daughter products) are conservative. Therefore, the radiological analysis of record is still bounding.

In the May 16, 1989 submittal, the licensee still further informed the NRC of the following concerning toxic gas releases:

A review of the chlorine transport analysis was performed at the new location for an instantaneous release and a continuous release (3/8 inch line break) for a 150 lb cylinder which is stored approximately 380 feet from the control room intake. The analysis took no credit for mixing of the chlorine plume due to the effects of a building wake, and the analysis also assumed the wind direction is such that the centerline of the chlorine plume at ground level blows directly towards the control room air intake (approximately 41 feet above plant grade).

For the instantaneous and continuous releases under various meteorological conditions, a toxic limit (0.045g/m^3) was only achieved in the control room envelope when the control room received air from outside sources at rates greater than 13,000 cfm (instantaneous release) and 1750 cfm (continuous release until cylinder is depleted) respectively. These control room outside air rates were assumed constant for the duration of the accidental chlorine releases. The minimum times to achieve a toxic limit were calculated as 320 seconds (instantaneous release) and 372 seconds (continuous release). Allowing 5 seconds for the detector loop response time, the minimum operator response times to restrict the control room outside air source rate (switch to full recirculation) were assumed as 315 seconds (instantaneous release) and 367 seconds (continuous release).

The 12R control room HVAC tests have demonstrated an outside air source rate less than 1750 cfm for the full recirculation mode of operation. Further, the minimum times assumed for operator response are greater than the minimum operator response time (120 seconds) required by Regulatory Guide 1.78. Due to these facts and the conservative assumptions noted above, we have concluded that the control room operator has sufficient time from the receipt of a chlorine alarm to place the control room HVAC system (A or B) into full recirculation, and the need to don respiratory equipment is not warranted. Plant procedures currently in place direct the operator to switch the system to full recirculation upon the receipt of a chlorine alarm in the control room.

2.0 EVALUATION

The staff has reviewed the above described licensee submittals and other documents and, based on this review, concurs with the licensee's statement that, by submittal of the May 16, 1989 response, it has complied with the request for additional information and has addressed the design objectives identified in their June 4, 1985 letter. The staff also finds that the licensee's responses are acceptable.

Two new issues were raised, however, by the May 16, 1989 response, as described above, which bear on the validity of the radiological analysis and the toxic gas analysis. The staff has reviewed the information described above regarding the new issues, and based on this review, concurs with the licensee's conclusions (1) that the radiological analysis of record is still bounding, and (2) that the control room operator has sufficient time from the receipt of a chlorine alarm to place the control room HVAC system (A or B) into full recirculation, and the need to don respiratory equipment is not warranted. The licensee has not provided justification, however, for not proposing appropriate TS for chlorine detection and for the minimum air inflow to the control room, which was previously found to be necessary, in the safety evaluation of Amendment 105, due to the presence of a potential chlorine hazard to the control room operators. The earlier resolution of this is negated by the failure to completely eliminate all potential chlorine hazards (the one-ton chlorine tank was eliminated, but the latest submittal describes an 150-lb chlorine tank which presents a potential chlorine hazard to the control room operators).

In addition, the licensee verbally agreed to comply with the NRC request, in the NRC letter dated March 31, 1987, that GPUN propose additional control room habitability TS on the maximum control room temperature and a plant shutdown if the control room HVAC system (except dampers) is inoperable for more than 7 days. The review of thyroid doses on control room operators during a design basis accident remains deferred until the Commission completes its review of the source term for the LOCA.

3.0 CONCLUSION

The staff has evaluated the licensee's May 16, 1989 submittal and, based on its review, finds that the submittal is responsive to the NRC's request for additional information. The staff also finds that the conclusions reached by the licensee, as described in our evaluation, are acceptable, pending proposal and incorporation in the license of the appropriate TS amendments (as described in our evaluation) and the review and evaluation of the control room operator thyroid doses, which has been deferred pending completion of the Commission review of the source term for the LOCA. Alternatively, the licensee may submit acceptable justification for not providing the TS amendments.

Principal Reviewer: Charles Nichols

Dated: October 2, 1989