UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO JUSTIFICATION FOR CONTINUED OPERATION

REGARDING THE POTENTIAL FOR A PREVIOUSLY UNACCOUNTED FOR

RADIOACTIVE RELEASE IN THE MAXIMUM HYPOTHETICAL ACCIDENT ANALYSIS

CONSUMERS POWER COMPANY

PALISADES PLANT

DOCKET NO. 50-255

1.0 INTRODUCTION

By letters dated January 10, April 21, and July 28, 1992, Consumers Power Company, the licensee for the Palisades Plant, requested NRC's permission for continued operation of the plant until the end of the 1994 refueling outage (beginning of Fuel Cycle 12) and provided its justification for continued operation (JCO) of the plant. In its January 10, 1992, JCO submittal, the licensee pointed out that its discovery of the existence of a potential leak path for radioactive containment sump water to the safety injection and refueling water (SIRW) tank during the recirculation phase of a postulated loss-of-coolant accident (LOCA) raised an unreviewed safety issue. This is because the tank is vented directly to the atmosphere unmonitored via a 6-inch line, and the licensee had not previously considered the tank vent release as a source term when it calculated control room operator and offsite doses.

For the Palisades Plant, during the injection phase of a design basis LOCA, the engineered safety feature (ESF) pumps (high and low pressure safety injection pumps) and the containment spray pumps take suction from the SIRW tank. When the tank water reaches a preset low level, the recirculation actuation signal (RAS) gets initiated and the recirculation phase of LOCA starts. On an RAS, the SIRW tank gets isolated, the low pressure injection pumps stop, and the suction of the high pressure ESF pumps and the containment spray pumps get automatically transferred to the containment sump. In the January 10, 1992, submittal, the licensee stated that during the recirculation phase of LOCA, the pressure in the discharge header combined with the assumed SIRW tank isolation leakage could cause back flow of radioactive containment sump water into the SIRW tank. This, in turn, would result in release of airborne radioactive material via the SIRW tank vent. Since the licensee had not previously recognized the potential for the SIRW tank water to become radioactive via back leakage of containment sump water during the recirculation phase of LOCA, the licensee did not include possible dose contributions due to SIRW tank vent releases in its control room and offsite dose analyses. In the January 10 and April 21, 1992, submittals, the license committed to provide by April 30, 1992, a new design bases LOCA (maximum hypothetical accident) analysis to account for the additional dose contributions to control room and offsite doses due to the SIRW tank vent release, and to identify the modifications needed to support the analysis.

The licensee further added that it would complete all the modifications by the end of the 1994 refueling outage subject to the NRC's approval of the licensee's analysis by November 1, 1992.

The licensee initially provided its JCO (submittal dated April 21, 1992) outlining the proposed compensatory measures including limited administrative controls and the interim calculated doses with the associated assumptions. The April 21, 1992, submittal additionally included the licensee's responses to the staff's questions based on the staff's review of the January 10, 1992, submittal. Finally, by submittal dated July 28, 1992, the licensee revised its earlier (April 21, 1992, submittal) source term assumptions to be consistent with Regulatory Guide (RG) 1.4 guidelines and recalculated the interim control room doses and offsite doses for the design basis LOCA. The staff's evaluation of the licensee's JCO based on its review of the licensee's submittal is given below.

2.0 EVALUATION

In its JCO, the licensee discussed three potential leakage paths by which the containment sump water can backflow into the SIRW tank. These are: (1) SIRW tank main discharge lines or suction headers via the tank suction valves; (2) high pressure safety injection (HPSI) minimum flow recirculation line via the recirculation control valves; and (3) the shutdown cooling cross connect line (line downstream of the shutdown cooling heat exchanger used for system testing) via a normally locked-closed manual test valve on the line. Discussing the first leakage path which included consideration of the required containment pressure that could force flow from the sump to the SIRW tank, the licensee determined that due to the elevation difference provided in the design between the containment sump and the SIRW tank, no leakage of the containment sump water into the SIRW tank would occur through the tank suction valves. With regard to the second pathway, the licensee stated that there is no significant mechanism for degradation of the HPSI mini flow recirculation control valves and consequently the licensee expects very little leakage through the subject valves on the pathway. The licensee stated that this is because the subject valves are normally open, are seldom operated, are made of non-corrosive materials, and are only exposed to water from the SIRW tank which has good chemistry control. Additionally, the licensee stated that the subject valves are two gate valves in series and the leak testing of the valves during the 1992 refueling outage showed measured leakages of 0.0 and 0.01 gpm, well below the licensee's administratively established acceptance criteria of leakage for use in its design basis LOCA analysis. With regard to the third pathway, the licensee stated that a blank flange had already been installed on the subject line to prevent entry of containment sump leakage into the SIRW tank via this pathway.

The licensee had also looked at other possible scenarios which could result in migration of the sump water into the SIRW tank through the main discharge lines. The licensee found that such migration would be possible only with a unique set of equipment failures including leakage through several valves in series and, therefore, did not consider such scenarios as credible.

As stated above, the licensee's submittal identified compensatory measures including limited administrative controls to reduce the releases to the environment and consequently the associated doses during the postulated LOCA. The submittal stated that applicable emergency operating procedures have been revised to direct the operators to add 200 gallons of sodium hydroxide via the ESF systems (containment spray and HPSI systems) to the containment sump water immediately after recirculation has been verified. The licensee stated that the revised procedures would ensure a thorough mixing of the containment sump water and buffer it to a pH of 7 to 8 and that the addition would take less than an hour. The licensee further stated that the above procedures in conjunction with post-accident containment sampling and analysis would ensure maintaining the containment sump water pH above 7 during the recirculation phase of LOCA and thereby prevent the long-term re-evolution of iodine from the sump into the containment atmosphere. This, in turn, would mean that dose contribution to control room and offsite doses due to long-term re-evolution of radioiodine from the containment sump need not be considered. The licensee stated that in addition to the above compensatory measure, a blank flange had already been installed on the shutdown cooling cross connect line to eliminate possible backflow of containment sump water into the SIRW tank via this pathway. Regarding administrative controls, the licensee has established an in-leakage rate acceptance criterion of 0.1 gpm for the SIRW tank from the containment sump for use in its design basis LOCA analysis. The licensee justified the chosen value on the basis of the need to keep the containment sump water intrusion into the SIRW tank as low as possible. The licensee additionally referred to an emergency implementation procedure in place at the facility which provides guidance for the use of potassium iodide tablets by the control room operators for reducing their uptake of radioiodine. The staff further notes that respirators are available for the control room operators which when used will reduce the thyroid dose by inhalation pathway.

The submittal included a discussion of what the licensee perceives as conservatism in the interim dose calculations. The licensee cited the assumed flat leakage rate of 0.05 weight percent of containment per day for the remaining duration of the LOCA after 24 hours (half of the rate assumed for the first 24 hours) regardless of continuously decreasing containment pressure, and assumed occupancy factors for the control room operators regardless of available operating crews and rotational shifts, as good examples of conservatism in its interim dose calculations.

The submittal justified continued plant operation over a comparatively long interim period, namely, till the beginning of Fuel Cycle 12, on the basis that all the hardware modifications (to support the final analysis) would have to be verified by testing and revised further, if so required to ensure optimum solution. The licensee further indicated that possible future NRC guidance in the area of control room ventilation could have an effect on its proposed modifications and may warrant changes in the modifications and consequently additional time to complete the modifications.

By submittal dated July 28, 1992, the licensee calculated less than 1 rem whole body dose and 15 rem thyroid dose to the control room operator using the RG 1.4 and Standard Review Plan Section 15.6.5 source term assumptions and an unfiltered inleakage of 11.6 ft^3/min (licensee's calculated value across the normal intake isolation dampers, zero unfiltered inleakage into the control room for ingress/egress due to installed vestibule doors) into the control room. For the above source term assumptions, the licensee calculated 0.3 rem whole body dose, and 16 rem thyroid dose at the site boundary for 2 hours and less than 1 rem whole body dose and 9.5 rem thyroid dose at the low population zone for 30 days.

Based on the information provided above, the staff has determined that the compensatory measures and limited administrative controls mentioned above provide reasonable assurance that (1) there will not be any long-term re-evolution of iodine from the sump into the containment atmosphere, and (2) the leakage via backflow containment sump water into the SIRW tank will not exceed 0.1 gpm assumed in the licensee's interim dose calculation. The staff has further determined that the assumed unfiltered inleakage to the control room in the interim dose calculation is reasonable. Also, the staff notes that the licensee's source term assumptions are consistent with RG 1.4 assumptions. Additionally, the staff finds the licensee's reasons for requested relief until the beginning of Fuel Cycle 12 to be reasonable. The staff also finds the interim control room operator doses and the offsite doses calculated by the licensee are acceptable since they are based on acceptable assumptions and are within the applicable General Design Criterion (GDC) 19 and 10 CFR Part 100 limits.

3.0 CONCLUSION

By Safety Evaluation Report dated April 29, 1983, the staff had previously concluded that the control room operator radiation exposures during accident conditions will not exceed 5 rem whole body or its equivalent to any part of the body for the duration of the accident (GDC 19 limit). However, the licensee's discovery of an unreviewed safety issue discussed above has necessitated the licensee's JCO and revised design basis LOCA analysis both for calculating control room doses and offsite doses. Based on the determination as it relates to the JCO submittals (April 21 and July 28, 1992) and discussed above, the staff finds the licensee's JCO to be acceptable and, therefore, recommends that Palisades be allowed continued operation until completion and submittal of the final MHA analysis during Fuel Cycle 12, but no later than January 1996.

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Date: January 9, 1995