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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 68 TO FACILITY OPERATING LICENSE NO. NPF-57

PUBLIC SERVICE ELECTRIC & GAS COMPANY

ATLANTIC CITY ELECTRIC COMPANY

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

By letter dated April 23, 1993, as supplemented by letters dated November 10, 1993, and January 13, 1994, the Public Service Electric and Gas Company (the licensee) submitted a request for changes to the Hope Creek Generating Station (HCGS), Technical Specifications (TS). The requested change would decrease the maximum allowable value of average river temperature from 90.5°F to 88.6°F; revising the action statement associated with the limiting condition for operation to permit continued normal operation for a period of 6 hours with the average river temperature in excess of 88.6°F, but at or below 89.9°F, provided that both loops of the station service water system (SSWS) and safety auxiliary cooling system (SACS) are verified to be operable; increasing the required frequency of monitoring average river temperature when the river temperature is above 85°F from once-every-6-hours to once-every-2-hours; and revising the bases associated with the ultimate heat sink (UHS) TS. The November 10, 1993, and January 13, 1994, letters provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

The SSWS normally provides water from the Delaware River to remove heat from the SACS heat exchangers and the reactor auxiliary cooling system (RACS) heat exchangers. The SSWS consists of two redundant loops for cooling the SACS heat exchangers. Each loop is equipped with two pumps in parallel. The two pumps supply two SACS heat exchangers arranged in parallel in each loop through a common header. The two SSWS loops are normally aligned to supply the two RACS heat exchangers, which are also arranged in parallel, through a common supply header. A loss of coolant accident (LOCA) signal causes motor operated valves to automatically isolate the non-essential RACS heat exchangers from each of the SSWS loops.

The SACS heat exchangers transfer heat from the turbine auxiliary cooling system (TACS) and various safety-related components served by the SACS, including the residual heat removal (RHR) heat exchanger, to the SSWS. The SACS also consists of two redundant loops. Each loop is equipped with two pumps in parallel. Heat is removed from each SACS loop by the two SACS eat

exchangers installed in that loop and transferred to the corresponding SSWS loop. The TACS is normally aligned to one loop of the SACS. Two motor operated valves in the return side headers and two hydraulically operated valves in the discharge side headers of each SACS loop automatically isolate the TACS from each loop of the SACS in the event of a LOCA, a loss of offsite power (LOOP), or low SACS expansion tank level.

The SSWS and the SACS are designed such that a single active failure will not cause a total loss of functional capability for either loop of the SSWS or the SACS. Separate standby diesel generators (SDGs) power each of the four emergency power buses at HCGS. Each of the emergency buses powers one SSWS pump and one SACS pump. As described above, redundant and independent valves isolate the non-essential RACS and TACS from the SSWS and SACS, respectively. Similarly, a single passive failure will not cause a loss of both loops of the SSWS and the SACS.

Although both loops of the SSWS and the SACS are normally available, a single loop is capable of performing many functions. Sections 9.2.1 and 9.2.2 of the Hope Creek Updated Final Safety Analysis Report (UFSAR) state that a single loop of the SSWS, with two operating pumps, and the corresponding SACS loop, also with two operating pumps, provide sufficient cooling to support normal shutdown, safe shutdown following a LOOP, and the long-term primary containment cooling mode of LOCA recovery. However, the UFSAR also states that both SSWS loops, with a single operating pump in each loop, and both SACS loops, also with a single operating pump in each loop, are necessary to satisfy minimum cooling requirements in the emergency core cooling system (ECCS) injection phase of LOCA recovery.

In licensee event report (LER) 90-014-00 dated September 12, 1990, PSE&G reported that the TS minimum operability value for UHS temperature was unconservatively high at 90.5°F. This UHS temperature limit was determined by analysis to provide sufficient heat removal from the SACS heat exchangers to maintain the maximum SACS outlet temperature not greater than 95°F under the highest expected heat loads. However, this analysis did not provide an allowance for SSWS pump degradation. Consequently, given the operating margins of the SSWS pumps, the SSWS pumps could not develop the head necessary to meet the SSWS flow requirements at the 90.5°F river water temperature.

At the time LER 90-014-00 was submitted, the licensee had imposed administrative limits on UHS temperature of 85°F based on the design temperature of the SSWS supply piping. On July 12, 1991, PSE&G submitted LER 90-014-01 to report that the administrative limit had been increased to 87.5°F based on a refined engineering analysis and a 10 CFR 50.59 evaluation. Subsequently, the administrative limit was further increased to 88.1°F based on continued engineering analysis of the SACS heat exchangers. By letter dated August 4, 1992, PSE&G reiterated a commitment to establish a final UHS temperature limit and submit a license amendment to incorporate the new value in TS 3.7.1.3.

3.0 EVALUATION

During the design phase of the SSWS, the architectural engineer (AE) for Hope Creek originally identified the following four bounding modes of system operation: (1) power generation (normal operation), (2) normal shutdown, (3) after a LOOP, and (4) operation greater than 10 minutes after a LOCA. For each operational mode, the AE calculated the resulting SACS heat exchanger loads for both single and two loop SSWS configurations. The AE subsequently determined that, in each mode, single loop operation resulted in the highest heat exchanger heat duty.

The licensee determined that single SSWS loop operation during conduct of normal shutdown procedures is the limiting case for the determination of the UHS maximum allowable temperature. Based on an iterative analysis at the component level of the SSWS and SACS for single SSWS loop normal operation with SACS heat exchanger outlet temperature at or below the SACS design temperature of 95°F, the licensee established a revised UHS temperature limit of 88.6°F. The SACS design temperature is a conservative limit relative to maximum SACS temperatures capable of supporting individual component operation. The iterative analysis that determined this temperature limit was based on the following assumptions: (1) all SSWS pumps are degraded by 15 percent from their nominal performance; (2) 50 tubes in each SACS heat exchanger are plugged; (3) design minimum river water elevation; and (4) operator actions are taken following a LOOP without a LOCA to increase the heat removal capabilities of the SACS heat exchangers when UHS temperature is above 85°F and a single SSWS loop is operating.

The specific operator actions necessary following a LOOP without a LOCA are isolation of SSWS flow to one RACS heat exchanger and reduction of SSWS flow to the remaining RACS heat exchanger to 2200 gpm. The licensee has committed to incorporate these operator actions into an existing station SSWS operating procedure. Also, the licensee has determined that areas of the reactor building where operator action is required are accessible following a LOOP. Operator actions in the reactor building are not required following a LOCA or a LOCA coincident with a LOOP because the SSWS supply to the RACS heat exchangers is automatically isolated in those instances.

Because the design temperature of the SSWS supply piping is 85°F and is below the proposed maximum UHS temperature, the licensee performed a review of applicable stress calculations. The licensee concluded from their review that adequate margin exists to ASME Boiler and Pressure Vessel Code, Section III, allowable stresses to accommodate the minor increase in thermal stress resulting from an increase in SSWS supply temperature from 85°F to 90°F.

Based on the above evaluations, the licensee has adequately demonstrated that the SSWS is capable of performing its design function with a maximum river water temperature of 88.6°F. The proposed change to the TS maximum river water temperature is also conservative. Therefore, the reduction in the maximum allowed average river water temperature in TS 3.7.1.3 from 90.5°F to 88.6°F is acceptable.

The licensee has proposed decreasing the surveillance interval for average river water temperature from once-every-6-hours to once-every-2-hours when river temperature is above 85°F. The average river temperature is indicated in the main control room. Based on a review of 3 years of data, the river temperature exceeds 85°F an average of 14 hours per year. This proposed change supports identification of periods when the average river temperature exceeds the limiting condition for operation without burdening the control room operators. Therefore, the proposed increase in surveillance frequency for average river water temperature when river water temperature is above 85°F is acceptable.

In PSE&G's letter dated November 10, 1993, the licensee modified their original submittal to permit continued operation for a period of 6 hours with river temperature above 88.6°F providing that both loops of the SSWS and SACS are operable and the river temperature is at or below 89.9°F. With both loops of the SSWS and SACS operable, a minimum of 100 percent capacity in one loop and 50 percent capacity in the remaining loop will be retained following any single active failure. With the additional capacity provided by the second loop operating at 50 percent flow, the licensee determined that the plant can continue normal operation and complete a normal shutdown with SSWS supply temperature at or below 89.9°F.

The change permitting continued operation with river water temperature above 88.6°F for 6 hours results in a condition where completion of a normal shutdown has not been determined to be achievable with a single SSWS/SACS loop, contrary to the description in the UFSAR. However, continued operation at an increased river water temperature is acceptable based on the limited period of time operation is permitted to continue at with the increased river water temperature and the extremely low probability of a coincident passive failure of one SSWS or SACS loop.

Based on the above evaluation, the staff concludes that the proposed changes to TS 3.7.1.3 and TS 4.7.1.3 are conservative and acceptable. The proposed changes to the associated TS Bases are consistent with the justification for the changes.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State Official was notified of the proposed issuance of the amendment. By letter dated January 13, 1994, the State official notified the NRC of a concern related to the frequency of monitoring of the river water temperature. The State Official commented that the monitoring frequency of once-per-24-hours would not detect river water temperatures above 85°F caused by an incoming tide during the surveillance interval. A monitoring interval of one-half to 1 hour, after low tide and during the mid-to-late afternoon was recommended by the State Official.

By letter dated March 4, 1994, PSE&G responded to the State Official's concern. PSE&G notes that at Hope Creek, the Control Room Integrated Display System (CRIDS) provides the operator with updated river water temperature every 60 seconds, and a strip chart recorder provides a continuous record of service water pump discharge temperatures. PSE&G believes that existing instrumentation and procedures enables the operator to perform the required surveillances and determine if the ultimate heat sink limiting condition for operation are exceeded at any time. Based on the above, PSE&G concludes that changes to Technical Specification Surveillance Requirement 4.7.1.3.b.1 is not required.

The staff notes that at a river water temperature of above 85°F, the frequency of monitoring the temperature is 2 hours. It should also be noted that 85°F is not the maximum allowable temperature, but that 88.6°F is the maximum allowable temperature. Also, with limitations on the amount of equipment inoperable, operation with temperatures between 88.6°F and 89.9°F is allowed for 6 hours. Because the operators have available essentially continuous indication and recording of river water temperature, the fact that 85°F is not the maximum allowable river water temperature and 2-hour monitoring of river water temperature is required above 85°F; the staff concludes that changing the technical specification to require monitoring every one-half to 1 hour is not necessary.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (58 FR 30200). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: April 15, 1994