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DONAHUE,J.W. Carolina Power & Light Co.
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SUBJECT: Forwards response to 980225 RAI re proposed amend to TS 3/4.6.2 re depressurization & cooling systems.Info requested to be provided within 30 days of end of next refueling outage,which is scheduled to commence 981024.

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Carolina Power & Light Company
Harris Nuclear Plant
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JUN 29 1998

SERIAL: HNP-98-074

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
ON THE PROPOSED AMENDMENT TO TECHNICAL SPECIFICATION 3/4.6.2,
DEPRESSURIZATION AND COOLING SYSTEMS (TAC NO. M98857)

Dear Sir or Madam:

By letter dated February 25, 1998, the NRC requested that Carolina Power & Light Company (CP&L) respond to a request for additional information on the proposed amendment to Harris Nuclear Plant (HNP) Technical Specification 3/4.6.2, Depressurization and Cooling Systems. This letter requested that the information be provided within 30 days of the end of the next refueling outage. The next HNP refueling outage is currently scheduled to commence October 24, 1998.

A written response providing the requested information is provided in the enclosure to this letter. Questions regarding this matter may be referred to Mr. J. H. Eads at (919) 362-2646.

Sincerely,

J. W. Donahue
Director of Site Operations
Harris Plant

AEC/aec

Enclosure

c: Mr. J. B. Brady (NRC Senior Resident Inspector, HNP)
Mr. L. A. Reyes (NRC Regional Administrator, Region II)
Mr. S. C. Flanders (NRR Project Manager, HNP)

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON THE PROPOSED AMENDMENT TO TECHNICAL SPECIFICATION 3/4.6.2, DEPRESSURIZATION AND COOLING SYSTEMS (TAC NO. M98857)

Requested Information Item 1:

Discuss the analysis that provides the basis for TS 4.6.2.3.a.2.

Response 1:

One of the means by which energy is removed from containment is via the Containment Fan Coolers (CFCs), which are cooled by water from the Emergency Service Water System (ESWS). The basis for Technical Specification 4.6.2.3.a.2 is to ensure that the CFCs provide adequate heat removal capacity, in conjunction with the Containment Spray System (CSS), to limit the transient containment pressure and temperature during Main Steam Line Break (MSLB) and Loss of Coolant Accident (LOCA) conditions, according to the requirements of General Design Criterion (GDC) 38. Containment analysis calculations have been performed which estimate pressures and temperatures inside containment for a period of time following a LOCA or MSLB.

For the Harris Nuclear Plant (HNP), the calculations were performed by using the CONTEMPT-LT/026 and -LT/028 computer codes and input parameters specific to HNP. Some of the specific input assumptions are summarized as follows:

- The sources and amounts of energy released into containment as a function of time are presented and discussed in HNP Final Safety Analysis Report (FSAR) Sections 6.2.1.3 and 6.2.1.4.

- The heat removal capacity of the CFCs as a function of gas inlet temperature, service water capacity, fouling, etc. is provided by the vendor for use in the calculation. This information is summarized in the response to Question 3 in this letter.

- The number of available CFC units and CFC tubes plugged is assumed based on the accident type (MSLB or LOCA). This information is summarized in the response to Question 3 in this letter.

- The initial containment temperature is assumed to be 135 °F, which is a bulk temperature. Also, the CFC inlet service water temperature is assumed to be 95 °F, the service water capacity is assumed to be 1360 gpm per CFC, and the start time for the CFCs is assumed to be 110 seconds after the start of the accident.

The resulting estimate for maximum containment temperature and pressure following a MSLB is 368 °F and 55.9 psia (41.2 psig), respectively. The resulting estimate for maximum temperature and pressure following a LOCA is 257.1 °F and 53.1 psia (38.4 psig), respectively. These results are presented in HNP FSAR Table 6.2.1-2, "Calculated Parameters for Containment Parameters."

<u>Requested Information Item 2:</u>

Provide the basis for the original cooling water flow rate of 1425 gpm.

<u>Response 2:</u>

Prior to plant start-up, the minimum ESW flow limit to the CFCs was 1500 gpm. This was the value used in the original design specification for the CFCs. The original CFC performance characteristics shown in the design specification and used in the initial containment analyses were based on a design flow rate of 1500 gpm.

In 1986, final testing of the ESW system indicated a shortage of 5% of the design flow (75 gpm) to each of the CFCs. As a result, an analysis was performed to support a Technical Specification (TS) change to 1425 gpm, and the CFC performance curves were adjusted for use in the revised containment analyses. The TS value of 1425 gpm was reviewed and approved by the NRC through the issuance of the HNP Low Power TS in October 1986 and the HNP Operating License and TS in January 1987. The 1425 gpm was measured under test conditions which did not account for the minimum credible reservoir level.

<u>Requested Information Item 3:</u>

Provide the flow rate (and basis) used in the existing containment analysis and describe the assumptions used in that analysis.

<u>Response 3:</u>

The cooling flow rate used in the existing containment analysis is 1360 gpm. In 1995, an evaluation was performed to support the possible removal of one coil from service in each CFC train. In performing this evaluation, engineers discovered some non-conservatisms in the containment analyses. Specifically, the assumed mass-energy release history was non-conservative, and the fouling factor used for the CFCs was non-conservative. As a result, an engineering evaluation revised the containment analyses. During the course of this revision, engineers discovered that 1425 gpm was not the minimum post-accident flow rate through the CFCs resulting from the minimum credible reservoir level. A hydraulic model of the ESW system indicated that 1360 gpm would be the lowest expected flow rate through the CFCs assuming the TS minimum reservoir level of 205.7 ft. Single failures in the ESW system were not accounted for in the hydraulic model because there were more limiting single failures assumed in the containment analyses, such as the loss of an entire safety bus in the LOCA analysis or the failure

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of a Main Steam Isolation Valve in the MSLB analysis. The 1360 gpm value includes a four percent uncertainty in the hydraulic model. HNP submitted a request for license amendment to the NRC, by letter dated October 31, 1996, to change the TS minimum reservoir level from 205.7 ft. to 215 ft. While an increase in minimum reservoir level could result in an increase in the lowest expected flow rate through the CFCs, HNP does not plan to alter the existing containment analyses to credit any additional flow. The containment analyses will still assume a design input of 1360 gpm of ESW flow through the CFCs with the tube plugging limits discussed below. Any additional margin in ESW flow which is gained from increasing the TS minimum reservoir level will be reserved for future plant modifications.

Table 1 summarizes the per-cooler and total heat removal rates assumed in the MSLB and LBLOCA analyses based on 1360 gpm of ESW flow per cooler, a 95 °F ESW inlet temperature, and a 0.001 fouling factor. For the MSLB analysis, a single failure of a Main Steam Isolation Valve and the loss of one fan cooler is assumed. It is also assumed that one bundle of tubes (16 tubes) per safety train is plugged. Since there are 16 tube bundles per cooler, and three coolers are assumed available, this equates to an availability of 736 out of 768 (95.8%) of the total tubes. The effects of such plugging are conservatively accounted for by multiplying the per-cooler heat removal rate by 2.875 (3 x .958) to obtain the total heat removal rate for all three available coolers. For the LBLOCA analysis, the loss of one cooling train (2 fan coolers) is assumed. One tube bundle (16 tubes) in the two available fan coolers is assumed to be plugged. Since there are 16 tube bundles per cooler, and two coolers are assumed available, this equates to an availability of 496 out of 512 (96.9%) of the total tubes. The effects of such plugging are conservatively accounted for by multiplying the per-cooler heat removal rate by 1.938 (2 x .969) to obtain the total heat removal rate for the two available coolers.

Table 1. CFC Heat Removal Capacity at 1360 gpm

Inlet Gas Temp. (°F)	Per-Cooler Load (MBTUH)	MSLB Total Load (MBTUH)	LBLOCA Total Load (MBTUH)
120	4.23	12.16	8.20
150	11.71	33.67	22.69
180	22.07	63.45	42.77
220	38.62	111.03	74.85
258	55.50	159.56	107.56

Requested Information Item 4:

Identify the assumptions that were used for the proposed cooling water flow rate of 1300 gpm, and discuss how this reduction affects the containment parameters.

Response 4:

Table 2 summarizes the per-cooler and total heat removal rates assumed in the MSLB and LBLOCA analyses based on 1300 gpm of ESW flow per cooler, a 95 °F ESW inlet temperature, and a 0.001 fouling factor. For the MSLB analysis, only 8 tubes per train are assumed plugged for the cooling water flow rate of 1300 gpm. Since there are 16 tube bundles (16 tubes each) per cooler, and three coolers are assumed available, this equates to an availability of 752 out of 768 (97.9%) of the total tubes. The effects of such plugging are conservatively accounted for by multiplying the per-cooler heat removal rate by 2.937 (3 x .979) to obtain the total heat removal rate for all three available coolers. For the LBLOCA analysis, only 5 tubes are assumed plugged for the cooling water flow rate of 1300 gpm. Since there are two coolers available, and each cooler has 16 tube bundles (16 tubes each), this equates to an availability of 507 out of 512 (99.0%) of the total tubes. The effects of such plugging are conservatively accounted for by multiplying the per-cooler heat removal rate by 1.98 (2 x .99) to obtain the total heat removal rate for all three available coolers.

Table 2. CFC Heat Removal Capacity At 1300 gpm

Inlet Gas Temp. (°F)	Per-Cooler Load (MBTUH)	MSLB Total Load (MBTUH)	LBLOCA Total Load (MBTUH)
120	4.20	12.34	8.32
150	11.58	34.01	22.93
180	21.77	63.94	43.10
220	37.96	111.49	75.16
258	54.41	159.80	107.73

For both the MSLB and LBLOCA analyses, the total heat removal capacity of the CFCs at 1300 gpm with the assumed tube plugging limitations is greater than or equal to the total heat removal capacity at 1360 gpm with the corresponding tube plugging assumptions. Thus, a lower flow to the CFCs will satisfy the TS basis requirements as long as the number of plugged tubes is controlled. As stated in the original request for license amendment, the tube plugging limit of 5 tubes will be controlled by an engineering periodic test.