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August 16, 1988

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

SUBJECT: Response for Request for Additional Information Dated August 15, 1988 (TAC 69025)

This is in response to the request for additional information relative to our proposed application for a Technical Specification amendment to permit unit operation with a maximum service water inlet temperature of 90°F. That request had been verbally provided during discussion with the NRC staff on August 12, 1988 and followed up by letter dated August 15, 1988. The Attachment to this letter provides specific responses to the questions posed.

If you have any further questions do not hesitate to call us.

Very truly yours,

[signature]

Attachments

cc: Mr. William Russell
Regional Administrator - Region I
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Ms. Marylee M. Slosson, Project Manager
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U.S. Nuclear Regulatory Commission
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Washington, DC 20555

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 38
Buchanan, NY 10511

1. Provide a revision of USFAR Table 9.6-1, "Essential Service Water Requirements at 75°F River Water Temperature," to reflect all changes resulting from operating with a service water temperature of 90°F.

RESPONSE:

Essential Service Water Flows at 90°F

Equipment	Flow Per Unit (GPM)	Total (GPM)
FCU	1500	7500
DGs	400	1200
Rad Sample Coolers	As Req'd to 80	80
IA Compressor	65 and 75 (to CCR A/C)*	140
Strainers	As Req'd	100
T.O. Cooler	Not Req'd for DBA	--
Feed Pump Cooler	Not Req'd for DBA	--
		9020 Total

This Flow Requires 2 S.W. Pumps on Essential Header.

Non-Essential Service Water Flows at 90°F

Component Cooling Hx	5000

This Flow Requires 1 Pump on Non Essential Header.

*CCR A/C removed, line blanked off. All flow can go to IA compressor Hx.

2. Describe all reductions in heat removal capability and margins in components cooled by component cooling water and service water that result from increasing the maximum service water temperature from 85°F to 90°F.

RESPONSE:

As described in Chapter 9 of the FSAR, the Component Cooling Water System is a closed loop system which provides cooling to various plant components during both normal operation and in the accident conditions. The heat absorbed by the component cooling water system is rejected to the ultimate heat sink (Hudson River) via the Service Water System (SWS).

The Component Cooling Water System (CCW) incorporates three component cooling water pumps and two Component Cooling Water heat exchangers. Heat is rejected to the Service Water System via the two heat exchangers. System design and operation are discussed in Section 9.3-2 of the FSAR. It should be noted that the Boric Acid Evaporators and Condensate Coolers and the Flash Evaporator product cooler have been removed from service and no longer represent heat loads to the CCW System. This has enhanced the heat removal margin of the CCW System. Flow in the CCW system itself, and heat removal capacity, is controlled by the number of CCW pumps and heat exchangers in service. To enhance the heat removal capability of the CCW system, throttling on the Service Water System side is employed.

The operation of the CCW system and its interface with the Service Water System is described below along with information concerning margins and heat removal capability.

The Service Water System is divided into two headers, each with three pumps. The headers are fully interchangeable. One header is designated the essential header and the alternate the non-essential header. The terms essential and non-essential are misnomers in terms of safety. Each header performs a safety function during the accident scenario albeit at different times. The essential header provides cooling to engineered safeguards equipment during the initial phases of the accident whereas the non-essential header provides cooling during the recirculation phase.

The CCW system is served by the non-essential SWS header both during normal operation and in the accident scenario. During normal operation, two component cooling pumps and one component cooling heat exchanger are sufficient. This permits one CCW pump and heat exchanger to be in standby. Operation of standby equipment would enhance the heat removal capability of the CCW system. During the accident scenario, when the CCW system is performing its safety function (recirculation phase), one CCW pump, one SWS pump, one CCW heat exchanger, and one RHR heat exchanger are required.

During normal operation, service water is throttled to maintain the CCW temperature between a temperature of 70°F to 100°F. The component for which operability is most restrictive in terms of temperature during normal operation is the Reactor Coolant Pump thermal barrier. The continuous maximum temperature rating is 105°F; there is a short-term two hour rating of 125°F. Its temperature is continuously monitored and indicated in the Control Room. Recent temperature measurements of CCW temperature have not exceeded 95°F.

Additional SWS flow can be made available to cool the CCW system since the SWS system is currently operating in the throttled mode and is supplying a number of loads which are not essential to plant operation and can be isolated.

Cooling water flow in the CCW system to the different loads is constant regardless of SWS water inlet temperature. This flow only varies according to the number of pumps in operation or if a component (i.e., a heat exchanger) has been isolated. Thus for a given heat load, a rise in SWS inlet temperature will result in an increase in Component Cooling Water temperature. The increase in Service Water temperature can be offset by varying the service water flow or by a reduction in heat load to the CCW System. During normal plant operation, with two CCW pumps operating, a flow of 4,800 gpm is indicated in the Control Room. During the recirculation phase with only one pump running, flow will be at a rated pump condition of 3,600 gpm.

For the accident scenario, with a SWS inlet temperature of 90°F, the CCW temperature will increase to 152°F. As explained in the component cooling water system analysis submitted on August 10, 1988, this corresponds to a Containment Sump temperature of 274°F (time at which switchover to recirculation is initiated). This analysis contains an evaluation of all components considering a CCW temperature of 152°F. The limiting components were the Safety Injection pumps (i.e. lubricating oil). The IP-2 design incorporates a means of cooling the Safety Injection pumps via the Primary Water Storage Tank (PWST). The Emergency Operating Procedures have been modified to reflect using the PWST for this purpose at 130°F. Under these circumstances, the next limiting components in terms of temperature are the Recirculation Pump motors. Their operability with a CCW temperature of 165°F has been evaluated and found acceptable. Thus in terms of margin, with a CCW temperature of 152°F during recirculation, there exists a minimum margin of 15°F before equipment malfunction could occur.

3. At a service water temperature of 90°F, could containment temperature exceed 120°F? If so, describe the effects upon all environmentally qualified instrumentation for normal and accident operating conditions. Include discussion of equipment operability, degradation and life span under normal and accident conditions.

RESPONSE:

With the increased service water temperature, the containment temperature could exceed 120°F. However, the accident environmental parameters for containment were based on a reactor power level of 3216 MWt with an initial containment temperature of 120°F. A re-evaluation at current license power level shows that, with as high as 130°F initial temperature, post-LOCA containment pressure would still not exceed the 40.5 psig analyzed in the FSAR.

The increased ambient temperature has a negligible effect on degradation and aging since a constant 120°F was used for the aging analysis of containment qualified instrumentation. In fact, even with intermittent operation at 130°F, the weighted average annual temperature for containment will remain below 120°F.

4. Verify that for a service water inlet temperature of 90°F that the temperature of the service water entering 1) the emergency diesel generators, 2) the component cooling water heat exchangers, 3) the containment fan cooler units and 4) all other essential service water loads is less than or equal to 90°F. If not, describe the effects upon equipment operability and accident analyses.

RESPONSE:

The temperature at the inlets of various components cooled by the Service Water System are assumed to be the same as the service water inlet temperature. The heat added by the pump is negligible. The inlet to the diesel generators is the only essential service water cooling load that has inlet temperature measurement.

The Fan Cooler Units, Fan Cooler Motor Coolers, Instrument Air Compressor, Closed Cooling Water Heat Exchanger, or Radiation monitor mixing nozzle do not have inlet temperature measurement devices installed. However there are several non-essential service water loads that do have inlet temperature devices (generator coolers, and mechanical vacuum pump) that were measured at various times and also found to be equivalent to the intake readings.

The Fan Cooler Units and Motor Coolers have been analyzed to higher inlet temperatures. As previously submitted the increased temperature of water to the Fan Coolers can be offset by an increase of flow. The Motor Coolers have been analyzed to 93°F. The increase in temperature will have minimal effect on the motors. It will slightly reduce the substantial design margin and will in no way interfere with the motor's capability during or subsequent to an event.

The component cooling water heat exchangers are supplied from the non essential service water header. They have no permanently installed temperature measuring devices on the inlet:

Based on the indications we have for Service Water Temperature and the negligible input from the pump heat and ambient temperatures, the temperature at the inlet to a component is virtually the same as the intake temp.