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ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

September 3, 1985

Docket No. 50-461

Director of Nuclear Reactor Regulation
Attention: Mr. W. R. Butler, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Clinton Power Station (CPS)
RCIC and HPCS Low Temperature Automatic Transfer Feature

Dear Mr. Butler:

In the March 1975 CPS Construction Phase Safety Evaluation Report (SER), NUREG 75/013, Section 7.8, the NRC Staff identified a concern regarding the instrumentation required to transfer the Reactor Core Isolation Cooling (RCIC) or High Pressure Core Spray (HPCS) pump suction from the RCIC Storage Tank to the Suppression Pool. The Staff's concern was that the instrumentation did not satisfy the single failure criteria because it was not adequately protected against loss by freezing. The instrumentation of concern senses RCIC Storage Tank Level and provides a signal to transfer RCIC and HPCS pump suctions to the Suppression Pool.

Illinois Power (IP) responded to this concern by amending the CPS Preliminary Safety Analysis Report (PSAR) Amendment 29, Sections 7.3.1.1.1.1.2 and 7.4.1.1.3.5. The amendment included descriptions of instrumentation that would detect and annunciate low temperature in 1) the instrument line in the pipe tunnel between the RCIC Storage Tank and the Fuel Building and 2) the RCIC Storage Tank. The amendment also included a discussion of additional instrumentation that would automatically transfer the RCIC or HPCS pump suction from the RCIC Storage Tank to the Suppression Pool on either low tank temperature or low suction piping temperature. In the December 1975 CPS-SER Supplement No. 1, Section 7.8, the Staff concluded that the design of the low temperature automatic transfer feature was acceptable.

Changes in the RCIC Storage Tank design, such as the addition of tank insulation and a second tank heater and the addition of insulation to the instrument line, since the PSAR was written, prompted a review of our past licensing commitment to add the low temperature automatic transfer function. The results of our review indicate that the automatic transfer of RCIC or HPCS suction to the Suppression Pool on low tank or suction line temperature is no longer necessary. Adequate protection exists to prevent loss of level instrumentation due to freezing. A discussion justifying our position on this issue is provided in the Attachment.

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The information provided should properly justify the deletion of this automatic pump suction transfer feature. Please notify us at your earliest convenience if the above information is adequate for your review of this design change.

Sincerely yours,

F. A. Spangenberg

F. A. Spangenberg
Manager - Licensing and Safety

JBD/kaf

Attachment

cc: Mr. B. L. Siegel, NRC Clinton Licensing Project Manager
NRC Resident Office
Regional Administrator, Region III USNRC
Illinois Department of Nuclear Safety

Attachment to
U-600254
dated 10/03/85

Clinton Power Station (CPS)
Description of
RCIC Storage Tank and Pipe Tunnel Features and
Evaluation of Protection From Freezing

The purpose of the Reactor Core Isolation Cooling (RCIC) Storage Tank is to provide the RCIC and High Pressure Core Spray (HPCS) pumps with a source of clean water for injection into the reactor vessel. The cylindrical storage tank, approximately 30' tall and 30' in diameter, is located just outside the Fuel Building at the southeast corner of the plant. The tank is fabricated of 1/4" and 3/8" welded aluminum sheets. The cycled condensate system provides make-up to the tank which is normally filled with 145,000 gallons (125,000 gallons useable) of water. The sides of the tank are insulated with 2" of mineral wool with exterior metal lagging which provides a weather shield. The top of the tank has a 3" overhang which will prevent water from seeping into the insulation. The tank top is not insulated; however, a minimum 1.5 ft. air space is guaranteed by an overflow pipe. This air space will provide additional resistance to heat loss from the tank. Piping and instrumentation routed to and from the tank are enclosed in a pipe tunnel which connects the tank to the Fuel Building. This pipe tunnel is 17 ft. long, is constructed with insulated siding, and has a concrete floor. Tunnel heating is provided by a 10 kw space heater to maintain the tunnel at 65°F during cold weather.

Four level transmitters are provided to automatically initiate transfer of the RCIC and HPCS pump suction from the Storage Tank to the Suppression Pool when tank water level is low. These level transmitters sense Storage Tank level via a 4" diameter instrument line which passes through the pipe tunnel and into the Fuel Building. The instrument taps, sensing lines, and level transmitters are all located inside the Fuel Building. To protect against loss of automatic level transfer due to instrument line freezing, the instrument line is insulated with 2" of calcium silicate.

The Storage Tank is provided with two 12 kw electric immersion heaters which are attached to the outside of the tank on 6" flanges. Both heaters are mounted 1.5 ft. from the bottom of the tank and are located 180° circumferentially from each other. This configuration will provide more than twice the necessary heating capacity (10.3 kw) for the entire water inventory.

The tank heaters are controlled from a local control panel located adjacent to the Storage Tank. A temperature indicating controller (TIC), which utilizes a temperature sensing element located in the tank, is used to control tank water temperature. Whenever the sensed tank water temperature is below the TIC setpoint of 60°F, either one or both heaters will be operating (dependent upon the differential between the TIC setpoint and the tank temperature). Solid state electronic controllers are used to provide over-temperature protection for each heater. When a high temperature condition exists within a heater, its associated electronic controller will trip the heater and initiate an alarm light on the heater control panel. After tripping on high temperature, the heater can be reset by pushing a manual reset button on the heater control panel.

The local heater control panel is a NEMA 4 enclosure which is water-tight and dust-tight; rated for indoor and outdoor use. The panel is located in a metal Butler building to provide additional weather protection and to provide for administrative control of the TIC setpoint. The TIC and mercury-filled thermal sensing element are rated for ambient conditions from -30°F to 125°F.

Temperature related instrumentation and alarms for the RCIC Storage Tank and piping consist of the following:

1) Two tank heater high temperature trip indicating lights on local heater control panel (one light for each heater);
2) Tank water temperature gauge on local heater control panel;
3) Tank low temperature alarm set at 45°F (based on two in-tank temperature elements set at 45°F) on Main Control Room panel 1H13-P601 (ECCS benchboard); and
4) Instrument line low temperature alarm set at 45°F (based on two in-pipe temperature elements located in the pipe tunnel) on Main Control Room panel 1H13-P601.

The Storage Tank electric immersion heaters, the local control panel, and the pipe tunnel space heater are all non-safety related (non-1E). Also, the power sources for the heaters, the local control panel, and the instrumentation and alarms identified above are all non-safety related (non-1E). This is consistent with the design of the pipe tunnel and Storage Tank which are non-safety related, non-seismic structures. The power sources for the heaters and alarms are as follows:

Item	Power Source(s)
Storage Tank Heaters	Fuel Building MCC 1B
Pipe Tunnel Area Heater	Auxiliary Building MCC 1D
Tank Low Temp. Alarm	Control Building MCC 1C, 1E, 1F
Instrument Line Low Temp. Alarm	Control Building MCC 1C, 1E, 1F

All of the power sources identified above are mutually independent and should be operational during normal and plant shutdown modes. It is important to note that the tank and standpipe low temperature alarms have three independent power sources. Control Building MCC 1C is the normal (AC) power source, while Control Building MCCs 1E and 1F are backup battery (DC) power sources.

Heat transfer calculations for the tank show that during sustained ambient conditions of -20°F with a 15 mph wind, there will be a net heat input into the tank and water temperature will increase until the TIC setpoint is reached even if only one tank heater is in operation. The calculations also show that under the same ambient conditions if initial water temperature was 60°F and both heaters were inoperable, it would take over 24 days for the water to cool to 45°F (Control Room alarm setpoint). Sustaining such conditions for over 24 days is not typical of central Illinois and thus is very conservative.

Heat transfer calculations for the pipe tunnel indicate that during sustained ambient conditions of -20°F and a 15 mph wind, there will be a net heat input into the tunnel from the 10 kw space heater to prevent freezing of the suction and instrument line piping. Heat transfer calculations for the instrument line show that if initial water temperature was 65°F and the pipe tunnel heater was inoperable, it would take over 10 hours to cool to 32°F. This calculation does not take credit for the heat capacity of the air within the tunnel, and is thus conservative.

The current design of the storage tank and pipe tunnel should justify deletion of the automatic low temperature transfer function. This modification will not affect the availability of the RCIC or HPCS systems and, thus, will not impact plant safety. CPS operating procedures will be written to include manual RCIC and HPCS pump suction transfer to the Suppression Pool when either tank or piping low temperature alarms annunciate in the Main Control Room. To preclude the possibility of long-term heater inoperability, a surveillance procedure has been revised to include a log of tank water temperature (as given by the TIC), TIC setpoint and heater status every 8 hours whenever ambient temperature is below 32°F. Proper operation of the pipe tunnel heater will also be checked every 8 hours.

This evaluation indicates that all of the following events/failures must occur for tank freezing to be possible:

1) Prolonged severe environmental conditions;
2) Loss of tank heater power supply, failure of heaters to function, or failure to reset heaters;
3) Failure of operators to perform heater surveillances every 8 hours; and
4) Failure of the Main Control Room operator to acknowledge tank low temperature alarms or failure of the low temperature alarms.

An evaluation of the pipe tunnel indicates that all of the following events/failures must occur for freezing to be possible in the suction lines or instrument line:

1) Prolonged severe environmental conditions;
2) Loss of pipe tunnel heater power supply or failure of heater to function;
3) Failure of operators to detect pipe tunnel low temperature during surveillances conducted every 8 hours; and
4) Failure of the Main Control Room operator to acknowledge the instrument line low temperature alarms or failure of the low temperature alarms.

If the suction lines froze, pressure switches located on the suction lines near the HPCS and RCIC pumps would detect low suction pressure (after pump startup) and alarm in the Main Control Room. The operator would manually switch the suction from the tank to the Suppression Pool as instructed per annunciator procedures. If the instrument line froze, resulting in a loss of level indication, and the tank subsequently reached a low level without indication, low suction pressure would again be detected and the operator would switch the suction to the Suppression Pool. Therefore, the present design and operating procedures should justify no additional protection (i.e., automatic suction switchover logic for low temperature conditions).

IP's position on the low temperature transfer issue is consistent with other BWR 5 and 6 plants and the GE Standard Plant design. Our review of the Final Safety Analysis Reports for these plants revealed no mention of the low temperature transfer function.