MEMO TO Harry Rood

October 22, 1985
DATE PREPARED

Attached are revised descriptions for No Significant Hazards Consideration for the changes made by PCN-165 to Table 5.7-1.

If you have any questions, please call me.

FROM D. L. Cox

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SUBJECT: Forwards revised descriptions for NSHC for changes made by Procedure Change Notice PCN-165 revising Table 5.7-1 "Component Cyclic & Transient Limits."

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PCN-165

The proposed change revises Table 5.7-1 "Component Cyclic and Transient Limits." Table 5.7-1 identifies components subject to thermal fatigue when subjected to thermal cycling. The pressurizer spray system (used for control of pressurizer level and RCS pressure) is one such system identified on Table 5.7-1 which is routinely subjected to thermal cycling. Table 5.7-1 identifies the number of thermal cycles to which a component can be subjected and actions to be taken when the limit is approached. The severity of a thermal cycle on pressurizer spray is a function of the temperature differential between the pressurizer and the pressurizer spray. The greater this temperature differential, the fewer the number of spray cycles allowed before action must be taken. The threshold for determining when action must be taken is identified as the cumulative usage factor which is the sum of the usage factors for each differential temperature range. The usage factor for each temperature range is defined as the number of cycles accumulated in that temperature range divided by the number allowed.

Table 5.7-1 defines a spray cycle, the threshold temperature, the threshold differential temperature above which a spray cycle must be counted, differential temperature ranges and the number of spray cycles allowed for each range, the method for calculating the usage factor, the cumulative usage factor limit, and the action to be taken when the cumulative usage factor is exceeded. The proposed change revises Table 5.7-1 to apply to the: 1) entire pressurizer spray system rather than just the pressurizer spray nozzle; 2) redefines a spray cycle; increases the differential threshold pressurizer temperature from 150°F to 200°F; 4) redefines the temperature differential ranges and the number of allowed spray cycles for each range; and 5) reduces the cumulative usage factor limit from 0.75 to 0.65.

Currently, Table 5.7-1 applies only to the pressurizer spray nozzle. The proposed change will apply to the entire pressurizer spray system and require accounting for both main spray cycle when less than four reactor coolant pumps are operating and for all auxiliary spray cycles if the temperature differential is greater than 200°F. This change is an additional restriction which is currently not included in the current technical specification since the existing specification only applies to the pressurizer spray nozzle; therefore, this change is similar to Example (ii) of 48FR14870.

The existing specification defines a spray cycle as the opening and closing of a spray valve by main or auxiliary spray. The proposed change redefines the spray cycle as any initiation and termination of main or auxiliary spray flow through the pressurizer spray nozzle. This proposed change

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redefines the spray cycle to more closely correspond to the actual monitoring of spray cycles within the plant. Spray cycles are monitored by counting demands made by the spray valves in conjunction with monitoring spray line temperature rather than by monitoring actual opening and closing of the spray valves. This is more accurate since the spray valves often are not completely closed and a small bypass flow is allowed to minimize thermal transients on the system. This change is essentially a change in nomenclature and, therefore, is similar to Example (i) of 48FR14870.

The existing Table 5.7-1 requires logging of all pressurizer spray cycles where the differential temperature is greater than 150°F. The proposed change would require logging of all pressurizer spray cycles only if the differential temperature is greater than 200°F. This increase in the threshold temperature may be perceived to reduce, in some way, a margin of safety. However, the new threshold limit has been incorporated into the analysis of the pressurizer spray system and is compensated for by a decrease in the cumulative usage factor, thus with the proposed change fewer spray cycles may in fact be logged but with the lower cumulative usage factor limit, fewer cycles will have to be logged before action must be taken. The reanalysis of the pressurizer spray system and accounting for thermal cycles is consistent with the requirements of SRP Section 3.9.1 "Specific Topics and Mechanical Components." Therefore, this change is similar to Example (vi) of 48FR14870.

The existing specification redefines the differential temperature ranges and the number of allowed spray cycles for each range. Currently, 50,000 spray cycles are allowed in the temperature range of 150°F to 200°F, 7,000 are allowed in the range 201°F to 300°F, 2,000 in the range 301°F to 400°F, 1,000 in the range of 401°F to 500°F and 800 in the range of 501°F to 600°F. The proposed change allows unlimited cycles below 200°F since, as discussed above, 200°F is the new threshold limit. The new ranges are defined in 50°F increments from 201°F to 600°F with 11,000 cycles allowed to 250°F, 4,000 cycles between 251°F and 300°F, 2,200 cycles allowed between 301°F and 350°F, 1,300 between 351°F and 400°F, 900 between 401°F and 450°F, 500 between 451°F and 500°F, 300 between 501°F and 550°F and 200 cycles between 551°F and 600°F. Comparing the number of spray cycles allowed by the existing specification between 201°F and 300°F and by the proposed specification, the existing specification allows 7,000 cycles whereas the proposed change would allow a total of 15,000 cycles (11,000 between 201°F and 250°F, and 4,000 between 251°F and 300°F).

Recalling that the severity of transient increases with the differential temperature by splitting the ranges into smaller increments allows considerably more cycles at the lower temperatures; for example, in the existing range of 201°F to 300°F, 7,000 cycles are allowed, but from an analysis standpoint, all 7,000 could occur at 300°F, whereas in the proposed change, 11,000 cycles are allowed to 250°F which are less severe than cycles at 300°F and 4,000 are allowed at 300°F. Although the increased number of spray cycles allowed by the proposed change may be perceived to reduce, in some way, a margin of safety, the number of allowed spray cycles are accounted for in the analysis of the spray system in accordance with SRP Section 3.9.1; therefore, this change is similar to Example (vi) of 48FR14870.

Currently, the cumulative usage factor limit is 0.75. When the cumulative factor limit is exceeded, spray cycles must be limited to less than the threshold differential temperature and an engineering evaluation must be performed to show that the spray system remains acceptable prior to removing this restriction. The proposed change reduces the cumulative usage factor limit to 0.65. This reduction in the cumulative usage factor limit is an additional restriction and, in some ways, compensates for the relaxations in the threshold differential temperature and the increased number of allowed spray cycles in the redefined temperature ranges. Because this change is an additional restriction, it is similar to Example (ii) of 48FR14870.