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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 40 TO FACILITY LICENSE NO. DPR-39

SUPPORTING AMENDMENT NO. 37 TO FACILITY LICENSE NO. DPR-48

COMMONWEALTH EDISON COMPANY

ZION STATION UNITS 1 AND 2

DOCKET NOS. 50-295 AND 50-304

Introduction

By letter dated May 24, 1977 as supplemented September 27, 1978, Commonwealth Edison Company (the licensee) requested a change to Technical Specifications appended to Facility Operating Licenses DPR-39 and DPR-48 for Zion Station Units 1 and 2, respectively. The proposed amendments would allow the pressurizer boron concentration to be 200 ppm less than the reactor coolant loop boron concentration during plant heatup. The amendments would also correct two minor errors that presently exist in the Zion Technical Specifications regarding the Isolation Valve Seal Water Systems and the Penetration Pressurization Systems.

Discussion

The Zion Station Technical Specifications presently require that during plant heatup, the boron concentration in the reactor coolant loops and pressurizer be sampled every 4 hours with a boron deviation of no greater than 50 ppm allowed between successive 4 hour samples. This has been interpreted as also limiting the difference between the pressurizer and reactor coolant loop boron concentration to 50 ppm for the same 4 hour sample period. This interpretation however, does not adequately recognize the normal dynamic swings in boron concentration in the pressurizer due to vaporization and condensation, especially during reactor heatup.

During heat up of the reactor coolant system, prior to startup, a steam bubble (vaporization) is formed in the pressurizer, causing an increased boron concentration in the remaining non-vaporized water in the pressurizer. Conversely, when steam in the top of the pressurizer is condensed this increases the water content and the boron concentration decreases. Therefore, if during the course of a reactor heatup it becomes necessary to collapse and re-establish a steam bubble, the pressurizer boron concentration can be expected

to vary. An increase in the pressurizer boron concentration (bubble formation) would have the conservative effect of increasing the reactivity shutdown margin of the core somewhat should the contents of the pressurizer mix with the reactor coolant system. A decrease in the concentration (bubble collapse) would have the opposite effect.

To gain more operating flexibility within acceptable changes in the pressurizer boron concentration the licensee has proposed to change the Zion Technical Specifications to allow a difference of up to 200 ppm between the boron concentration in the pressurizer and that of the reactor coolant loops. The Technical Specifications would continue to limit the reactor coolant loop boron concentration such that a decrease of not more than 50 ppm between successive 4 hour samples would be allowed.

The licensee has also proposed two corrections to the existing Technical Specifications. The first involves the minimum required water level in the Isolation Valve Seal Water Tank and the second concerns the upper limit for long term uncorrected air consumption for the Penetration Pressurization Systems.

Evaluation

The basis provided by the licensee for the proposed Technical Specification boron concentration change is that the pressurizer volume is small compared to the total volume of the reactor coolant system and that, therefore, the mixing of pressurizer water of lower boron concentration with the larger volume of the entire system causes only minor changes in the reactor coolant boron concentration and, hence, the reactivity of the core.

In the example provided by the licensee, a boron concentration of 1500 ppm is assumed in the reactor coolant flowing through the core and 1300 ppm is assumed to be in the pressurizer which is connected to the minor reactor coolant system by a dead leg. If the pressurizer is also assumed to be completely filled with water at the lower concentration and then emptied into and mixed with the main reactor coolant system flow paths, the resultant boron concentration in the reactor coolant flowing through the core would decrease by approximately 22 ppm. This reduction of 22 ppm, caused by a 200 ppm difference between

the pressurizer and the main loops, is well within the variance of 50 ppm allowed for the reactor coolant system on successive 4 hour samples. It would result in a small reactivity increase of about 0.2% Δk/k. The Zion Technical Specifications require a shutdown margin of at least 1% Δk/k when in a cold shutdown condition (T_{avg} less than 200°F) and between 1% to 1.6% Δk/k, depending on the reactor coolant boron concentration, when greater than 200°F. The 0.2% Δk/k change that would be experienced in the worst case (200 ppm difference in boron concentration) represents only a minor fraction of the total required shutdown margin of the system and therefore, no potential would exist for a significant reduction in the shutdown margin should the entire contents of the pressurizer mix with the reactor coolant system at a time when the main reactor coolant flow boron concentration is already at its lowest allowed level. As discussed in the licensees letter of September 27, 1978, the maximum variance of 50 ppm allowed for the reactor coolant system on successive 4 hour samples is a conservative limit that was incorporated during the initial plant startup. It was originally recommended as a precautionary measure by the reactor vendor for Zion Station as the first 4-loop Westinghouse plants to preclude unknown reactivity dilutions during initial heatup due to the inadvertent addition of clean makeup water. The 50 ppm value was selected to insure that the differential measurement would be well above normal sample uncertainties and low enough to insure that subcriticality would be maintained with adequate margin. The 50 ppm maximum allowed variance was included in the Zion Technical Specifications when the Unit 1 and 2 operating licenses were issued in that it was conservative and constituted good operating philosophy. The reactor vendor no longer recommends such a limitation in its startup procedures and no other operating plant has such a requirement in its Technical Specifications. Rather than requesting a deletion of the existing requirement, the licensee has proposed to retain the maximum allowed variance in boron concentration in the reactor coolant system between successive boron concentration to reflect its operating philosophy, but to gain some operating flexibility with regard to the allowed difference in boron concentration between the pressurizer and reactor coolant system loop.

Based on our review of the licensee's proposed change we have concluded that the licensee has properly evaluated the potential effects and that no adverse impact on safety is involved. Based on the above we conclude that the proposed change is acceptable.

With regard to the proposed change to the Isolation Valve Seal Water System specifications, the present requirement to maintain a level of at least 28" in the Seal Water Tank corresponds to a tank inventory of greater than 130 gallons of water whereas the minimum level requirement is based on a 70 gallon volume. The change would delete the level requirement and substitute the more basic 70 gallon minimum volume requirement. We find this proposed change to be acceptable.

The other change would correct a calculational error made in Technical Specification Section 3.9.2E involving the upper limit for long term uncorrected air consumption for the penetration pressurization system. The allowed uncorrected air consumption rate is 0.2% of containment volume per day at 47 psig. Converted to standard conditions, this amount of leakage would be 950 standard cubic feet per hour (SCFH) not 226.25 SCFH as presently contained in the Technical Specifications. We find this proposed correction of a calculational error to be acceptable.

Environmental Considerations

We have determined that the amendments do not authorize a change in effluent types or total amounts or an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) because the amendments do not involve a significant increase in the probability or consequences of accidents previously considered and do not involve a significant decrease in a safety margin, the amendments do not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

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