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December 30, 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Generating Station Units 1 and 2
Braidwood Generating Station Units 1 and 2
Pressurizer Safety & Relief Valve
NRC Docket Nos. 50-454, 50-455, 50-456 and 50-457

Reference: (a) October 26, 1983 letter from T. R. Tramm to H. R. Denton

Dear Mr. Denton:

This is to provide additional information regarding the adequacy of pressurizer relief and safety valves at Byron and Braidwood stations. Details of safety and relief valve piping and support evaluations are provided. Review of this information should close the Confirmatory Issue discussed in Section 3.9.3.3 of the Byron SER.

In reference (a), we described the piping evaluations which would be performed on the basis of information obtained in the EPRI valve tests. That work has now been completed and the Byron 1 piping has been reviewed. This letter documents the manner in which the evaluations were completed and the overall effect upon piping design.

There were only two differences worthy of mention between the plan as described in reference (a) and the plan as implemented. First, instead of generating new thermal-hydraulic forcing functions with the RELAP5 MOD1 computer code, the new functions were generated by Westinghouse through use of their ITCH code. The change was made primarily as a convenience, since the forcing functions used before this assessment were also developed with the code. Westinghouse confirmed the adequacy of ITCH, by benchmarking it against the EPRI test data, in parallel with EPRI's efforts related to RELAP5 MOD1.

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The second difference was related to the queston of safety valve loop seal liquid temperature effects. At the outset of the assessment, it was apparent from the EPRI tests that highly significant thermal-hydraulic load reductions could be derived from elevating the loop seal liquid temperature profile and thereby increasing the safety valve inlet temperature to approximately 280-300°F. It was also determined that these effects could be achieved quite readily through a modification to install a passive loop seal insulation enclosure around each of the three safety valve loop seals. This particular approach directs heat from the pressurizer surface to the loop seal piping, compensating for heat lost by conduction through the safety valve and discharge piping masses. With this advance knowledge, a commitment was made to implement the insulation enclosure modification at Byron and Braidwood. Consequently, development of the new forcing functions for assessment took credit for the desired effects of the modification, rather than being based on the original uninsulated configuration.

The new forcing functions, developed according to the changes discussed, were then compared to the forcing functions used up to that point, as contemplated in the assessment action plan. The results revealed a modest general increase in axial loadings, approximately 15%, over the previous predictions for the overall piping network. The estimated range of specific increases was 0-20%. Despite the fact that a number of significant conservatisms were used in developement of the forcing functions (as major examples, precise simultaneous actuation of all three safety valves, both PORVs unavailable, etc.), an administrative decision was made in the interest of plant construction schedules to use the new forcing functions in the next revision of the subsystem piping and support structural analysis, rather than expending the time and resources that would have been needed to justify reduction of the axial load increases observed in the comparison.

As expected therefore, the updated structural analysis (which are now been finalized) did indicate higher piping and support stresses at a number of locations. It shuld be recognized however, that the differentials were not attributable to the thermal-hydraulic load increases exclusively. As a number of the strutural analysis inputs were attenuated in the revision to resolve other previously recognized uncertainties (items typically common in the plant construction phase such as support stiffness discrepancies, location measurement updating, etc.), it was not realistically feasible to quantify those portions of the stress differentials strictly related to axial load increases. For the safety valve actuation case, the revised total support stresses showed increases due to all causes in the general range of 0-40%. More specifically however, nine showed stress decreases, nine increases were in the range of 10-20%, and a modest number (5) of increases were over 40%. Typically, increases over 20% were

considered to exeed the applicable ASME Code allowables, indicating that further action was warranted. Although the capacities of some particular support components may have been exceeded in the larger stress increase cases, it was not apparent that any particular piping physical distortions could have been predicted that were servere enough to impede sufficient flow through the network for adequate overpressure protection purposes.

Another decision was then required to either; 1) Reduce combined load stresses to within applicable ASME Code allowables of modifications to upgrade affected sub-system hardware, or 2) conduct further analyses to quantitatively support the position that the higher predicted stresses for the hardware configuration then in place would not constitute a significant sub-system safety function challenge. From these alternatives, the former was selected for reasons of its smaller impact on plant costs and construction schedules, and the fact that it clearly relieves any potential safety concerns since the applicable ASME Code criteria is considered to be conservative. Although the analytical alternative was regarded as having good prospects for success, it was determined to be substantially more complex, less time and cost effective, and more difficult to defend than the efforts for the modification alternative.

The modifications, which covered all aspects of the structural analysis revision, involved a combination of support or support embedment strenethening measures, adding a small number of supports, and minor piping layout changes. These actions, as well as implementing the loop seal insulation enclosure modification, have been completed entirely with respect to Byron Unit 1. Corresponding actions are in progress for Byron Unit 2 and Braidwood. By the confirmation provided by the finalized sub-system structural analysis, we are therefore confident that the safety functions of the safty and relief valve piping network are assured, and that this segment of the NUREG 0737 Item II.D.1 requirement has been satisfied.

Please direct further questions regarding this matter to this office.

One signed original and fifteen copies of this letter are provided for your review.

Very truly yours,

T. R. Tramm

T. R. Tramm

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