SNUPPS

Standardized Nuclear Unit Power Plant System

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Executive Director

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SLNRC 84-0071 FILE: 0278
SUBJ: Revision in Diesel Generator Start Time

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

Docket Nos. STN 50-482 and STN 50-483

Ref: SLNRC 84-0069, dated April 17, 1984: Same subject

Dear Mr. Denton:

The reference letter submitted information supporting the acceptability of an emergency diesel generator start time modification from 10 seconds to 12 seconds for the SNUPPS plants, Callaway Plant Unit No. 1 and Wolf Creek Generating Station Unit No. 1.

Based on a review of the reference letter, the NRC staff requested additional information regarding the Emergency Core Cooling System (ECCS) evaluation model used to evaluate compliance of the SNUPPS plant design with the requirements of 10CFR50.46.

The enclosure provides additional information resulting from a comparison of the SNUPPS ECCS evaluation model to the more recent, 1981 evaluation model. This comparison demonstrates that greater than 200°F margin to the peak cladding temperature limit of 10CFR50.46(b)(1) would exist if the 1981 model were used to evaluate the revised diesel generator start time. Therefore, the proposed revision of the SNUPPS emergency diesel generator start time to 12 seconds would impose no increase in risk to public health and safety.

Very truly yours,

Nicholas A. Petrick

MHF/nld10a4
Enclosure

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Enclosure to SLNRC 84- 0071

COMPARISON OF SNUPPS ECCS EVALUATION MODEL TO

THE 1981 ECCS EVALUATION MODEL

The ECCS analysis currently reported in the SNUPPS FSAR is based on the February 1978 Evaluation Model. An extension was made to this analysis to respond to questions regarding maximum safeguards assumptions and the impact of an additional two second delay in diesel generator startup. Justification has been requested by the NRC as to why the extended FSAR ECCS analysis submitted recently for SNUPPS should still be acceptable in light of the model updates of the 1981 Evaluation Model. Specifically it was requested that the appropriateness of this evaluation be justified for SNUPPS. The following paragraphs demonstrate the conservatism of the 1978 Evaluation Model compared to the 1981 Evaluation Model for plants of the SNUPPS design. In addition, comparisons will be made to these plants for overall ECCS performance with the conclusion being that if SNUPPS were to be analyzed using the 1981 Evaluation Model, over 200°F of margin would be expected to the 10CFR50.46 limit.

In the development effort for the 1981 model, incorporation of "UHI Software Technology" was aproved. (Approval was requested generically in NS-TMA-2311 letter to James R. Miller, NRC, December 22, 1980). As part of WCAP-9220-Rev. 1, which presents the approved 1981 Evaluation Model, a sensitivity is presented which indicated a 309°F benefit using this new modelling technique. On Page B-47, Table 2, this sensitivity is presented for Plant A. That plant has the same features as SNUPPS regarding the NSSS - 4 loops, 3411 Mwt Power, 17 x 17 fuel, model 93A RCP, mod 1 F Steam Generators and identical reactor vessels and safety injection system designs. The only difference between Plant A and SNUPPS is that Plant A contains 17 x 17 optimized fuel and the containment discussed below. The SNUPPS plants contain 17 x 17 standard fuel. The calculated peak clad temperature without 17 x 17 optimized fuel for Plant A is 1965°F. In comparing the SNUPPS and Plant A analyses, further similarities are seen in End-of-Bypass time (26.5 sec.) and comparable End-of-Blowdown time (28.6 - 29.1 sec.) on the basis of the February, 1978 model.

It can be concluded that the sensitivity established for the 1981 evaluation model and reported in the WCAP is definitely applicable to SNUPPS. It would be unfounded to claim the full 309°F benefit, though, as there exist physical differences between the plants. There are identified differences in containment which would produce a lower containment pressure and a reduced core reflood rate for SNUPPS. A further evaluation of this effect is presented in the following paragraphs to show what benefit can be claimed.

In addition to the Plant A plant, two other plants having similar NSSS configuration have been identified as Plant B and Plant C. 1981 Model analyses have been completed for both of these plants. This comparison will show the effects of containment pressure on peak clad temperature. Both of these plants have containments worse than SNUPPS from an ECCS performance standpoint. For the plants under comparison, the back pressure is indicated here:

CONTAINMENT BACK PRESSURE (PSIA)

1981 MODEL, Fq = 2.32

	MIN SI PCT (°F)	@ 19 sec. (Peak)
Plant B	2100	34.37
Plant C	2155	33.45

On the basis of the Plant B and Plant C 1981 Model analyses, a sensitivity to containment back pressure can be established on the fact that both have the same vessel and RCS (RESAR-3S). SNUPPS is also a RESAR-3S plant. Based upon the minimum SI cases, a sensitivity of 59.8°F PCT/PSI is seen. This value is in line with values observed for the 1981 evaluation model.

For Plant A, both the February 1978 Model and 1981 Model show the same containment back pressure transient. Plant A and SNUPPS can then be compared on the February 1978 Model basis to quantify containment effects.

	1978 MODEL PCT, FQ = 2.32	Peak Containment Pressure
Plant A	1965	39.55
SNUPPS	2088	37.22
	Pressure Difference	2.33

This would indicate that a 139°F penalty would be expected for SNUPPS to account for containment differences compared to Plant A using the 1981 model. As the conversion of the Plant A analysis from '78 Model to '81 Model showed a clear benefit of 309°F, subtracting the potential containment effect indicates that the 1981 model improvements on SNUPPS would claim a benefit of at least 170°F. From the minimum SI result using the 1978 model 2088°F PCT, an expected PCT would be 1918°F when including the 1981 model improvements.

On the basis of results seen to date, then, if SNUPPS took advantage of the 1981 Model improvements in its current analysis, some 282°F in PCT margin would be expected to exist to the 2200°F Appendix K limit.

The issue of limiting single failure must also be addressed. As described in reference 27 of revised FSAR page 15.6-32, Westinghouse analyzes the limiting case break for each 4-loop plant assuming maximum safety injection flow rates. In this way it is assured that the limiting single failure has been considered. The 1978 Model ECCS analysis

amendment submitted for the SNUPPS plants demonstrates a penalty associated with maximum safety injection of 60°F. Since the WREFLOOD code changed very little between 1978 and 1981 evaluation models, the impact of the maximum safety injection assumption upon calculated ECCS core reflooding rate performance will be comparable in a 1981 model SNUPPS calculation.

The maximum safety injection condition impact on calculated peak clad temperature should be reduced below 60°F in a SNUPPS 1981 Model calculation because clad temperatures (and hence heat of reaction) are reduced. Corroboration of this conclusion may be found in the magnitude of maximum safety injection PCT impacts observed in 1981 model computations of plants similar to SNUPPS; penalties of 4°F and 32°F in calculated PCT have been identified for RESAR-3S plants which exhibit core flooding rates greater than and less than SNUPPS. Since the magnitude of the maximum safety injection penalty is a direct function of core flooding rate, the SNUPPS penalty is expected to be less than 30°F with the 1981 Westinghouse Evaluation Model.

The effect of delaying the diesel generator start in ECCS performance analyses is to extend the time required to refill the vessel lower plenum following blowdown. In the case of SNUPPS with maximum safety injection, a delay of two seconds in the commencement of safety injection flow will result in the loss of 34 cu. ft. of injected water. Therefore, the time to refill the vessel lower plenum, which corresponds to the time of adiabatic heating of the fuel in the core, will be extended by about 0.4 seconds due to a delay in diesel generator start. Based on adiabatic fuel heating rates, the delay will cause PCT to increase by about 10°F.

To summarize, a review of available 1981 Westinghouse Evaluation Model results for plants similar to SNUPPS clearly demonstrates that considerable margin (greater than 200°F) to the regulatory limit of 2200° F would exist if the 1981 Evaluation Model were utilized. The use of the 1978 evaluation model for analyzing the SNUPPS plants has been demonstrated to be conservative. The 1978 evaluation model was used in order to maintain consistency with the other cases in the break spectrum.