SNUPPS
Standardized Nuclear Unit
Power Plant System

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SUBJ: Follow-up Report on SNUPPS Pipe Whip Restraint Design Discrepancies

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Ref: SNLNC 81-003 dtd. 1/23/81: Pipe Whip Restraint Design Discrepancies

Gentlemen:

The reference letter forwarded to NRC, a preliminary report concerning a potential discrepancy in the design of SNUPPS standard power block pipe whip restraints. The purpose of this letter is to update the reference report and to provide a summary of actions being taken by the Architect-Engineer, Bechtel Power Corporation, to resolve this matter. At the suggestion of Mr. R. T. Carlson, Region I, this follow-up report is being issued simultaneously to Regions III and IV. Future reports involving generic SNUPPS defects and/or discrepancies and responses to IE Bulletins will be handled similarly.

The reference letter indicated concern with the analytical techniques used by Bechtel in the design of the SNUPPS pipe whip restraints. The design concept of the SNUPPS restraints accounts for dynamic impact effects by the use of an energy-absorbing device [stainless steel honeycomb energy-absorbing material (EAM) or stainless steel upset U-bolts]. These energy-absorbing devices are attached to carbon steel support structures which transfer the loads into the primary building structure. Design criteria developed for the SNUPPS project impose the requirement that dynamic impact effects be analyzed in accordance with Bechtel Topical BN TOP2 and energy balance equations developed specifically for the energy-absorbing device applications.

Although energy-absorbing devices are employed as required, the energy balance analysis was not conducted properly on restraints which by static analysis could develop a plastic hinge on the ruptured pipe at the support structure. A total of 103 restraints of 242 previously issued

for construction had the potential of being affected, primarily for smaller size piping. The design of these restraints has been reviewed and revisions, where necessary, are currently being made to properly satisfy energy balance considerations. This discrepancy was found during an internal Bechtel review of the design criteria.

During the review of the potentially affected restraints, a second question arose when it became apparent that, in some cases, the size of the U-bolts (diameter) was increased after the computed diameter was determined; or, in some instances, the cross-sectional area of the EAM was similarly increased without a corresponding increase in the support structure strength. Such action has the potential of making the U-bolt or EAM ineffective in absorbing energy. The design of all restraints has since been reviewed and revisions, where necessary, are presently being made. A total of 43 restraints have been modified to address the first two items of concern.

While the above concerns appear to have been adequately addressed, it has been determined that additional information must now be generated to resolve a third item. Specifically, the support structures for all pipe whip restraints are designed, using elastic design methods, for a strength at least 10% greater than the strength of the EAM, or the upper bound strength of the U-bolt. During the review of the total restraint design it was determined that additional information is required to demonstrate that the support structures have sufficient ductility to absorb the loads imposed by the energy-absorbing device. Further analysis is required to address this matter and to confirm the load transfer capability of the support structures. In the event adequate confirmation cannot be provided, the required ductility of the support structure can be obtained after the restraint is installed. Depending on the final results of the Bechtel study, this could result in direction to the field to make minor on-site modifications such as cutting the flange of a support structure.

As discussed with Mr. Carlson on Feb. 26, 1981, several weeks of additional analysis and study will be required to resolve the outstanding concerns regarding support structure ductility. At the present time, we anticipate a final report being available by June 1st. We will notify each of you promptly in the event this target date requires change. In the interim, please direct any questions on this matter to the undersigned.

Very truly yours,

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Quality Assurance Manager

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