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SUBJECT: Responds to NRC question re seismic/LOCA analysis of U2C2 reload. No significant differences exist in mass & stiffness properties between Ge 8X8 & ENC 8X8 fuels. Dynamic characteristics & responses essentially same.

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Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Project Director
BWR Project Directorate No. 3
Division of BWR Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO NRC QUESTION: SEISMIC/LOCA
ANALYSIS OF U2C2 RELOAD
PLA-2728 FILE R41-2

Reference: Letter, B. D. Kenyon to E. Adensam, PLA-2661 dated June 19, 1986.

Dear Ms. Adensam:

The referenced letter provided, in part, an analysis of the mechanical response of ENC 9X9 fuel during a Seismic-LOCA event. Based on a staff request, the following enhanced discussion of PP&L's review and subsequent conclusions relative to that analysis is provided:

The ENC 9X9 fuel is qualified by similarity to the fuel it replaces. The new fuel will have the same dynamic response (accelerations and displacements) as the fuel it replaces if it has the same dynamic characteristics (natural frequencies and mode shapes) and is subjected to the same dynamic excitation. The dynamic input to the fuel will be the same since it will be installed at the same location and there are no significant changes which would affect the overall response of the reactor pressure vessel (RPV) and its pedestal.

The dynamic characteristics of the fuel are solely dependent on its mass and stiffness properties. The weights of the GE 8X8 fuel and the ENC 8X8 fuel were first reviewed. The weights associated with these two fuel assemblies (600 lb and 596 lb, respectively) are very close. This weight comparison along with the facts that both fuel assemblies distribute this weight nearly uniformly along their lengths and that each has seven spacers, leads us to conclude that there are no significant differences in the mass properties of the two fuel assemblies. The significant items which determine the stiffness properties of the GE 8X8 and the ENC 8X8 fuels were reviewed. The overall

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fuel assembly lengths are almost identical (171.40 inches and 171.29 inches, respectively). Both fuel types use the same fuel assembly channel box, i.e., the same size, thickness and material type. The channel box dominates the overall stiffness of the in-core fuel. ENC calculations show that approximately 97% of the stiffness of a fuel assembly is attributable to the stiffness of the channel box. Based on the above review, it was concluded that there are no significant differences in the stiffness properties of the two fuel assemblies.

Since there are no significant differences in the mass and stiffness properties between the GE 8X8 and the ENC 8X8 fuels, their dynamic characteristics and dynamic responses are determined to be essentially the same.

Natural frequencies associated with an individual GE 8X8 fuel assembly have not been determined by PP&L. The entire core was represented in both the horizontal and vertical mathematical models of the RPV and internals. Some natural frequencies for the core as a whole are included in these models. Please be advised that PP&L placed little emphasis on trying to match these frequencies with those determined for the ENC fuel, since we do not know what the corresponding mode shapes look like. For the GE mathematical models, the "fuel" modes have natural frequencies of 4.316 Hz, 7.162 Hz, 8.148 Hz and 17.58 Hz, but these natural frequencies may involve other portions of the RPV internals as well. Calculations of natural frequencies for the sake of comparison are not necessary since we know that the mass and stiffness properties have not changed significantly.

After the GE and ENC 8X8 fuel types were determined to have the same dynamic response, the ENC 9X9 fuel was compared to the ENC 8X8 fuel. As before, the fuel's mass and stiffness properties were reviewed. The fuel assemblies' lengths and channel boxes are identical, thus, their stiffnesses will be the same. Both fuel assemblies have their weight nearly uniformly distributed along their lengths and each has seven spacers. The weight of the 9X9 fuel (580 lb) is noted to be slightly less than that of the 8X8 fuel (596 lb). To investigate the significance of this difference the natural frequencies of the two fuel assemblies were determined. These natural frequencies are reported in XN-NF-86-60, Appendix B, and were determined to have good agreement. Based on the results of this comparison and the previous review, the dynamic response of the ENC 9X9 fuel will be essentially the same as that of the GE 8X8 fuel. Thus, the Seismic-LOCA dynamic response evaluation performed in support of the initial core remains applicable for the Cycle 2 core. Deformation of the channel to the point that control blade insertion is inhibited is not predicted to occur.

Any further questions on this issue should be directed to Mr. R. R. Sgarro at (215) 770-7855.

Very truly yours,

H. W. Keiser
Vice President-Nuclear Operations

cc: M. J. Campagnone - USNRC
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