UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

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Files (Docket No. 50-133)
THRU: D. L. Ziemann, Chief, ORB #2, DRL

SAFETY REVIEW OF CYCLE 7 OPERATION WITHOUT CONTROL ROD FOLLOWERS - PROPOSED CHANGE NO. 35 (PACIFIC GAS AND ELECTRIC COMPANY)

By Proposed Change No. 35 dated August 12, 1971, and supplement dated August 19, 1971, the Pacific Gas and Electric Company (PG&E) requested changes in the Technical Specifications of Facility License No. DPR-7 for the Humboldt Bay Power Plant Unit No. 3. The proposed change would authorize a fuel loading for Cycle 7 operation different from that authorized by Change No. 33, authorize the operation of the Humboldt Bay reactor without control rod followers, reduce the rated power from 240 MWt to 224 MWt at the beginning of Cycle 7 and cancel the demonstration run authorized by Change No. 33 dated May 14, 1971.

Because of the random fuel element failures experienced during Cycle 6, the fuel loading pattern for Cycle 7 has been changed from that proposed and approved in Change No. 33. This change involves the removal of eight failed Type III fuel assemblies requiring eight more Type II fuel assemblies to remain in the core. The differences in nuclear and thermal hydraulic characteristics, as a result of this change, are identified in Tables 1 and 2, respectively, of the submittal for Proposed Change No. 35. No change was made in the number of new Type III-3 fuel assemblies (44) added for Cycle 7 as reviewed and approved in Change No. 33. The changes noted in the proposed change to the Technical Specifications for Cycle 7 core loading reflect the Humboldt Bay reactor core as loaded and do not involve any unreviewed safety questions.

Due to the failure of the rivets connecting the follower section to the poison section of several control rod assemblies, PG&E decided to remove the follower sections from all of the 32 control rods in the Humboldt Bay reactor. We have reviewed the proposed operation of the Humboldt Bay reactor during Cycle 7 without control rod followers in regard to mechanical performance, nuclear characteristics, thermal hydraulic characteristics and accident consequences.

We have concluded that the mechanical operation of the control rod system without followers should not be different from prior performance with followers. The current control rod surveillance required by the Technical Specifications should be adequate to detect any abnormal conditions and assure continued satisfactory operation of the control rods.

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Although the margin between the limiting conditions for operation, as stated in the Technical Specifications, and the predicted conditions of thermal hydraulic fuel conditions are reduced, the limiting conditions for operation can be met during operation in the proposed manner provided the rated power is reduced from the authorized maximum reactor power of 240 MWt to 224 MWt. Therefore, PG&E states, and we concur, that the power level at the beginning of Cycle 7 should be limited to 224 MWt and may be increased only as the thermal hydraulic limits in the Technical Specifications allow. To compare the fuel specifications approved in Change No. 33 with the thermal and hydraulic characteristics for Cycle 7 as loaded (excluding the demonstration run), approximately 20 fuel rods (only corner rods in the newly installed Type III-3 fuel assemblies) would exceed the previously approved heat flux and fuel center temperatures for the first half of Cycle 7. The increased heat flux is a result of an increase in local flux peaking due to the removal of the control rod followers.

insignificant

Changes in the nuclear characteristics of the core that result from removal of the control rod followers are to increase the hot uncontrolled reactivity and to decrease the moderator temperature coefficient. There are no changes in the cold uncontrolled effective multiplication of the core or in the reactivity worth of the control system. PG&E states, and we concur, that the maximum reactivity worth for a single control rod withdrawn in sequence will continue to be within the Technical Specification limits and that the reactivity worth of the liquid poison is increased and greater than the Technical Specifications limits for minimum worth of the system. The increase in the hot uncontrolled reactivity for the core is only 0.5% $\Delta k$ and therefore does not represent a significant change. The slight decrease in the moderator temperature coefficient is not a significant consideration in the reactivity accident analysis. PG&E states, and we concur, that removal of the control rod follower does not increase the consequences of previously analyzed reactivity accidents or require a change in the Technical Specification limits on nuclear parameters.

We reviewed and authorized the use of special control rod patterns to raise the linear power of four highly enriched demonstration fuel rods to approximately 18.5 kW/ft for a duration not to exceed 500 hours at the beginning of Cycle 7 operation by Change No. 33 dated May 14, 1971. Due to the removal of the control rod followers and the resultant increase in heat flux, this high power density demonstration run has been cancelled by PG&E, and all specifications related to the run will be removed from the Technical Specifications.

Based on the above considerations, we have concluded that Proposed Change No. 35, as supplemented, does not present significant hazards considerations not described or implicit in the Humboldt Bay Unit No. 3 FSAR and that there is reasonable assurance that the health and safety of the public will not be endangered by operation in the manner proposed.

Accordingly, the Technical Specifications appended to Facility License No. DPR-7 may be changed as proposed by the licensee in Proposed Change No. 35 dated August 12, 1971, as supplemented on August 19, 1971.

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