



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Enclosure 4

APR 12 1984

NOTE TO: ~~George Lear, Chief, SGEB~~

FROM: Victor Benaroya, Chief, CMEB

SUBJECT: CORROSION EFFECTS ON BASEMAT REBAR AT WATERFORD III

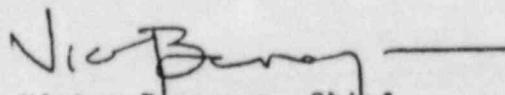
We have reviewed the licensee's proposed Limiting Conditions for Operation on the possible corrosion of basemat rebar due to groundwater penetration through cracks in the concrete basemat.

We considered the following factors in our evaluation:

1. Analysis of groundwater at the site indicated a chloride concentration of approximately 35 ppm, which is significantly below the 710 ppm chloride corrosion threshold for rebar in the presence of oxygen (D. A. Hausmann, Materials Protection, pp. 23-25, October, 1969).
2. The rate of seepage of groundwater through the 12-foot thick basemat is small, which restricts the access of dissolved oxygen, chlorides and carbon dioxide to the rebar-concrete interface.
3. The slow movement of water through the basemat causes the water to become alkaline (pH=12.5) by contact with the calcium oxide and calcium hydroxide content of the concrete.
4. The corrosion rate of steel by alkaline water is low.

On the basis of our evaluation, we find that there is reasonable assurance that the basemat rebar will not be significantly corroded by the penetration of groundwater of the acidity and chloride content observed at the Waterford site.

The board required monitoring the quality of groundwater at the Waterford site. The licensee has prepared a Limiting Condition for Operation requiring the analysis of a sample of groundwater at least once per 92 days to verify that the chloride content does not exceed 250 ppm. On the basis of the above evaluation, where the time element is not critical, we conclude that the proposed Limiting Condition for Operation is acceptable.


Victor Benaroya, Chief
Chemical Engineering Branch

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Enclosure 5

Specific Applicant's Action Items

It is recommended that the Division of Licensing forward and direct the Louisiana Power & Light Co. to implement the following "Specific Applicant's Action Items":

1. The applicant should update his crack mapping records, including observable vertical or inclined cracks in Category I structures supported by the mat, 30 days prior to issuance of license.
2. The applicant shall propose an expanded differential settlements and crack monitoring program and associated plant technical specifications within next 30 days for staff review and acceptance.
3. The applicant shall propose a surveillance program to monitor potential rebar corrosion due to the ground water and associated plant technical specifications within next 30 days for staff review and acceptance.
4. The applicant shall propose a program, within next 30 days for staff acceptance, to selectively perform nondestructive testing of mat cracks and potential voids. The program should also include the procedures and schedule for evaluation of the effect of cracks and potential voids upon the concrete mat integrity.

5. The applicant is required, within next 30 days, to either justify that its original analyses are still adequate in light of the NRC geotechnical engineering staff evaluation or perform additional analyses to account for the actual foundation soil conditions.

6. The applicant shall provide additional justification and/or propose a confirmatory analysis program, within next 30 days, to resolve the concerns pertaining to mat analysis raised by the BNL consultants in the enclosure 3 to the safety evaluation report.