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SUBJECT: Forwards response to NRC GL 96-04, "Boraflex Degradation in Spent Fuel Storage Racks," for plant.

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**Carolina Power & Light Company**
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville SC 29550

OCT 23 1996

Robinson File No: 13510
Serial: RNP-RA/96-0182

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
RESPONSE TO GENERIC LETTER 96-04,
"BORAFLEX DEGRADATION IN SPENT FUEL STORAGE RACKS"

Gentlemen:

Enclosure 2 to this letter provides our response to NRC Generic Letter (GL) 96-04, "Boraflex Degradation in Spent Fuel Storage Racks," for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2. GL 96-04 was issued dated June 26, 1996, with a response required within 120 days of the issuance of the GL. Accordingly, this response is due to be submitted by October 24, 1996.

Questions regarding this response may be referred to Mr. A. L. Garrou at (803) 857-1544.

Very truly yours,

Dan Stoddard for

R. M. Krich
Manager - Regulatory Affairs

JSK/klb
Enclosures
c: Mr. S. D. Ebneter, Regional Administrator, USNRC, Region II
Ms. B. L. Mozafari, USNRC Project Manager, HBRSEP
Mr. J. Zeiler, USNRC Resident Inspector, HBRSEP



A068

United States Nuclear Regulatory Commission
Enclosure 1 to Serial: RNP-RA/96-0182
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Affidavit

**State of North Carolina**
**County of Wake**

C. S. Hinnant, having been first duly sworn, did depose and say that the information contained in letter 96-0182 is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, contractors, and agents of Carolina Power & Light Company.

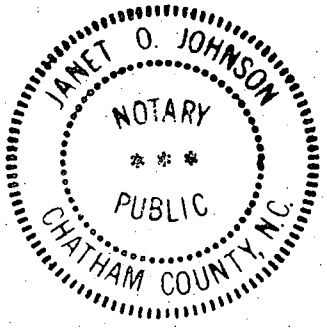
C S Hinnant

Sworn to and subscribed before me

this 23rd day of October 1996

(Seal) Janet O. Johnson
Notary Public for North Carolina

My commission expires: June 10, 1998



H. B. Robinson Steam Electric Plant, Unit No. 2
Response to Generic Letter (GL) 96-04
"Boraflex Degradation in Spent Fuel Storage Racks"

**Request 1**

"All licensees of power reactors with installed spent fuel pool storage racks containing the neutron absorber Boraflex are requested to provide an assessment of the physical condition of the Boraflex, including any deterioration, on the basis of current accumulated gamma exposure and possible water ingress to the Boraflex and state whether a subcriticality margin of 5 percent can be maintained for the racks in unborated water. Monitoring programs or calculational models in effect or being developed, or an estimation of anticipated concerns based on the specific rack design, are considered an appropriate basis for this response."

**Response 1**

We have performed two Boraflex coupon surveillance programs, both accelerated and long term, at the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2. The accelerated surveillance program consisted of two strings of eight coupon assemblies suspended adjacent to a freshly discharged fuel assembly at each core off-load for eight consecutive fuel cycles. The accelerated surveillance program began when the Boraflex racks were installed in 1983 and loaded with spent fuel in 1984 and continued until 1995, when the last remaining coupon was removed. The accelerated surveillance program was concluded upon removal of the last accelerated surveillance coupon. The long term surveillance program began when the Boraflex racks were installed and consists of suspending similar coupon assemblies adjacent to a freshly discharged fuel assembly approximately every four years.

Results of both coupon surveillance programs indicate significant deterioration of some samples and minimal deterioration of other accelerated and long term samples. We believe chemical dissolution to be the cause for the rapid deterioration of both the accelerated and long term surveillance coupons. The surveillance coupons have a relatively large surface area of Boraflex that is exposed to the spent fuel pool water. The large surface area of the surveillance coupons is not representative of the Boraflex panel surface area exposed to chemical dissolution from spent fuel pool water.

In addition to the coupon surveillance programs, we have been monitoring reactive spent fuel pool silica concentrations magnitude and trend. Data collected from January 1992 to present indicate silica concentration levels in the range of less than 5 ppm to a peak of 12 ppm. Based on a comparison with industry experience data obtained by Electric Power Research Institute (EPRI) our silica concentration levels fall in the lower one half of the Pressurized Water Reactor (PWR) intermediate range (i.e., 5 to 20 ppm). Of the 33 PWRs in the EPRI data, the maximum spent fuel pool silica concentration is 100 ppm and the minimum concentration is 2 ppm. The silica level at HBRSEP, Unit No. 2 is currently 9 ppm. Our spent fuel pool cleanup system resins quickly become saturated with silica, and operation continues with silica

levels approaching equilibrium. Since elevated silica concentration is indicative of Boraflex dissolution, and our spent fuel pool clean-up capability is relatively ineffective for reduction of silica concentration, our moderate silica concentration indicates that accelerated or advanced deterioration of the Boraflex panels is not occurring.

Our spent fuel storage racks were designed by the Westinghouse Electric Corporation, and have been in use since 1984. The racks have demonstrated low susceptibility to chemical dissolution of Boraflex due to water ingress as demonstrated by industry experience and reflected in the EPRI data. The use of the Westinghouse design contributes to the low silica concentration that we have observed. The Westinghouse rack design has not been associated with accelerated Boraflex deterioration due to water ingress, and the shrinkage assumptions in the Westinghouse design bound the maximum shrinkage reported by EPRI for this design.

Based on what is known today and the effect of fuel rack design features and inherent variation introduced by rack fabrication tolerances, we cannot quantitatively determine whether the Boraflex racks will be capable of maintaining a 5% subcriticality margin in unborated water for the life of the plant. However, as discussed above, trending of silica concentration does not indicate that advanced or accelerated deterioration is occurring. Therefore, the current spent fuel pool criticality analysis, performed in July 1994, remains valid. In addition, the current criticality analysis does not take credit for fuel burnup and assumes only limited credit for poison inserts (i.e., gadolinia rods). The presence of soluble boron neutron poison in the spent fuel pool at a level of approximately 1900 ppm, although not credited in the criticality analysis discussed in Updated Final Safety Analysis Report (UFSAR), Section 9.1.2, "Spent Fuel Storage," provides further assurance that the subcriticality margin will be maintained. Based upon the low concentration of silica in the spent fuel pool water, our surveillance program will provide sufficient indication of Boraflex degradation so that timely corrective actions can be taken, if needed, in order to maintain the 5% subcriticality margin.

**Request 2**

"All licensees are further requested to submit to the NRC a description of any proposed actions to monitor or confirm that this 5 percent subcriticality margin can be maintained for the lifetime of the storage racks and describe what corrective actions could be taken in the event it cannot be maintained."

**Response 2**

Our proposed actions consist of the long-term surveillance coupon program, monitoring of silica concentration in the spent fuel pool water, administratively controlling radiation exposure of the Boraflex panels, observation of surveillance coupon data, and comparison of silica concentration with industry data. We will continue the existing silica surveillance and trending program and monitor for unusual spikes or rates of increase indicative of advanced material deterioration. We have depleted our inventory of accelerated coupons, but will continue surveillance testing of the remaining long-term exposure test coupons.

Administrative controls that were utilized during the Refueling Outage 17 that was completed on October 20, 1996, include off-loading fuel from the core to low density racks without Boraflex where geometry assures the 5% subcriticality margin, and utilizing the high density racks for storage of new fuel with poison inserts (i.e., gadolinia rods) and high burnup discharged fuel which has had one cycle to cool in the low density racks. These administrative controls will minimize gamma radiation exposure to high density Boraflex storage racks.

We will continue to observe our surveillance coupons and to compare silica concentration levels with industry information to identify any adverse trends for which additional action is warranted.

**Request 3**

"Licensees should describe the results from any previous post operational blackness tests and state whether blackness testing, or other in-situ tests or measurements, will be periodically performed."

**Response 3**

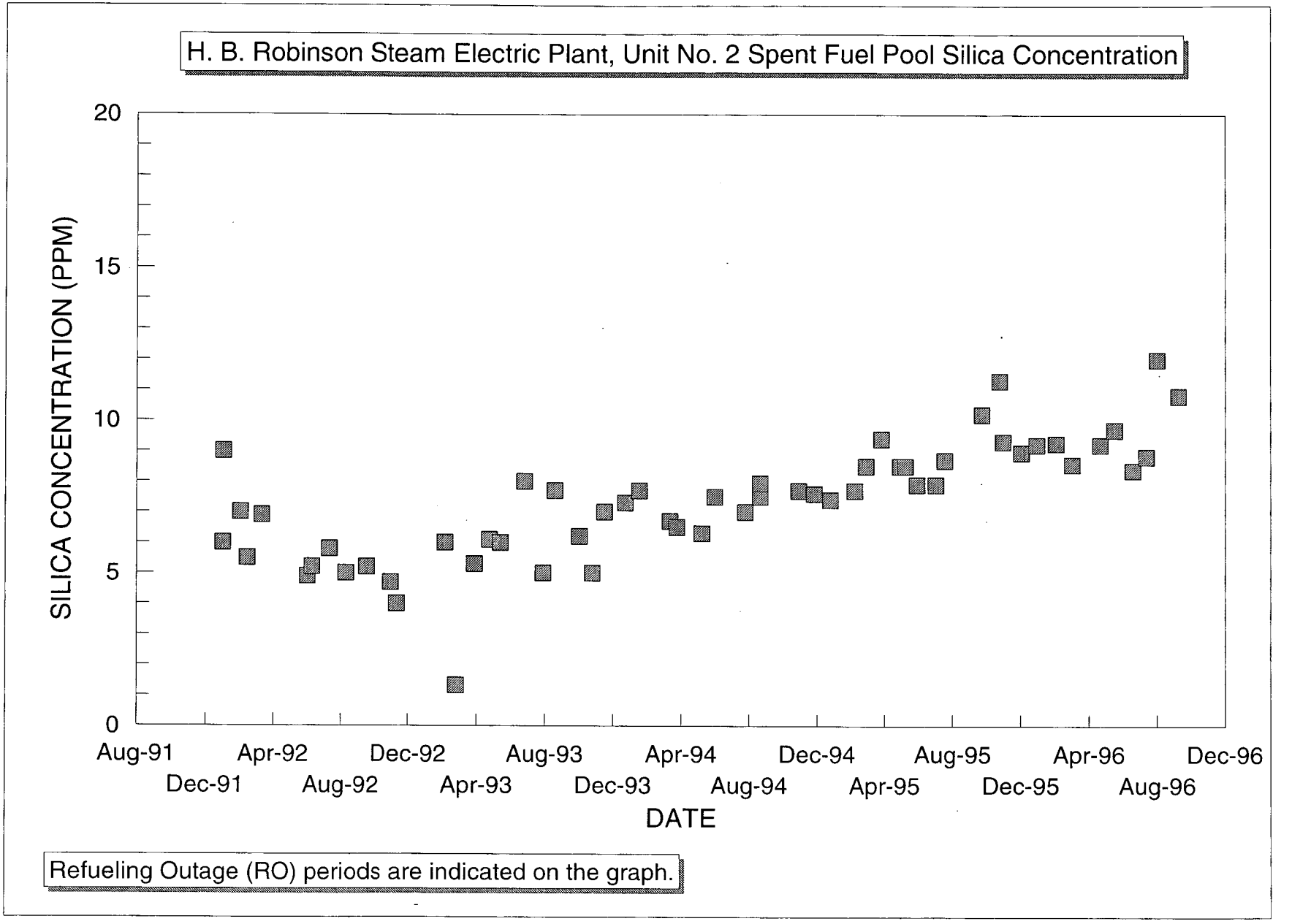
Blackness testing can provide an indication of areas of gross Boron loss along panels of Boraflex; however it cannot provide an accurate quantitative determination of lesser grades of panel thinning and degradation that can impact subcriticality margins. We have not performed blackness testing. Our proposed actions in response to Request 2 provide adequate assurance that the 5% subcriticality margin is maintained, therefore, no blackness testing is planned.

**Request 4**

"Chronological trends of pool reactive silica levels, along with the timing of significant events such as refuelings, pool silica cleanups, etc., should be provided. Implications of how these pool silica levels relate to Boraflex performance should be described."

**Response 4**

Current trending results, shown in Attachment 1, are in the intermediate range based on industry data and do not indicate the presence of accelerated Boraflex degradation. The data show only a very gradually increasing trend in dissolved silica. Expected fluctuations during refueling outages are within the range identified previously. We have not performed pool silica cleanup since trending began in 1992 and we have no plans to perform silica cleanup in the future in order to assist monitoring of the Boraflex condition. These trending data indicate that accelerated deterioration of the Boraflex in the HBRSEP, Unit No. 2 spent fuel pool racks is not occurring.


H. B. Robinson Steam Electric Plant, Unit No. 2 Spent Fuel Pool Silica Concentration
SILICA CONCENTRATION (PPM)
0
5
10
15
20
Aug-91
Dec-91
Apr-92
Aug-92
Dec-92
Apr-93
Aug-93
Dec-93
Apr-94
Aug-94
Dec-94
Apr-95
Aug-95
Dec-95
Apr-96
Aug-96
Dec-96
DATE
Refueling Outage (RO) periods are indicated on the graph.