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SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, P.O. Box 15830, Sacramento CA 95852-1830, (916) 452-3211
AN ELECTRIC SYSTEM SERVING THE HEART OF CALIFORNIA

MPC&D 96-137

October 23, 1996

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Docket No. 50-312
Rancho Seco Nuclear Station
License No. DPR-54

DISTRICT RESPONSE TO NRC GENERIC LETTER 96-04, BORAFLEX DEGRADATION IN SPENT FUEL POOL STORAGE RACKS

Attention: Seymour Weiss

Attached is the District's response to the Requested Information specified in NRC Generic Letter 96-04. The District divided the Requested Information paragraph into three parts and provides a response to each part.

The District installed Boraflex filled, high density fuel assembly storage racks in the Rancho Seco spent fuel pool in 1985. The Rancho Seco nuclear facility permanently ceased reactor operations in June 1989. The District has stored all its 493 fuel assemblies in the Rancho Seco spent fuel pool since December 198?. The District is currently licensing the Rancho Seco Independent Spent Fuel Storage Installation (ISFSI) to accommodate dry storage of the 493 irradiated fuel assemblies, and expects to complete the Rancho Seco dry fuel storage project in 1998.

Members of your staff requiring additional information or clarification may contact Jerry Delezenski at (916) 452-3211, extension 4914.

Sincerely,

Steve Redeker

Steve J. Redeker
Manager
Plant Closure & Decommissioning

A008 1/1

cc w/atch: L. J. Callan, NRC, Arlington, Texas
R. Dudley, NRC, Rockville

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

No. 5907

State of California

County of Sacramento

On October 23, 1996 (DATE) before me, Debbie Brenner, Notary Public (NAME, TITLE OF OFFICER - E.G., "JANE DOE, NOTARY PUBLIC"),

personally appeared Steve Kedeker (NAME(S) OF SIGNER(S))

☒ personally known to me - **OR** - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/~~her/their~~ authorized capacity~~(ies)~~, and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

DEBBIE BRENNER
Commission # 1073847
Notary Public — California
Sacramento County
My Comm. Expires Nov 29, 1999

WITNESS my hand and official seal.

Debbie Brenner
SIGNATURE OF NOTARY

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District Response to NRC Generic Letter 96-04

Requested Information: Part 1

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 subcritical margin of 5 percent ($K_{eff} \leq 0.95$) 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.)

District Response:

Based on:

1. Direct operator observations made during spent fuel pool and fuel and component handling activities since 1985 (when the District installed high density, Boraflex filled storage racks); and

2. An ongoing Boraflex sampling program that evaluates the physical condition and neutron absorbing properties of Boraflex samples stored in the spent fuel pool,

the District believes the Boraflex material used in the Rancho Seco spent fuel pool storage racks is in good physical condition and continues to maintain a subcritical margin of five percent.

The Boraflex storage rack design includes an annulus that allows pool water to enter the storage racks at the bottom and exit at the top. The only driving force available for this flow is natural circulation. Since the storage rack annulus is slightly wider than the Boraflex material, water can flow over the Boraflex material in the racks.

The Boraflex sample coupon design permits water to flow only around the perimeter edges of the sample coupons. The sample coupons are sandwiched between stainless steel plates, which restricts water flow over the sample coupons.

Operators performing fuel and component handling operations in the spent fuel pool have not observed gray or dark clouds of material emanating from the spent fuel storage racks that would be indicative of Boraflex washing out or dissolving in the spent fuel pool water. Operators have observed spent fuel pool water crud debris associated with handling and moving spent fuel assemblies and control components.

District Response (Part 1): (Continued)

A District calculation concludes that if the spent fuel pool storage racks had no Boraflex, Boron would be required to maintain a subcritical margin of at least five percent ($K_{eff} \leq 0.95$). Assuming a fuel assembly arrangement that maximizes spent fuel pool reactivity, the calculated minimum Boron concentration required to maintain at least a five percent subcritical margin for no Boraflex in the pool is 560 parts per million (ppm).

In addition, the District believes the permanently shutdown status of the Rancho Seco reactor minimizes the factors that influence Boraflex degradation. First, the District has not placed additional irradiated fuel assemblies in the spent fuel pool since 1989. The spent fuel assembly decay heat generated in the spent fuel pool has reduced significantly since 1989, resulting in typical spent fuel pool bulk coolant temperatures below 80 °F. Pool temperatures greater than 80 °F have occurred infrequently and for short durations due to maintenance and controlled pool heat-up tests. Finally, the Boraflex material radiation source in the spent fuel pool has decreased considerably since 1989 due to radioactive decay, thereby abating potential Boraflex material gamma radiation induced shrinkage.

Requested Information: Part 2

Provide a description of any proposed actions to monitor or confirm that this five 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. (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.)

District Response:

The District maintains a vendor specified Boraflex surveillance program. A Boraflex sample coupon assembly tree is stored in a spent fuel pool storage rack location that is completely surrounded by irradiated fuel assemblies. The District Boraflex surveillance program consists of:

- Periodically removing two Boraflex sample coupons from the spent fuel pool;

District Response (Part 2): (Continued)

- Measuring the coupons for thickness, length and width, hardness, and mass;
- Testing the coupons for neutron attenuation; and
- Comparing these sample coupon measurement results to the original, pre-irradiated sample coupon data.

Boraflex surveillance results, including blackness tests, indicate satisfactory performance of the Boraflex material since installation at Rancho Seco in 1985. The District intends to continue the vendor specified Boraflex testing program as long as irradiated fuel remains in the spent fuel pool. The District anticipates completing the dry storage of all fuel assemblies currently stored in the spent fuel pool at the Rancho Seco ISFSI in 1998.

The District currently monitors the spent fuel pool Boron concentration monthly. Rancho Seco plant operating procedures: (1) Specify a 700 ppm minimum spent fuel pool Boron concentration limit; and (2) Prohibit operator actions that could dilute the spent fuel pool Boron concentration. The District October 1996, measurement of spent fuel pool Boron concentration was 1,255 ppm. This administrative Boron concentration monitoring and control program obviates the concerns associated with loss of Boraflex effectiveness.

Requested Information: Part 3

Provide any chronological trends of spent fuel pool reactive silica levels, along with the timing of significant events such as refuelings, pool silica cleanups, etc. Describe the implications of how the pool silica levels relate to Boraflex performance.

District Response:

The District did not collect Rancho Seco spent fuel pool silica data prior to 1996. In September 1996, the District implemented a spent fuel pool silica sampling program. The baseline spent fuel pool water silica concentration on September 9, 1996, was approximately *8.4 ppm*. The District took two subsequent spent fuel pool water silica samples on September 26, 1996, and October 1, 1996, that resulted in silica

District Response (Part 3): (Continued)

concentrations of approximately *8.6 and 8.5 ppm*, respectively. The relative error of the silica analysis method is 5%. The District is currently monitoring for spent fuel pool silica monthly but may change to quarterly if the silica level stays approximately constant.

The District spent fuel storage and transportation cask contractor (VECTRA) performed an assessment of chemical, galvanic, and other reactions in the NUHOMS spent fuel storage and transportation casks. In VECTRA's assessment report, VECTRA provides typical spent fuel pool silica concentrations for the NUHOMS Owner Group member plants (i.e., H. B. Robinson, Oconee, Calvert Cliffs, Davis Besse, Oyster Creek, Susquehanna, and TMI-2). Typical spent fuel pool silica levels range from zero to 12 ppm among the NUHOMS Owner Group. The current Rancho Seco spent fuel pool silica level is within the VECTRA owners group range.

Because the Rancho Seco fuel storage rack design permits pool water to flow up through the Boraflex annulus within the storage racks, a high spent fuel pool water silica concentration could indicate Boraflex degradation. But, the Rancho Seco spent fuel pool silica concentration is within the typical range for the VECTRA NUHOMS owners group spent fuel pools. The current Rancho Seco spent fuel pool silica levels are not indicative of degraded Boraflex material performance.

Due to a lack of historical spent fuel pool silica data, the District is not able to comment on how pool silica levels relate to past Boraflex performance. But, based on the District's:

1. Recently measured spent fuel pool silica levels;

2. Spent fuel pool fuel and component handling observations; and

3. Results from the Boraflex coupon testing surveillance program,

the District believes the Boraflex in use at Rancho Seco continues to perform adequately.