UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
DUKE POWER COMPANY	)	
	)	
(Amendment to Materials License SNM-1773 for Oconee Nuclear Station Spent Fuel Transportation and Storage at McGuire Nuclear Station)	)	Docket No. 70-2623

AFFIDAVIT OF WILLIAM C. ORTH

I, William C. Orth, being first duly sworn, do depose and state as follows:

I have been employed by Duke Power Company for the past 26 years in various positions dealing primarily with power chemistry, with 20 years directly involved in the operation of a nuclear power facility. I have previously testified in this proceeding, after being first qualified as an expert witness, regarding the subject of the maintenance of the boron concentration in the McGuire spent fuel pool. (Tr. 5078-5095)

This affidavit addresses the following two questions:

1. Whether activities associated with the operation of a demineralizer in the spent fuel pool recirculating water system could result in a significant decrease in the boron concentration of the spent fuel pool water, and
2. What effect would a decreased concentration of boron in the reactor coolant system have on the boron concentration in the spent fuel pool.

With regard to the first question, water in the spent fuel pool is circulated through, among other things, a mixed-bed demineralizer which is designed to remove certain impurities in the water. The borate ion (boron) is also removed until the resin is saturated. Once the demineralizer is saturated with boron, no additional boron will be accumulated in the demineralizer. The amount of boron required to saturate the type demineralizer used in the spent fuel pool at McGuire is approximately thirty pounds. Prior to placing a demineralizer into service the boron saturation condition is tested to assure that the correct condition is present. If an unsaturated demineralizer was placed into service, it would remove boron from the water until it had accumulated the 30 pounds required for saturation. Thereafter, it would remove no additional boron.

To determine the effect on the boron concentration in the spent fuel pool of placing a boron unsaturated demineralizer into service, the calculations contained in Attachment A were performed. As can be seen from these calculations, even if a boron unsaturated demineralizer was inadvertently placed into service, there would only be a decrease in the boron concentrations of the pool from 2000 ppm to 1989 ppm after the demineralizer accumulated the 30 pounds of boron required to saturate it. Thus, the maximum effect of such a situation is an insignificant decrease in the pool boron concentration of 11 ppm.

With regard to the second question (i.e., the effect of a low boron concentration in the reactor coolant system on the spent fuel pool water), the only time that the reactor coolant system and spent fuel pool are open to each other is during a refueling. At that time, the two systems are connected by the refueling canal. However, there is no positive circulation of water between the two systems. The only mixing that would occur would be limited to a very small mixing zone actually in the canal. Thus, in that there is very little mixing of the two systems, the reduction of the boron concentration in the reactor coolant system would have no impact on the concentration of boron in the spent fuel pool.

With regard to this second question, I was asked to perform a calculation to determine the decrease in boron concentration in the spent fuel pool given the following unrealistic assumptions: (1) the boron concentration in the reactor coolant system was 1800 ppm, the lowest condition that would result from use of the Boron Thermal Regeneration demineralizers,[1/] and (2) there was total mixing of the water in the reactor cooling system and the water in the spent fuel pool. As set forth in Attachment B,

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1/ It should be noted that the boron concentration in the reactor coolant system is recorded every shift and a coolant sample analyzed daily.

the resulting boron concentration would be approximately 1980 ppm.

William C. Orth

Subscribed and sworn to before me
this 21st day of October, 1980.

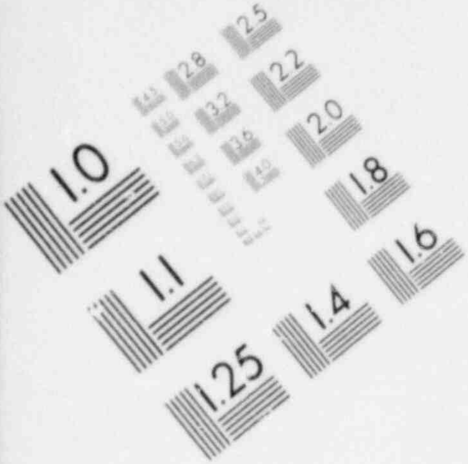
Sue C. Sherrill
Notary Public

My Commission expires: 9-20-84

IMAGE EVALUATION
TEST TARGET (MT-3)

6"

MICROCOPY RESOLUTION TEST CHART



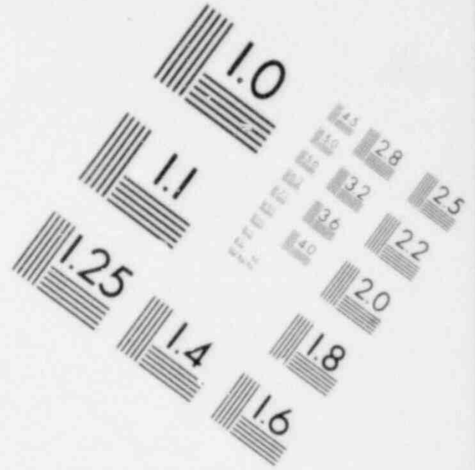
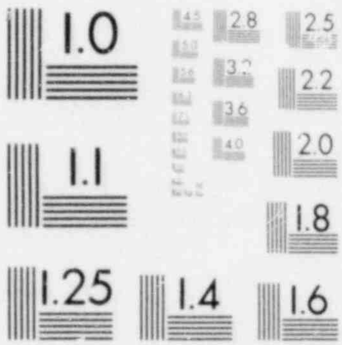
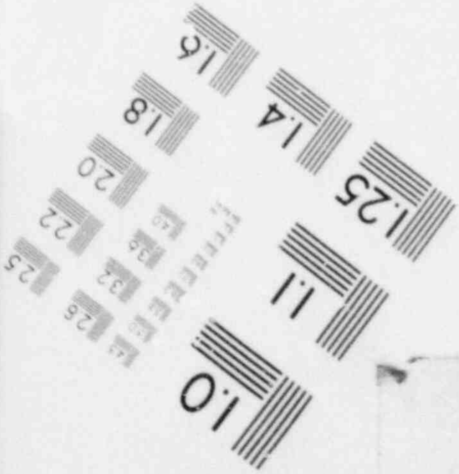


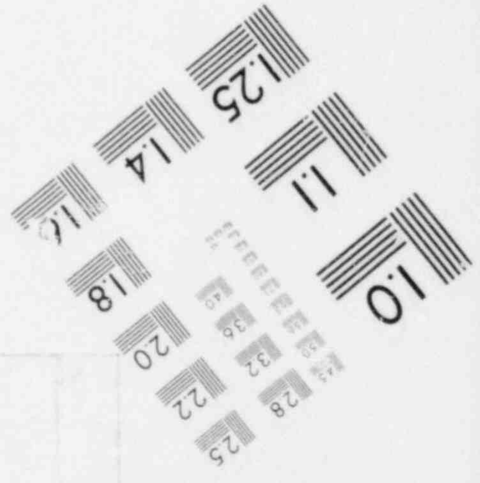
IMAGE EVALUATION TEST TARGET (MT-3)



6″

MICROCOPY RESOLUTION TEST CHART





ATTACHMENT A

Assume:

1. KF demineralizer has 45 ft^3 of mixed bed resin.
2. Equivalent anion capacity = 22.5 ft^3.
3. Capacity of anion to deplete boron = 2.0 meq/ml.
4. Spent fuel pool contains 400,000 gallons of water borated to minimum of 2000 ppm.

$22.5\ ft^3 \times 7.5\ gal/ft^3 \times 3785\ ml/gal \times 2.0\ meq/ml$

$= 1.277 \times 10^6$ meq capacity

$= 1.27 \times 10^3$ equi. capacity

$$\frac{1.27 \times 10^3 \text{ equi. cap.} \times 61.8 \text{ gms/equi. } H_3BO_3}{453.6 \text{ gms/lb.}} = 173 \text{ lb capacity for } H_3BO_3$$

173 lb capacity for H_3BO_3 X .1748 lbB/lb H_3BO_3 = 30.2 lb capacity for boron

400,000 gal. X 8.34 lb/gal. = 2.9×10^6 lb H_2O

2000 ppm X 2.9×10^6 lbs = 5800 lbs B in pool

$$\frac{5800 - 30.2}{2.9 \times 10^6} = 1989 \text{ ppm B}$$

The McGuire fuel pool cooling demineralizer is a mixed-bed demineralizer with 45 cubic feet of H^+ - OH form resin provided to remove ionic contaminants from the fuel pool water that result from corrosion or fission products. The flow capacity is 310 gallons per minute. In the event the demineralizer were improperly preconditioned, the demineralizer has the potential for depleting 30.2 pounds of boron from the spent fuel pool water prior to saturation. Considering a spent fuel pool water volume of 400,000 gallons borated to 2000 ppm, the boron concentration in the pool would be lowered approximately 11 ppm.

ATTACHMENT B

McGuire Nuclear Station design does not include the same type of deborating demineralizers as Oconee. McGuire has a Boron Thermal Regeneration System that can reduce the boron concentration of the reactor coolant system (RCS) approximately 200 ppm.

During refueling the Technical Specifications require a boron concentration of 2000 ppm in the RCS, refueling canal and spent fuel pool. Therefore, assuming that the volume of the reactor coolant system is 84,500 gallons, the volume of the refueling canal is 350,000 gallons and the volume of the spent fuel pool is 400,000 gallons, the net change in boron concentration, assuming complete mixing, is calculated as follows:

84,500 gals. at 1800 ppm B = 1269 lbs B
350,000 gals. at 2000 ppm B = 5838 lbs B
400,000 gals. at 2000 ppm B = 6672 lbs B
13779 lbs B Total

834,500 total gals. with 13,779 lbs B = 1980 ppm B

Net change = 2000 ppm - 1980 ppm = 22 ppm B

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
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DUKE POWER COMPANY)
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(Amendment to Materials License) Docket No. 70-2623
SNM-1773 for Oconee Nuclear)
Station Spent Fuel Transportation)
and Storage at McGuire Nuclear)
Station))

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicant's Response to CESG's Motion to Reopen the Record", dated October 21, 1980, in the above-captioned matter have been served upon the following by deposit in the United States mail this 21st day of October, 1980:

Marshall E. Miller, Esq.
Chairman
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. Emmeth A. Luebke
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. Cadet H. Hand, Jr., Director
Bodega Marine Laboratory of California
P. O. Box 247
Bodega Bay, California 94923

David S. Fleischaker, Esq.
1735 Eye Street, N.W
Suite 709
Washington, D. C. 20006

J. Michael McGarry, III, Esq.
Debevoise & Liberman
1200 Seventeenth Street, N W.
Washington, D. C. 20036

Mr. Jesse L. Riley
Carolina Environmental Study Group
854 Henley Place
Charlotte, N. C. 28207

Richard P. Wilson, Esq.
Assistant Attorney General
State of South Carolina
2600 Bull Street
Columbia, S. C. 29201

Atomic Safety and Licensing Appeal Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Atomic Safety and Licensing Board Panel
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docketing and Service Branch
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

William L. Porter