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UNIVERSITY OF VIRGINIA
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
CHARLOTTESVILLE, 22901

DEPARTMENT OF NUCLEAR ENGINEERING AND ENGINEERING PHYSICS
REACTOR FACILITY

TELEPHONE: 804-924-7136

June 26, 1979

Mr. James P. O'Reilly, Director
U.S. Nuclear Regulatory Commission, Region II
101 Marietta Street Suite 3100
Atlanta, Georgia 30303

Dear Mr. Reilly:

The enclosed written report of a reportable occurrence was originally mailed to you on June 18, 1979, but was returned to us on June 26 since it was addressed incorrectly.

Sincerely,

Bryce L. Shriver

B.L. Shriver, Director
University of Virginia, Reactor Facility

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June 15, 1979

Director, Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20546

ATTN: Mr. Robert W. Reid, Chief
Operating Reactor Branch #4

Re: License No. R-66, Docket No. 50-62 - Reportable Occurrence

Dear Mr. Reid:

This letter is to inform the NRC of a reportable occurrence at the University of Virginia Reactor Facility as required by Section 6.5 and 6.7 of the UVAR Technical Specifications. (The Technical Specifications use the obsolete term "abnormal occurrence" instead of the present term "reportable occurrence.")

Specifically, on June 13, 1979 it was determined that one fuel element was releasing small amounts of fission products to the reactor coolant. No release of radioactive materials to the environment was detected and the health and safety of the public or operating personnel were not affected by this occurrence.

On June 8, 1979 a routine, weekly analysis of the UVAR reactor pool water was made. This analysis indicated the presence of fission products in the reactor coolant. A second analysis performed the same day confirmed these results. The level of activity measured at 1:20 PM for three of the fission product isotopes used to detect leaking fuel elements are listed in the following table:

Isotope	Specific Activity (μCi/ml)
I-131	$< 1.7 \times 10^{-6}$
I-133	$1.9 \times 10^{-5} \pm 5\%$
Xe-135	$1.5 \times 10^{-5} \pm 5\%$

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These measured activities for iodine 131 are below the limits in 10 CFR Part 20 for restricted areas and the activity used to determine that fission products are being released from a fuel element. No increase in the airborne background activity was observed at any time. Due to the low fission product activity measured it was not clear that it was a result of a leaking fuel element. However, these fission products are not normally observed in the reactor coolant and were not observed in the previous weekly sample.

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The reactor was shut down at 3:37 PM on Friday, June 8, 1979. Due to the low levels of activity measured in the water and the fact that no increase in airborne activity was detected, no additional measurements were made until Monday, June 11, 1979.

At 8:00 AM on Monday, June 11, 1979 the reactor pool water was again analyzed for the presence of fission products. The results for three of the isotopes are shown in the following table:

Isotope	Specific Activity (μCi/ml)
I-131	$4.5 \times 10^{-7} \pm 21\%$
I-133	$4.6 \times 10^{-7} \pm 26\%$
Xe-135	$< 2.2 \times 10^{-7}$

The iodine activities were within 20% of the lower detectable limits and xenon was below the detectable limit. Based on these low activities it was concluded that additional reactor operation was necessary to determine whether fission products were being released from a fuel element and, if so, to locate the leaking element.

The reactor was taken to power at 9:02 AM on June 11, 1979 and operated until 8:49 AM on June 12, 1979.

Samples of the pool water were taken at noon, 5:30 PM and 8:40 PM on June 11, 1979 and at 8:47 AM on June 12, 1979. The highest activities measured during this period are shown in the following table:

Isotope	Specific Activity (μCi/ml) 8:40 PM on 6/11	8:47 AM on 6/12
I-131	$1.3 \times 10^{-6} \pm 36\%$	$< 1.6 \times 10^{-6}$
I-133	$7.1 \times 10^{-6} \pm 9\%$	$9.9 \times 10^{-6} \pm 7\%$
Xe-135	$4.0 \times 10^{-6} \pm 11\%$	$1.0 \times 10^{-5} \pm 5\%$

The observed increase in fission product activity indicated that there was a continuing source of fission products, most likely from a fuel element. Water samples were taken from directly above each of the fuel elements in the core in accordance with the procedure for detecting leaking fuel elements. These samples were counted on June 12, 1979 and the results reviewed on June 13, 1979. The fission product activity above one of the elements (AN-22) was significantly higher than above the other elements. Based on this data it was concluded that one fuel element (AN-22) was releasing low levels of fission products to the reactor coolant.

Fuel element AN-22 was removed from the core on June 13, 1979 and moved to the fuel storage rack at the north end of the reactor pool. Water samples taken directly above fuel element AN-22 and from the bulk pool confirmed that higher fission product levels were associated with element AN-22. A visual check of

the element did not reveal any obvious signs of fuel element failure.

Fuel element AN-22 was fabricated by Babcock and Wilcox and delivered to the University of Virginia in December 1958. The original fuel loading was 165.1 grams of uranium-235. Approximately eight percent of the uranium-235 had undergone fission when the fission product activity was detected in the reactor pool.

Action has been taken to determine the cause of and correct the source of the fission product activity in the coolant as discussed above. Additional pool water measurements will be taken and analyzed to confirm that the source of fission products has been removed from the core.

Water additions to the reactor pool have been less than 75 gallons per day during periods of reactor utilization including the period when low level fission product activity was detected. These losses are primarily due to evaporation. Since there was no liquid release from the reactor pool and no increase in the radioactivity in the reactor room air was detected it is concluded that there was no measurable release of fission products to the environment.

The Nuclear Regulatory Commission Region II Compliance Officer (Mr. S. A. Elrod) was informed of the reportable occurrence and corrective actions by telephone on June 13, 1979.

Sincerely,

Bryce L. Shriver

Bryce L. Shriver, Director
Reactor Facility

BLS/ph

cc: Mr. James P. O'Reilly, Director
U. S. Nuclear Regulatory Commission
Region II, Atlanta, GA 30303

Mr. Steve Ramos
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C.

Mr. T. G. Williamson
Mr. J. P. Farrar
Reactor Safety Committee