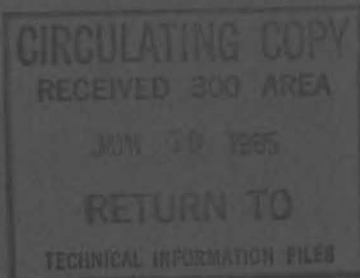


AEC
RESEARCH
and
DEVELOPMENT
REPORT



BNWL-60

C-46-

**QUARTERLY REPORT
FERTF PROGRAM PROGRESS AND PLANS
JANUARY-MARCH, 1965**

APRIL, 1965

ENTRY NO	P.L.N.O.	LOCATION	TEST POINT DATE
Extra			



PACIFIC NORTHWEST LABORATORY operated by BATTELLE MEMORIAL INSTITUTE

LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

PACIFIC NORTHWEST LABORATORY

RICHLAND, WASHINGTON

Operated By

BATTELLE MEMORIAL INSTITUTE

For The

U. S. ATOMIC ENERGY COMMISSION Under Contract No. AT(45-1)-1830

PRINTED BY/FOR THE U. S. ATOMIC ENERGY COMMISSION

3 3679 00060 1064

BNWL-60

UC-25, Metals, Ceramics
and Materials

QUARTERLY REPORT
FERTF PROGRAM PROGRESS AND PLANS
JANUARY-MARCH, 1965

By

J. A. Stoddard
Technical Planning
Test Reactor and Engineering Services

April, 1965

FIRST UNRESTRICTED
DISTRIBUTION MADE JUN 9 '65

PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON

Printed in USA. Price \$1.00. Available from the
Clearinghouse for Federal Scientific and Technical Information
National Bureau of Standards
U. S. Department of Commerce
Springfield, Virginia

QUARTERLY REPORT
FERTF PROGRAM PROGRESS AND PLANS
JANUARY-MARCH, 1965

INTRODUCTION

The Fuel Element Rupture Testing Facility⁽¹⁾ (FERTF) permits on-plant testing of PRTR size defective and high risk fuel elements operating at power reactor conditions. A summary of FERTF progress for the first quarter of CY-1965 and future operating plans is presented.

PROGRESS

At the end of the fall quarter, 1964, the irradiation of a vibrationally compacted UO_2 fuel element, 1067, defected with a 3 in. longitudinal slit, was in progress.⁽²⁾ The reactor shutdown of January 16, 1965 completed this test after the defective element had accumulated 9.9 MWd or 163 MWd/ton exposure in about 527 hr of operation and had experienced 10 reactor scrams including 2 from full power.

Following its discharge from the reactor, the test element was visually inspected in the storage basin. Some slight swelling of the defect location that caused the saw cut to be about double its original width was noted, but there was no apparent evidence of fuel washout.

A 21 rod cluster of UO_2 - PuO_2 EBWR prototype fuel rods was charged for the reactor start-up of January 30. This element accumulated about 10.6 MWd or 550 MWd/ton exposure in about 552 hr of reactor operation. During this period of operation, the cluster maintained a power generation of about 480 kW and no fuel defects were detected.

-
1. H. E. Hanthorn. PRTR Final Safeguards Analysis, Supplement 5, Fuel Element Rupture Testing Facility Analysis, HW-61236 SUP 5 REV. General Electric Company, Richland, Washington, May, 1963.
 2. J. A. Stoddard. Unpublished Data, General Electric Company, Richland, Washington.

An attempt was made to extend the 3 in. slit in fuel element 1067 (discussed above) to a length of 6 in. The element was then charged for the reactor start-up of February 25, and was subsequently cycled through three power cycles in which a full reactor power of 70 MW was achieved, including two scrams from full power. During this time the element accumulated about 3.4 MWd exposure in 173 hr of operation.

At the completion of the run, the fuel element was closely inspected in the storage basin. It was discovered that the slit had not penetrated the entire length of the extension, and it was not possible to tell whether the fuel swelling would have continued if the proper penetration had been made.

A standard 58 in. length Mark I fuel element containing six outer rods of 2% PuO_2 in UO_2 fuel material obtained by the salt cycle process was charged for the reactor startup of March 17. At the end of the month, the element had accumulated about 7.8 MWd or 200 MWd/ton exposure in 310 hr of reactor operation.

The estimated power generation of the salt cycle element was 875 kW at full reactor power. Problems with RTD and thermocouple measurements prevented an accurate determination of the fuel element power.

PLANS

Irradiation of the salt cycle fuel element will continue until the end of the present run. At this time the test element will be moved into the main PRTR core for further irradiation.

The test section will be moved in the April outage from the present fringe location in the PRTR core (Channel 1946) to the center position (Channel 1550) for high power tests. The test section will be left at this location until the batch core experiments begin; then it will be returned to its original fringe location.

The first five tests tentatively planned in this new location are:

- A thermocoupled short (58 in.) length 19 rod cluster with graded fuel loading at the end cap regions is planned to operate at a power of 1600 kW for 15 to 20 days.

- The irradiation of the 6 in. slit vibrationally compacted UO_2 fuel element, 1067, after correction of the slit extension will be run from about May 15 to June 15.
- A standard short length 19 rod cluster will be irradiated at 1800 kW to test its performance at this power and to determine afterwards, by destructive examination, the degree of fuel melting.
- Defect tests of the above element will be performed on replaceable fuel rods. A 1/16 in. hole will be drilled in one of the irradiated fuel rods and the defective element will be irradiated at powers of 1350 kW, 1600 kW, and 1800 kW in three 3 to 5 day steps to measure the fission product release and to determine whether defect propagation will occur.
- A short length inverted cluster consisting of a large diameter tube penetrated by seven coolant channels is being designed for loop testing. This element will be tested in the loop for about 15 or 20 days before being moved to the PRTR core proper.

Other possible tests in late summer, 1965, might be a fuel element with a rod enriched by a plutonium wire in the center, and a plutonium-thorium fuel element.

INTERNAL DISTRIBUTIONCopy Number

1	C. H. Allen
2	J. A. Ayres
3	J. M. Batch
4	R. G. Clark
5	D. R. de Halas
6	K. Drumheller
7	R. V. Dulin
8	J. R. Fishbaugher
9	M. D. Freshley
10	H. Harty
11	R. L. Junkins
12	W. R. Lewis
13	D. E. Newby
14	L. T. Pedersen
15	R. H. Purcell
16	W. D. Richmond
17	W. E. Roake
18	R. E. Skavdahl
19	R. I. Smith
20	W. G. Spear
21-36	J. A. Stoddard
37	L. D. Turner
38	P. C. Walkup
39	R. D. Weed
40	R. D. Widrig
41	M. R. Wood
42	F. W. Woodfield
43-44	Technical Publications
45-49	Technical Information Files

EXTERNAL DISTRIBUTION (SPECIAL)Number of Copies

1	General Electric Company, Richland, Washington Attn: N. T. Hildreth
2	Richland Operations Office Attn: R. K. Sharp Technical Information Library