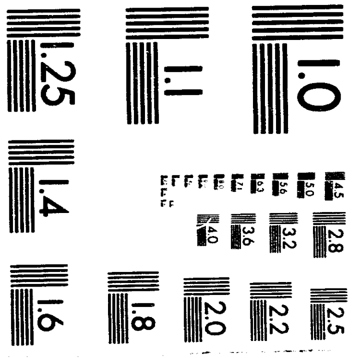
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3

1 of 1

File Folder

[redacted] (CLASSIFICATION) DECLASSIFIED

DOCUMENT NO.

HW-79650

SERIES [redacted] COPY NO. [redacted]

DATE

November 15, 1963

GENERAL ELECTRIC

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

[redacted]

THIS DOCUMENT CONTAINS RESTRICTED DATA AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954. ITS TRANSMITTAL OR THE DISCLOSURE OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED.

TITLE

PRODUCTION OF ZIRCONIUM-NIOBIUM-95 AND SCANDIUM-46 AT HANFORD. ADDENDUM TO HW-79404

[redacted] ING COPY

[redacted] 703 AREA

ISSUING FILE

[redacted] 22 1963

RETURN TO

TECHNICAL INFORMATION FILES

☐ OTHER OFFICIAL CLASSIFIED INFORMATION

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U. S. C., SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

AUTHOR

W. E. Johnson

[redacted]

THIS DOCUMENT MUST NOT BE LEFT [redacted] TENDED OR WHERE [redacted] UNAUTHORIZED [redacted] ERSON MAY [redacted] ACCESS TO IT. WHEN [redacted] IN USE, IT MUST [redacted] STORED IN AN AR[redacted] D LOCKED RE[redacted] TORY WITH[redacted] APPR[redacted] GUARDED [redacted]. WHILE IT IS [redacted] POSSESSION AN[redacted] IL YOU HAVE [redacted] AINED A SIG[redacted] RECEIPT [redacted] M CLASSI[redacted] FILES, IT IS [redacted] RESPONSIBILITY [redacted] EEP IT AND [redacted] ONTENTS WI[redacted] THE LI[redacted] OF THIS [redacted] JECT AND FROM [redacted] UNAUTHORIZED PE[redacted] ITS TRANSM[redacted] TO, AND S[redacted] GE AT Y[redacted] PLACE OF [redacted] SIDENCE IS PRO[redacted] ED. IT IS NOT [redacted] DUPLICATED [redacted] ADDITIONA[redacted] OPIES A[redacted] REQUIRED, [redacted] AIN THEM FROM [redacted] RELATED ISSUING [redacted]. ALL PERSON[redacted] ADING THIS [redacted] UMENT A[redacted] REQUESTED TO SIGN IN THE SP[redacted] PROVIDED BELOW.

ROUTE TO:	PAYROLL NO.	LOCATION	[redacted]S ROUTE DATE	SIGNATURE AND DATE
[redacted]			NOV 22 1963	

DISCLAIMER

[redacted]

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

[redacted]

DECLASSIFIED

MASTER

54—3000—340 (3—57) AEC-GE RICHLAND, WASH.

[redacted] (CLASSIFICATION)

DISTRIBUTION RESTRICTED TO U.S. ONLY

54-3000-036 (7-62)
AEC-GE RICHLAND, WASH.

GENERAL ELECTRIC COMPANY

RICHLAND, WASHINGTON . . . TELEPHONE 942-1111

HANFORD ATOMIC PRODUCTS OPERATION

HW-79650

November 15, 1963

U. S. Atomic Energy Commission
Richland Operations Office
Richland, Washington

This document consists of [redacted] pages. No. [redacted] of [redacted] copies. Series [redacted].

Attention: Mr. J. E. Travis, Manager

Gentlemen:

PRODUCTION OF ZIRCONIUM-NIOBIUM-95 AND SCANDIUM-46 AT HANFORD
ADDENDUM TO HW-79404

Ref: (1)- Letter, A. T. Gifford to T. R. Clark, "Request for Study - Zirconium-Niobium-95 and Scandium-46," dated November 4, 1963 (O:HEP).

(2) HW-79404 (Secret), Letter, W. E. Johnson to J. E. Travis, "Request for Study - Zirconium-Niobium-95 and Scandium-46", dated October 30, 1963.

We have prepared additional information concerning the production of zirconium-niobium-95 and scandium-46 as requested in your recent letter. The material supplements our previous letter (Ref. 2).

The following pertain to your questions concerning scandium-46:

1. A stockpile of slightly over 11 megacuries of scandium-46 would be required to guarantee 10 megacuries delivery. Roughly 2.5 megacuries per month would be required to replenish the decay. The specific activity in curies per gram would be diluted by the replenishment.

2. Hanford's maximum production capability might be in the order of 125 megacuries per month with unlimited raw materials available. This would require one to two thousand pounds per month of scandium

[redacted] RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

Group 1

[redacted]

charged in the reactors. This amount of material is in excess of present supplies by a factor of 10 or more, and aggressive procurement programs would have to be initiated to furnish the scandium. Special production methods might allow an additional factor of 2 increase in reactor capability, but would require even more scandium.

3. The cost of scandium production, stated in terms of plutonium loss, might be as high as one kilogram of plutonium per megacurie per month of scandium produced. If, however, the scandium is charged in a way that would not decrease the uranium in the reactor, the reactor costs could be reduced by as much as a factor of 2.

300 grams Plus 1/4 plus decay.

4. By selecting reactor locations of highest flux values, we could obtain material of roughly 200 curies per gram activity. If the stockpile were maintained in the reactor, no degradation would occur due to the normal 20 per cent per month decay of scandium-46. If the stockpile were maintained outside of the reactor, the specific activity would soon be reduced to 100 curies per gram or lower. If an out of reactor stockpile were planned, research should be undertaken to develop a means of sorting active scandium-46 nuclides from scandium-45. The probability of achieving this goal should be quite good in light of reported successes with Szilard-Chalmers reactions. Such a process would make possible delivery of active material even higher than the 1000 curies per gram mentioned as the upper limit of specific activity in which the customer was interested. It would also reduce the cost of stockpiling material outside the reactor inasmuch as a satisfactory level of specific activity could be maintained indefinitely by occasional removal of the decay product.

The following pertain to your questions concerning zirconium-niobium-95:

1. Based on the process scheme outlined in Ref. (2), the maximum quantity of zirconium-niobium-95 available at Hanford would be 300 megacuries per year with an average rate of 25 megacuries per month and an instantaneous rate as high as 40 megacuries per month. The average figures assume a uranium throughput rate exclusive of NPR of 6300 tons per year at a metal exposure of 600 MWD/T, a power level of 10 MW/T and a cooling time of 180 days. The instantaneous rate corresponds to a Purex plant processing rate of 3.6 CF. Overall yields are assumed to be 50 per cent of theoretical values due to reactor outage effects and separations plant operating efficiencies.

2. The availability of zirconium-niobium-95 could be increased by decreasing the cooling time between pile discharge and B-Plant processing. Assuming 130 days cooling rather than 180 days cooling, the annual output and instantaneous rates would be increased to approximately 500 megacuries per year and 60 megacuries per month, respectively.

GENERAL ELECTRIC

U. S. Atomic Energy Commission
Attention: Mr. J. E. Travis -3- November 15, 1963

Addition of NPR material to the B-Plant process system would increase the annual zirconium-niobium-95 availability some 25 - 30 per cent although instantaneous rates would remain approximately the same.

3. Additional process facilities might be required above those outlined in HW-79404 to improve I-131 control in the Purex plant and permit processing greener metal. Close-coupled operation between B-Plant and Purex would be required to maintain high specific activities. The capital investment needs would be approximately $250,000.

4. The calculated specific activity of the zirconium-niobium-95 material would approach 600 curies per gram at 180 days cooling and 1000 curies per gram at 130 days cooling. An analytical program has been initiated to substantiate these estimates.

If we can be of any further assistance, please call.

Very truly yours,

S/ P. W. Reinker

for General Manager

WE Johnson:WSF:rmj

DISTRIBUTION

1, 2, 3 - J. E. Travis, AEC-RLOO
4, 5 - W. E. Johnson
6 - P. H. Reinker
7 - A. B. Greninger
8 - T. R. Clark
9 - J. B. Fecht
10 - W. S. Frank
11 - O. H. Greager
12 - K. G. Grimm
13 - O. F. Hill
14 - B. F. Judson
15 - L. W. Lang
16 - R. W. McCullugh
17 - W. H. Reas
18 - O. C. Schroeder
19 - H. P. Shaw
20 - S. G. Smolen
21 - R. E. Tomlinson
22 - M. T. Walling
23 - J. H. Warren
24 - 300 File
25 - Record File

[redacted]

DATE
FILMED
3/24/94
END