

out

AUG 6 1980

SGML:RLJ
70-687

Union Carbide Corporation
ATTN: Mr. James J. McGovern
Business Manager, Radiochemicals
P.O. Box 234
Tuxedo, New York 10987

Gentlemen:

This is in response to your letter dated July, 7, 1980, requesting permission to proceed with your highly enriched uranium recovery program.

We have determined that the granting of your request will not endanger the common defense and security and is otherwise in the public interest. Accordingly, License Condition 2.1 of Amendment MPP-3 to your License No. SNM-639 is hereby revised and new License Condition 2.6 is hereby added, effective immediately, to read as follows:

2.1 "The licensee shall follow the Fundamental Nuclear Material Control Plan dated July 1, 1975; as amended June 23, 1978, and revised September 18 and 28, 1978 and descriptions found in Chapters 3.0, 4.0, and 7.0 and any other appropriate sections and procedures relating to the Uranium Waste Form Process in the revised FNMC Plan dated May 15, 1980 submitted with the cover letter dated July 7, 1980; and as revised in accordance with the provisions of 10 CFR 70.32(c)."

2.6 "The licensee shall collect recovery data pertaining to the first year of the Uranium Waste Form Process operation and summarize actual versus estimated SNM material balance data in a report due within 30 days after the licensee's receipt and evaluation of all pertinent data. This report shall be sent to NRC Headquarters, Division of Safeguards, Material Control and Accountability Licensing Branch and a copy to the NRC's Region I Office of Inspection and Enforcement."

Other revised sections of the Fundamental Nuclear Material Control Plan dated May 15, 1980, will be incorporated in your License Amendment upon completion of our review.

8009080489

OFFICE ▶					
SURNAME ▶					
DATE ▶					

AUG 6 1980

In accordance with your telephone request of July 17, 1980, we have determined that the attachments to your letter of July 7, 1980 contain information of a type specified in 10 CFR 2.790(d). Accordingly, pursuant to Section 2.790(d)(1), such information is deemed to be commercial or financial information within the meaning of 10 CFR 9.5(a)(4) and shall be subject to disclosure only in accordance with the provisions of 10 CFR 9.12.

Sincerely,

James G. Partlow, Chief
Material Control and Accountability
Licensing Branch
Division of Safeguards

DISTRIBUTION:

Docket File

Case File

PDR

SGML r/f

NMSS r/f

SGPL r/f

JPartlow

HBartz

RBrightsen

DWeiss

LRouse

HWerner, IE

WMartin, Reg. I

OFFICE	SGML	S. GML	SGML			
SURNAME	RJackson:rlm	RBrightsen	JPartlow			
DATE	8/1/80	8/14/80	8/16/80			

UNION CARBIDE - TUXEDO

SNM OPERATIONS DESCRIPTION

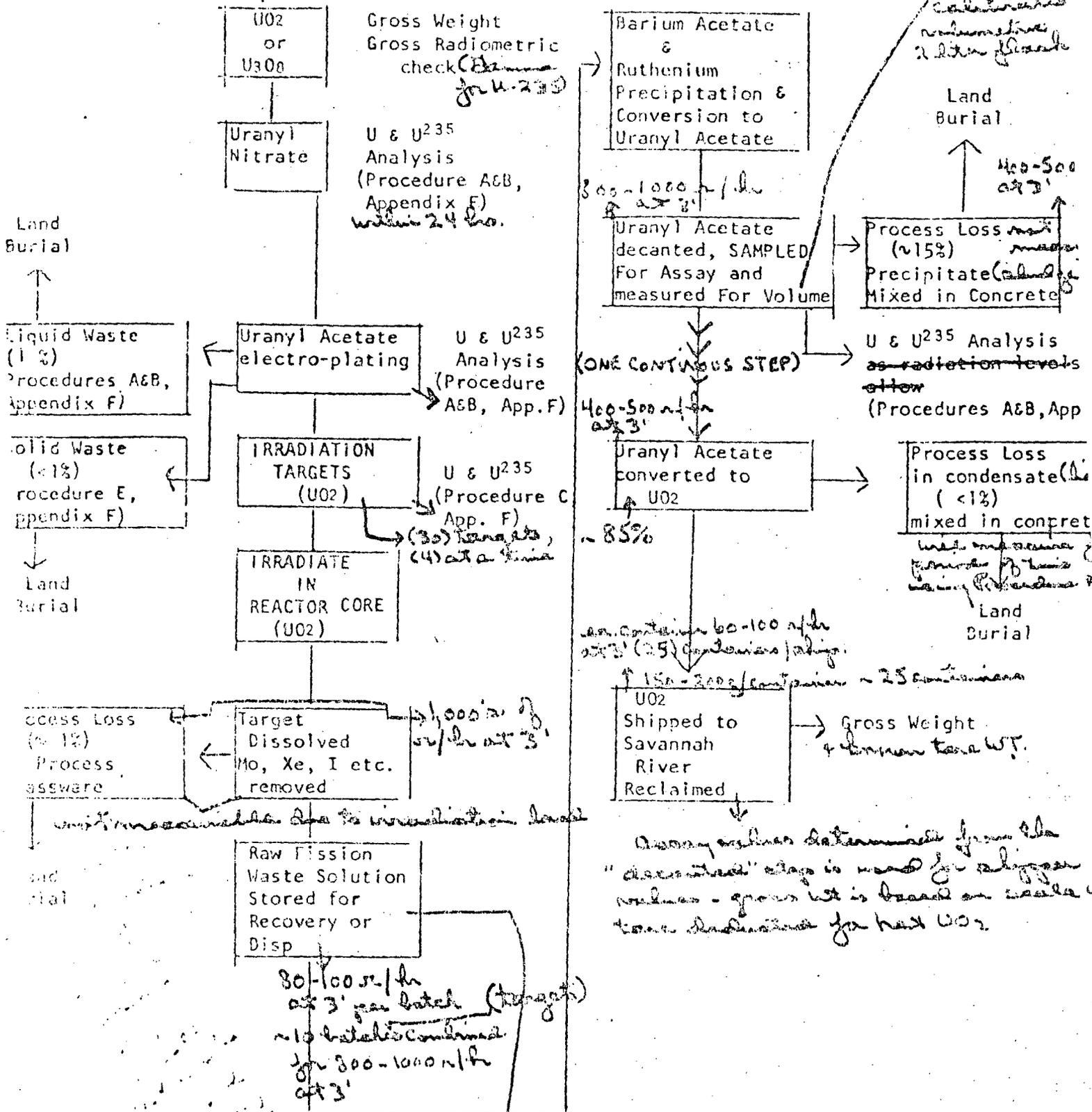
Highly-enriched uranium oxide (UO_2), received from an SNM supplier, is dissolved in nitric acid to form a uranyl nitrate solution. The uranium is then plated out of solution in a layer on the inside of steel tubes. The amount of SNM plated in each tube is determined by radiometric assay. The tubes are welded closed. After quality control measurements, the sealed tubes are irradiated in a nuclear reactor. Irradiated tubes are transferred to shielded hot cells where they are opened, the uranium is dissolved, and the desired products, (radio-pharmaceuticals), are chemically separated. After a minimum 1 month decay the uranium solution, still highly radioactive, is either packaged for shipment to a licensed burial ground or the fission products, mainly MO-99, are stripped-out from the uranyl sulfate solution to a dry UO_2 powder for shipment to Savannah River for further purification and eventual return to production.

The flow diagram (Figure "C") shows the sequence of operations, the waste streams, and the locations in the process where SNM logs are maintained [Material Balance Areas (MBA)].

URANIUM
FLOW CHART

(For information only)

(2) 300 g batches
ready (2) hours



Gross Weight
Gross Radiometric
check
(Handwritten: for U-235)

U & U²³⁵
Analysis
(Procedure A&B,
Appendix F)
within 2.4 hrs.

Barium Acetate
&
Ruthenium
Precipitation &
Conversion to
Uranyl Acetate

300-1000 n/hr
at 3'

Uranyl Acetate
decanted, SAMPLED
For Assay and
measured For Volume

Process Loss
(~15%)
Precipitate
Mixed in Concrete

in a pre-
calibrated
volumetric
2 liter flask

Land
Burial

400-500
at 3'

(ONE CONTINUOUS STEP)

400-500 n/hr
at 3'

Uranyl Acetate
converted to
UO₂

Process Loss
in condensate
(<1%)
mixed in concrete

Land
Burial

see container 60-100 n/hr
at 3' (25) condensate / aliquot

↑ 150-300g/container ~ 25 containers

UO₂
Shipped to
Savannah
River
Reclaimed

Gross Weight
& known tare WT.

Assay values determined from the
"decanted" stage is used for aliquot
values - gross wt is based on scale &
tare standard for each UO₂

Raw Fission
Waste Solution
Stored for
Recovery or
Disp

80-100 n/hr
at 3' per batch (targets)

~10 batches combined
for 800-1000 n/hr
at 3'

see batch is a discrete
item traceable to target
numbers

Process Loss
(~1%)
Process
aware

↑ 1000 n/hr
at 3'

with measurable due to irradiation level

Land
Burial

APPENDIX A

DESCRIPTION OF URANIUM WASTE FORM PROCESS

Fission product Mo-99 is produced by irradiating targets containing fully enriched uranium. Waste solutions, generated by this procedure, consist of uranium and mixed fission products dissolved in a dilute (~2 N) sulfuric acid containing ~2% nitric acid. The gaseous fission products (Xe, Kr, I₂) are removed during the fission product Mo-99 process. Each process creates approximately 150 ml of such waste, which is then stored in a borosilicate glass bottle and labeled with a sequential process number, for further disposition. Since only a small portion (~1%) of the U-235 present in each target tube fissions during irradiation, each of these bottles may be assumed to contain essentially the same amount of U-235 as was originally present in the targets. The basic process steps are listed below and shown in Figure A-4. ~~Figures A-1 through A-3 show the processing equipment dimensions and arrangement inside the hot cell, along with the minimum unit cell boundary defined by the proposed license conditions; however, the license conditions are governing regarding these matters.~~ Process steps include:

1. Combine the contents of borosilicate waste bottles containing up to 100 g U-235 in Container A. Repeat for Container B.
2. Precipitate ruthenium from the raw fission waste solution as a sulfide at 90°C by the use of thioacetamide added to Container A and B. This adds a volume of approximately 25 ml to the 750 ml of waste solution in each flask. (This is a precautionary step; its need will be evaluated during the startup program. If it is found unnecessary it will be eliminated.)
3. Precipitate the sulfates from the raw fission waste solution at 90°C by the use of barium acetate solution added to Containers A and B. This adds a volume of approximately 650 ml to the 775 ml of waste solution in each flask. (Steps 2 and 3 may be reversed or done simultaneously.)
4. Decant and filter the solution to remove the BaSO₄ precipitate (Container A to C or B to C).
5. Measure the filtrate volume and take a sample for assay (Container C).
6. Transfer the solution to an aluminum can placed in an electrically heated furnace and heat to dryness. The vacuum differential distillation is run at approximately 50°C. At the end of the vacuum drying step, the temperature of the dry Uranyl Acetate will be approximately 280°C. (Heating done in Container D with distillate passing to containers E and F.)

7. Continue to raise the temperature of the dry power to calcine the uranium to a final temperature of 320°C. During this stage, the input and output of the aluminum can (Container D) are vented through glass wool particulate traps to the hot cell atmosphere.
8. Weigh the aluminum container to determine the net weight of mixed uranium oxides content (Container D).
9. Seal the aluminum container and store for subsequent shipment to the reprocessing facility (Container D).
10. Dispose of the precipitate sludge (Container A and B) and the distillate (Container F) by solidifying in concrete for burial.

Mo-99
Process

Xe, Kr, I, Mo-99
Extracted from each target

U-235 and
Raw Fission
Waste from
Targets

U-235 and
Raw Fission
Waste from
Targets

Thioacetamide

Thioacetamide

Ru Precipitation
≤ 100 gm U-235

Ru Precipitation
≤ 100 gm U-235

Ru

Ru

(Alternate)

Barium Acetate

Barium Acetate

BaSO₄, ~25% of
U-235, some
Fission products;
solidify in
concrete for burial

SO₄
Precipitation

SO₄
Precipitation

BaSO₄, ~ 25% of
U-235; some
fission produc
solidify in
concrete for
burial

Filter

Uranyl
Acetate
≤ 200 gm U-235

Measure Volume and
Take Assay Sample
for U-235 and U-total

Distill and
dry
≤ 200 gm U-235

H₂O, NO₂; take assay
sample for U-235 and
U-total. Solidify in
concrete for burial

Calcine
≤ 200 gm U-235

Air

H₂O, CO₂, CO, CH₃COOH, CH₃COCH

Weigh

Store pending
Shipment to
Savannah River

3/1/55
FIGURE 1
Uranium Waste
Form Process