

UNITED STATES GOVERNMENT

Memorandum

TO : Robert W. Kirkman, Director
Region I, Division of Compliance

DATE: 16 OCT 1964

FROM : Willis G. Browne, Inspection Specialist (Criticality)
WGB Region I, Division of Compliance

SUBJECT: INVENTORY ACTIVITIES AT UNITED NUCLEAR'S SCRAP RECOVERY FACILITIES,
WOOD RIVER JUNCTION, RHODE ISLAND

On September 14, 1964, the United Nuclear Corporation submitted a detailed operations plan for their proposed inventory of uranium bearing materials in the Fuels Recovery plant at Wood River Junction, Rhode Island. After review by the Division of Compliance personnel, it was agreed that the inventory procedure could be followed without creating any nuclear safety problems or performing work in the plant that could be construed as operation of the plant.

Division of Compliance inspectors were present at the Fuels Recovery plant during most of the inventory, to observe the methods employed and review procedures that might constitute a nuclear safety problem. During the six days when Compliance inspectors were observing the procedures, United Nuclear personnel followed the procedures they had submitted and in general carried out a carefully controlled inventory program. A few minor problems were encountered and were corrected in the approved manner. Some minor deviations from procedure were also noted, but these were corrected as soon as they were recognized. The inventory was conducted in a competent manner, using techniques and standards that could be considered to equal or exceed those normally used by the nuclear industry.

Observations and Inventory Details

Inventory activities as summarized in Attachment 1, were in progress on Wednesday, September 23, 1964, when I arrived at the Wood River Junction Scrap Recovery Plant in Rhode Island. R. B. Chitwood, CO:HQ, had been present on September 22, 1964 when inventory procedure items prior to C.I.f were completed. (See Attachment 2.)

Four changes in the proposed inventory procedure had been necessary and copies of the first three approved procedure changes were given to Mr. Chitwood. The fourth change had been approved, but had not been duplicated before Mr. Chitwood left, so I received a copy of this change (Attachment 3) when I arrived at the plant site. While I was at the

C-55

plant on September 23, 24 and 25, two additional changes were proposed, but copies were not available until 9/28/64. Copies of these changes are appended (Attachments 4 and 5).

At about 8:30 a.m. on Wednesday, September 23, 1964, the inventory team, which consisted of Stan Skowronek, Bill Pearson, Marshall Cutler, John Murphy and Joe Simas, started at Item C.1.g. of the inventory procedure. Solution from the 1-D-10 B and C tanks, was drained into the 1-D-20 A precipitator. The solution was then drained into a one gallon jar and filtered through a buachner funnel to remove black particles that were suspended in the solution. The filtrate was then poured from the 4 liter filtrate flask, into an 11 liter bottle, via a special stainless steel funnel. When the 11 liter bottle was nearly full, it was agitated and sampled. The 11 liter bottle was then taken to the platform of the evaporator-precipitator area so that the contents could be poured into the evaporator feed leg. After pouring the contents of two 11 liter bottles into the feed leg, the pump 1-P-23 was started and the solution was pumped up to the overhead storage tank 1-D-10 A. By 7:00 p.m. the 1-D-10 B and C tanks had been completely emptied and flushed.

During the day it was noted that the 11 liter bottle did not have a permanent identification stenciled on it and that no identification label had been affixed to the bottle. This 11 liter bottle was the only bottle being used for the inventory procedure, but because solution could remain in the bottle overnight, it was suggested that a "stick-on" label be placed on the bottle to identify the bottle's contents. The label which Mr. Pearson prepared read: "11 liter bottle to be used during inventory of 1-D-9 A, B, and C, 1-D-10 B and C, and 1-D-20 A, B, C, and D."

The sample taken from solution in the 11 liter bottle was placed in a standard 4 ounce sample bottle. Six to ten of the 4 ounce bottles were accumulated in a cardboard box before the group of samples were taken to the Analytical Laboratory.

On the morning of 9/24/64, the precipitator tanks 1-D-20 A, B, C, and D, and associated pumps and piping were flushed with nitric acid solution to remove all remaining heels of uranium. About 10:00 a.m. Item C.2. of the inventory procedure was started, and by noon the 1-D-9 F tank had been emptied and flushed.

Solution in the 1-D-9 A, B, C, D, and E tanks was drained into the 1-D-43 tank, transferred to the 1-D-34 tank, agitated, sampled and then returned

to the 1-D-9 F tank. By the end of the day all of the overhead feed storage solution in the tanks, except in one-third of the 1-D-9 A tank had been emptied, sampled and returned to the 1-D-9 D, E, and F tanks.

The last of the 1-D-9 A tank was emptied on 9/25/64 and Item D.1. of the procedure was started about 10:45 a.m. One gallon jars were emptied into the stainless steel dissolver (1-J-4) until between 40 and 50 liters of solution were in the dissolver. Nitric acid and aluminum nitrate were added, the solution agitated for 15 minutes, sampled, and transferred through the assay tank to the 1-D-9 tanks. By the end of the day, all but six of the one gallon bottles that were stored on the floor in the process area had been processed through the stainless steel dissolver and transferred to the 1-D-9 tanks.

On 9/30/64 and 10/1/64, H. W. Crocker followed the inventory procedures in Item F.1. and 2. Three procedural changes were approved during that period. (See Attachment 6.)

By 10/6/64, all of the inventory had been taken except for a few miscellaneous solutions stored in 55 gallon drums. Storage tank status was as follows:

1-D-9 A - one-half full
1-D-9 B
thru F - Full
1-D-10 A - Full
1-D-10 B - two-thirds full
1-D-10 C - empty and clean

Attachments:

1 thru 6

cc: R. Whitwood, CO:HQ
w/ attachments

ATTACHMENT 1

SUMMARY OF PHYSICAL INVENTORY PROCEDURES
(UNITED NUCLEAR CORPORATION - FUELS
RECOVERY PLANT)

A. General

1. The objective of the inventory is to establish a post-incident uranium balance.
2. All uranium bearing materials are to be sampled and analyzed for U-235.
3. Execution of the inventory procedures will be under the direct surveillance of a Nuclear Safety Supervisor.
4. Material to be inventoried has been divided into six major categories.
5. Except for the incineration of burnable material which parallels other operations, each category will be completely inventoried before proceeding to the next category.
6. Only one container of uranium bearing material will be in motion at a time.
7. Burnable items will be processed through the incinerator.
8. The inventory team will consist of a Fuels Recovery Supervisor, an Accountability Representative, and not more than two chemical operators.
9. Samples will be placed in standard 4 ounce sample bottles.
10. 11 liter bottles are to be stored and moved in dollies.
11. Solution transfers will be made with a minimum of 24 inches edge to edge separation between containers.
12. Sample bottles and containers will be properly labeled.
13. A three part accountability form will be used for inventory data.
14. Procedure changes will be initiated in writing by the Fuels Recovery Supervisor and must be approved by the Accountability Representative and the Nuclear Safety Supervisor.

B. Procedure for Dry ADU

1. One at a time, the gallon bottles of ADU will be moved from storage, to hood 1-L-16-B.
2. A thief sample will be taken from the bottle.
3. After sampling, re-establish the net weight of the bottle.
4. Take the sample bottle to the laboratory for analysis.
5. Complete the ADU inventory before starting Category C.

C. Solutions Stored in Overhead Tanks and Associated Equipment

1. 1-D-10 A, E, and C tanks, Evaporator and Precipitators
 - a thru d. Concerns details of draining the 1-D-10 A tank.
 - e and f. Concerns details of draining the precipitator tanks.
 - g thru o. Concerns details of the 1-D-10 B and C tank inventory.
 - p and q. Concerns details of the precipitator flushing and inventory.
2. 1-D-9 A, B, C, D, E, and F tanks
 - a and b. Concerns details of emptying one of the 1-D-9 tanks.
 - c thru h. Concerns details of inventory for the remaining 1-D-9 tanks.
 - i and j. Concerns details of the flushing of associated tanks.

D. Procedure for Dilute and Concentrated Aqueous Solutions

1. One gallon jars and 11 liter bottles
 - a thru h. Concerns details of the adjusting and sampling of solutions from the one gallon jars and transfer of the solution to the 1-D-9 tanks.

i thru m. Concerns details of the adjustment and sampling of solutions from the 11 liter bottles, followed by transfer of the solution to the 1-D-9 tanks.

2. 55 gallon drums of solutions, excluding pickle liquor

a thru e. Concerns details of the agitation and sampling of solutions stored in the 55 gallon drums.

E. Pickle Liquor Adjustment Tank and 1-D-41 Tank

1. Skim foreign material from the surface of solution in the 1-D-12 tank and incinerate it. Drain tank contents into a 55 gallon drum.
2. Sample the 1-D-41 tank.
3. Drain tank contents to 55 gallon drum if the uranium concentration is less than 5 grams/liter.
4. Agitate drum contents for 15 minutes.
5. Take a thief sample from the drum.
6. Obtain net weight of drum contents.
7. Label and identify the sample and drum.
8. Store the 55 gallon drums in the outside storage lot.
9. Alternate procedure for the case where 1-D-41 contents are above 5 grams/liter.

F. Pulse Columns, Organic Storage Tank, Filtrate and Slop Tanks

1. Procedures for the draining and sampling of the pulse columns 1-C-6, 7 and 8, the carbonate columns 1-C-9 and the TCE column 1-C-10.
2. The draining and sampling of the organic storage tank 1-D-5.
3. The agitation and sampling of the filtrate tanks 1-D-24 A and B, and the slop tanks 1-D-21 A and B.

G. Miscellaneous

1. The determination of net weight in the containers and the representative sampling of incinerator ash generated prior to the incident.
2. The draining, flushing and sampling of solutions from pumps that have not been previously inventoried.
3. The physical separation of TCE and aqueous solutions, followed by the sampling and analysis of the TCE for uranium content.

4. Other

- a thru c. Dissolution, adjustment and sampling of the uranium nitrate crystals in Bottle "X", and transfer of the adjusted and sampled solution to the 1-D-9 tanks.
- d thru f. Draining, flushing and inventory of the assay tanks.
- g. Inventory of used organic stored in 55 gallon drums.
- h and i. Inventory of carbonate solutions from TCE washing.

ATTACHMENT 2

SEP 22 1964

Leo Dubinski, Assistant Director
for Materials

Division of Compliance

Richard B. Chitwood, Inspection Specialist
(Criticality)

Division of Compliance

REPORT ON VISIT TO UNITED NUCLEAR CORPORATION'S SCRAP RECOVERY FACILITY,
WOOD RIVER JUNCTION, TO OBSERVE INVENTORY ACTIVITIES

On September 22, 1964, I visited the subject licensee to observe inventory activities being conducted at the facility by licensee representatives under the procedures submitted to the Commission on September 14, 1964. In reference to these procedures, Dr. Marvin Mann indicated by letter to United Nuclear Corporation on September 17, 1964, that the Commission had no objection to the licensee conducting his inventory in accordance with the latest procedures they submitted.

When I arrived at the plant about 8:45 a.m. Tuesday, the inventory activities had not been resumed from the previous day. Work did not begin until about 9:30 a.m. because of the late arrival of the accountability representative on the inventory team. This individual did not realize that the presence of all members of the team was required for work to be performed. The inventory team is comprised of the following individuals with the corresponding responsibilities.

William R. Pearson, Process Supervisor
Stan Skowronek, Nuclear Safety Supervisor
Marshall Cutler, Accountability Representative
John Murphy, Process Operator

Work on the inventory began on Monday and on that day all of the nominally dry ADU was sampled, labeled and stored. In addition, the inventory team had performed the operations described in section C.1.a through C.1.d of the procedure. This consisted of transferring the contents of 1-D-10-A storage tank to 1-D-10-B by way of the evaporator. During this operation a condition was encountered which resulted in writing the first alternate procedure. While draining the evaporator, organic was found with the aqueous solution. Since the procedure formerly written did not anticipate this contingency, it was necessary for the licensee to provide an alternate procedure permitting the use of a separatory funnel to separate the organic material from the aqueous before the aqueous solution was added to the 1-D-20-A precipitate vessel according to the original procedure. A copy of this alternate procedure is attached as Appendix A.

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Inventory Activities Observed Tuesday

The inventory team listed above began work at about 9:30 a.m. They started with procedural step C.1.e, which initiated the draining operation for the 1-D-19 precipitators. The 1-D-19-B and C precipitator discharges were found plugged with ADU which had settled to the bottom of the vessels and hardened. Even though a 1 normal solution of HNO_3 had been added to the vessels 1-D-19-B and C the previous day, the ADU was found to have remained intact. About 1 1/2 hours were required to break through the ADU plug in 1-D-19-C using a rigid steel rod inserted from the top of the precipitator vessel to churn and impact the ADU cake. In addition, a steel wire was inserted through the drain line and ball valve in an effort to break through the ADU cake from the bottom. This approach was finally successful. After the ADU plug was broken, the material was collected in 1-gallon containers. The remaining ADU in the 1-gallon container was dissolved by the addition of 1 normal HNO_3 . The material from the 1-gallon bottle was transferred to a 5-inch diameter 11-liter bottle as described in procedural step A-11. This material was weighed, sampled and poured into the evaporator. The precipitator 1-D-19-B was the second vessel to be unplugged after about 2 hours of churning and prodding in the same fashion as described for unplugging 1-D-19-C. Because of the delay encountered in removing the plug from 1-D-19-B, the supervisor, Mr. Pearson, wrote an alternate procedure requesting approval to bypass procedural step C.1.e and to proceed with step C.1.f which authorizes draining of the 1-D-20-A precipitator. In this procedure, he requested permission to use two operators not on the inventory team to proceed with the 1-D-19-B unplugging operations. This procedure was approved by the Nuclear Safety Supervisor. The activities associated with the 1-D-20-A were discontinued almost before they got under way when the plug was removed from the 1-D-19-B precipitator. The contents of the 1-D-19-B precipitator were then removed, inventoried and transferred to the evaporator in the same fashion as was the material in the 1-D-19-C vessel. This second alternate procedure is attached as Appendix E. When the 1-D-19-C clean out and material inventory for this system was completed step C.1.f of the procedure was started.

In draining the contents of 1-D-20-A a black crud was noted in the UNH solution. In order to remove this impurity from the solution it was necessary to initiate a third alternate procedure which was reviewed and approved by the Nuclear Safety Supervisor (see Appendix C). This procedure authorized exchanging the 1-gallon plastic bottle called for by the procedure with a filter flask (approximately 4-inch

(continued)

long neck, 2-inch diameter with an inverted conical body of approximately 30 degrees), on top of which would be placed a cylindrical pan having a filter frit in the pan base. This filter pan had dimensions of approximately 9-inches diameter by 4 inches high. Although not stated in the alternate procedure, the operator did not allow the solution depth in the filter pan to exceed 1/2-inch at any time. The inventory was terminated at 3:00 p.m. when it was recognized that a plastic conical funnel of approximately 45 degrees and about 10 inches in diameter at the lip was being used to receive material poured directly from the 11-liter bottle after the inventory step without procedural approval and when it was learned that the Nuclear Safety Supervisor had left the plant premises.

Here again it appears that not all members of the inventory team recognized that their presence was required in connection with the inventory activity. At the end of the day shift the 55-gallon drum containers outside of the building were lashed together and tied down in preparation for the high winds accompanying the hurricane Gladys. In addition, steps were being taken to secure all containers within the plant to prevent uncontrolled movement of material in the event that windows and doors were blown out and open.

Other Observations and Information

Titanium Contamination

T. Callopy, a chemist recently employed by United Nuclear has been assigned the immediate task of determining the source and nature of the titanium contamination in the plant production material. According to Richard Holthaus there is considerable puzzlement over the large variation in titanium contamination values reported. These range from 6 to 500 parts per million in a given sample.

Leaks At End Plates of Overhead Storage Tanks

I observed all of the overhead storage tanks and noted that the end plates and flanges on these vessels are about 1/4-inch thick. They are secured by approximately eight bolts. I noted that about four heavy duty "C" clamps were affixed to one end of the 1-D-10-C and D

(continued)

ATTACHMENT 2

Leo Dubinski

-4-

tanks to supplement the bolts used to secure the face plates and to prevent leaks. According to Pearson, these vessels were to have met a 90 psig test prior to acceptance by United Nuclear. However, according to him, United Nuclear agreed to an acceptance pressure of 40 psig since the higher performance value could not be realized.

Attachments:
Appendices A-C

cc: R. W. Kirkman, COIL

SPEED MESSAGE

TO

S. Shornick

FROM

W. R. Pearson

SUBJECT

addendum to Inventory Procedure

DATE

9/21/1964

Please add the following procedure to Section C-1 of the Inventory Procedure. The purpose is to separate organic materials from aqueous mineral solutions. C-1-D-20.

1. Separate & label separated mineral water C-1-D-20.
2. Wash yellow bottle from the separator C-1-D-20. Add the separated mineral. Keep this bottle & keep minimum from other mineral bearing materials.
3. Collect aqueous phase as specified in existing procedure.
4. Collect organic phase in 1 yellow bottle(s) for further inventory.

Approved

S. Shornick 9/2/64

SIGNED

W. R. Pearson

Cover Line

"SPEED-POST" FORM 40-500 2-PARTS

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SPEED MESSAGE

TO

J. L. L. L.

FROM

W. R. Pearson

SUBJECT

Deviation from Inventory Procedure

DATE

9/22/64

I request permission to temporarily omit
 step C.1.2. 1-D-19B Precipitation is plugged
 with solid RDX and is not clean. This
 precipitation will be replaced by 2 operators
 not on the Inventory Team. As soon as it is
 unplugged, these operators will be reassigned
 again. The precipitation 1-D-19B will then be
 cleaned and inventoried by the Inventory Team.

Change approved - J. L. L. L. 9/22/64

SIGNED

W. R. Pearson

Grey Line

"DRAW-A-WAY" FORM 64-100 2-PARTS
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ATTACHMENT 2

SPEED MESSAGE

TO

J. Starnick

FROM

W. R. Pearson

SUBJECT

DATE

9/22

1964

I request that you be allowed to use a 4-litre filter flask to clean the 1-1-70A precipitator. The reason is that we have a filtration of the liquor to remove "black" tails. Draining from 1-1-70A will be controlling to prevent overfilling the filter flask.

OK. J. Starnick 9/22/64

SIGNED

W. R. Pearson

ATTACHMENT 2

SPEED MESSAGE

TO S. S. Starnick FROM V. P. Cannon

SUBJECT _____

DATE 9/23 1964

We need a Pump & 1000. Please
(1) liter bottles & the Embroidered (or) 100
A problem to see a pat. attached (or) 1000
which less than 1000 (3) liter capacity.

Funnel out of 3 liter level - ok S. S. Starnick Water

SIGNED V. P. Cannon

XERO COPY
XERO COPY
XERO COPY

Attachment 4

SPEED MESSAGE

TO S. Skawonek FROM W.P. Pearson

SUBJECT

DATE 9/25/64

I would like to revise section E-7
so that I can put the 1 gallon of solution
drawn from 1-D-41 for sampling into a
55 gallon drum. Provide the analysis permit
1-D-41 to be drawn into 55 gallon drums.

OK. S. Skawonek 9/28/64

SIGNED W.P. Pearson

SPEED MESSAGE

TO S. Stowman FROM W R Pearson

SUBJECT

DATE 9/25 1964

Request to change the sequence of the
operating procedure. Section F will be
completed before starting section D. 2.

Approved S Stowman 9/28/64

SIGNED W R Pearson

UNITED STATES GOVERNMENT

Memorandum

File
L. Brown

TO : R. W. Kirkman, Director
Region I, Division of Compliance
New York

FROM : Hilbert W. Crocker, *Inspection Specialist* (Criticality)
Region III, Division of Compliance, Chicago

DATE: October 2, 1964

SUBJECT: OBSERVATION OF POST ACCIDENT SNM PHYSICAL INVENTORY AT UNITED NUCLEAR CORPORATION, FUELS RECOVERY PLANT, WOOD RIVER JUNCTION, RHODE ISLAND
DATE - SEPTEMBER 30 AND OCTOBER 1, 1964

As an assist to Region I this inspector observed the SNM physical inventory operations at the licensee's plant on September 30 and October 1, 1964.

The principal activities observed were as follows:

1. draining of the columns 1-C-6, 1-C-7, 1-C-8, and 1-C-10 and associated operations as per procedure F-1, and
2. drainage of the organic storage tank 1-D-5 and associated operations as per procedure F-2.

The inventory operations appeared to be conducted in a safe efficient manner. The operators involved in the activities appeared to have a good understanding of the procedures. The operations were conducted in accordance with detailed procedures. On September 30, 1964 Mr. Pearson requested three deviations from the written procedures. These deviations were in writing and were reviewed and approved for nuclear safety by Mr. Skowronek. A copy of the approved deviations are attached. Licensee supervision exercised close control of all phases of the physical inventory operations observed by the CO inspector.

Enclosure:
Above document

cc: R. B. Chitwood, CO:HQ w/encl.

ATTACHMENT 6

TO J. Starnes FROM W. H. Pearson

SUBJECT _____

DATE 9/30/64

Request permission to move the
separation panel from immediately H-2
to adjacent at 1-P-2 pump control box
in the Column Room.

OK J. Starnes 9/30/64

SIGNED W. H. Pearson

SPEED MESSAGE

TO W. J. Skowronek FROM W. J. Pearson

SUBJECT

DATE 7/15/61

Transfer to 55 gallon drum after
analysis shows $< 5 \text{ gms/LIT}$ OK
drum only temporary
storage S. Skowronek

350 gms $1/235$
per drum
May

Transfer to 55 gallon drum after
analysis shows $< 5 \text{ gms/LIT}$ OK
drum only temporary
storage S. Skowronek

SIGNED

W. J. Pearson

ATTACHMENT 6

KERO
COPY

CopyLine

"SNAP-A-WAY" FORM 44-900 2-PARTS
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TO Mr. Pearson FROM W. A. Pearson

SUBJECT _____

DATE

9/30 1964

I require temporary storage of 11
litter bottles to permit emptying
of 1-D-5.

OK - Bottles positioned & anchored 9/30/64 by Pearson/
Skinner

Movement of anchored Bottles with my concurrence and
one at a time S Skinner 9/30/64

SIGNED

W. A. Pearson

Zip Line "SNAP-A-WAY" FORM 44-500 2-PARTS
JLSON JONES COMPANY • © 1961 • PRINTED IN U.S.A.

ATTACHMENT 6

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SECURITY OFFICE

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COPY

XERO
COPY

XERO
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