DOCKET NO. 20-820 11 pgs

# UNITED NUCLEAR
CORPORATION
CHEMICALS DIVISION

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ROUTE 21-A
HEMATITE, MISSOURI

February 4, 1964


Mr. Eber R. Price
Assistant Director
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

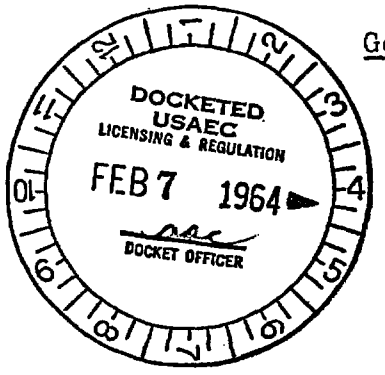
ATTENTION: Mr. Robert L. Layfield, Acting Chief
Source & Special Nuclear Materials Branch
Division of Licensing & Regulation

SUBJECT: APPLICATION FOR SOURCE AND SPECIAL NUCLEAR MATERIAL LICENSES FOR UNITED NUCLEAR CORPORATION'S SCRAP PLANT FACILITIES AT WOOD RIVER JUNCTION, RHODE ISLAND

Gentlemen:

This is to supplement our letter of January 31, 1964 and complete the replies to points mentioned in your letter of January 22, 1964.

Replies are itemized to correspond to your list of January 22:




General Information Manual

2. A revised page marked No. 2 was included in the attachments in our letter of January 31 (as we mentioned by phone February 4).

3. The emergency power system will be checked weekly instead of once a month as stated; please correct our page 3 of 4 of section 800 accordingly.

4. See attached report (marked No. 13).

Emergency Control Plan

12. See attached page marked No. 7
25. See attached pages marked No. 14.

Yours truly,

L. J. Swallow

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ACKNOWLEDGED

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(#15)

February 5, 1964

Docket No. 70-820

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# EVALUATION OF ACCIDENTAL NUCLEAR EXCURSIONS

A study of the probability and effects of an accidental nuclear excursion has been made of the Fuels Recovery Facility at Wood River Junction, Rhode Island. This study and the following discussion have been based on the Convair Research and Development Report NYO-2980, "Safety Analysis of Enriched Uranium Processing" dated March 18, 1960.

Enriched uranium handling and processing at the Fuels Recovery Facility is done primarily in two areas:

1. The general plant area where highly enriched uranium scrap materials are converted to $U_3O_8$. This includes the receiving area and storage of the in-process and finished uranium materials.

2. The laboratory where small quantities of uranium compounds for process control testing.

Nuclear safety is primarily achieved by the use of safe geometry and/or safe batch processing. In a few places (noted specifically elsewhere in our license application) moderation control and use of poisons is maintained as supplemental control.

Uranium material is carefully controlled from time of receipt, through processing, final storage and shipment through procedures described in "General Information and Procedures" to insure safe spacing and minimize the amount of material in its movement through the plant.

Since it is not unusual for greater than critical quantities of U-235 to be inventoried in our plant, the assembly of a critical mass is a possibility at any point in the plant at which the material is handled. However, this report will be limited to those points, which in our estimation, are most likely to be subject to the risk of incurring a critical assembly.

## I. Potential Criticality Sites - Processing Area

| Location | Control Failure Required |
|---|---|
| Product Storage Rack (Racks provide spaces for sizeable amounts of U-235 material) | Physical failure of the concrete block walls combined with accidental moderation. The occurrence of an excursion is very unlikely because of the strength of the walls. |
| Hoods and Glove Boxes (Finish goods handling in hoods along South wall and center aisle opposite dissolvers) | Failure of administrative control in determing the batch size and failure to provide proper spacing between safe geometry vessels. |
| Rework and Residue Storage | Failure of administrative control to provide proper spacing between safe diameter bottles prior to assay. |

| Location | Control Failure Required |
|---|---|
| Tray Dissolvers | Failure of administrative control to prevent heaping of tray dissolver together with optimum moderation and greater-than-expected U-235 content in the alloy scrap (e.g. Zr chips). |

II. Upper Limit of Nuclear Excursion

Potential nuclear excursions can be divided between two catagories: unmoderated metal excursion and aqueous excursions.

As discussed in the Convair report, the maximum excursion would result from an unmoderated U-235 metal assembly. In this case, the maximum excursion would be in the order of $10^{20}$ fissions. As pointed out on Page 106 of the Convair report, this type of excursion would be terminated almost instantaneously by physically blowing itself apart. This type excursion is quite unlikely since, although our license application allows for handling U-235 in metallic form, this type scrap will be in the form of small pieces (not large chunks) of relatively low U-235 content alloy material.

The maximum excursion in a moderated assembly would be in the order of $10^{18}$ fissions in the initial burst with a total fission yield in the order of $10^{19}$ (based on Convair's report - Pages 99 and 100).

The shutdown mechanism in an aqueous solution excursion would consist of boiling the solution, resulting in dispersion or evaporation of the moderating material. Since the possibility of such an excursion is very small, we have not felt a need to install provision for controlled shutdown procedures.

An excursion in the drying ovens would be shutdown by the vaporation of the water as a result of the heat generated, or by self-destruction from a sudden reactivity buildup.

III. Offsite Radiation Hazard. (Reference Pages 127 through 195 of the Convair Report)

A. Direct Radiation

Figure 8, Page 128 of the Convair report, shows that an aqueous excursion could have a lethal direct radiation radius of approximately 50 meters. The nearest fence to a potential excursion is approximately 20 meters. Therefore, anyone remaining close to the fence for a prolonged period could receive a lethal exposure. However, the plant is in a relatively remote location. Consequently, the number of non-plant personnel within 30 meters of the fence would at most not exceed one or two.

In the case of a metal excursion, the lethal radius would extend to approximately 100 meters ( Figure 8 of the Convair report). (Attention is again called to the second paragraph of Section II above). It is believed the number of non-plant personnel still would not exceed one or two. It should be noted, however, that a metal excursion is judged to be the most improbable type in accordance with NYO-2980.

Persons within a radius up to 100 meters could receive harmful but not lethal exposure from an aqueous excursion (Figure 8, Page 128, of the Convair report).

Persons within 450 meters could receive harmful but not lethal exposures from a metal excursion (Figure 8, Page 128, of the Convair report). Again, at most, only a few non-plant personnel would conceivably be within this distance.

B. Fission Cloud Hazards

A lethal dose from direct radiation can be received in a band 50 meters wide for a distance of 300 meters (Figure 14, Page 145, of the Convair report). On this basis the maximum number of persons affected would be limited to approximately a dozen. Less than fatal exposures can be expected up to a distance of 1800 meters in a band 200 meters wide (Figure 14, Page 145, of the Convair report). The number of persons affected could in this case be as many as 100 to 500 assuming that this cloud reached Wood River Junction (about 1100 meters away) and/or the NY. NH and H railroad tracks (about 800 meters away) at the time a train was passing. The prevailing wind directions (from northwest and southwest) make probable that such a cloud would go toward the uninhabited areas to the southeast and to the northeast.

Again it should be noted that these estimates are based on the most improbable type excursion. The results of an aqueous excursion would be limited to a much smaller range since the buildings would remain intact restricting the spread of radioactive products.

C. Ground Contamination

As pointed out in NYO-2980, the ground contamination would be limited in a radius of 250 meters. Since our property would include all of this, a hazard to the public is not expected.

We believe that the detailed descriptions given above adequately cover the assumptions which we have made in arriving at our conclusions. Exact sets of conditions in a scrap materials processing plant are so variable from job to job that any further detail and/or possible assumed conditions would not be warranted. Also, we believe that the plant conditions and assumptions which are part of the calculations of the Convair report (NYO-2980) represent a close approximation to those of our plant; we believe that the conclusions from these calculations are valid for us.

Rough Draft 1/24/64

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The emergency organization is headed by the Emergency Coordinator (the Plant Superintendent or the Industrial Relations Manager), who is responsible for the direction and coordination of all activities during the emergency. The highest ranking member of Management present will act as Emergency Coordinator when the Emergency Coordinator is not present or has become a casualty.

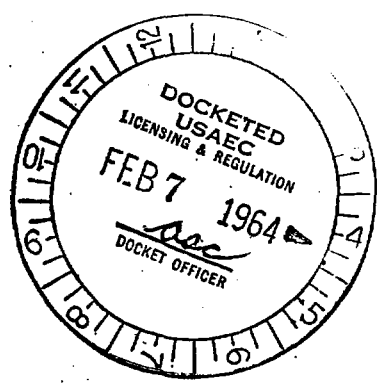
## II. RESPONSIBILITIES

In the event of an emergency, the responsibilities listed in the left-hand column are assigned to the individuals holding the positions listed on the right:

| Responsibility | Assigned to |
|---|---|
| Security and Communications | Security Operations Officer |
| Physical protection of life & property | Security Operations Officer |
| Public Relations | Vice President/Industrial Relations Manager |
| Transportation | Production Planning & Materials Control Manager |
| Health Physics & Safety | Health Physics & Safety Specialist |
| Criticality | Supervisor responsible for plant criticality |

## III. COORDINATOR - EMERGENCY PROCEDURE

The Emergency Coordinator will maintain close contact with all effected departments or portions thereof. The Control Center, located in plant offices (or at assembly point for criticality incident - see description, Section XV) will be the main point of [illegible] the Emergency Coordinator. Should this site become inoperable because of the emergency, the Control Center will be located in Chariho High School.



## XV. ASSEMBLY POINT

The assembly point is located in excess of 500' in a westerly direction from the Fuels Recovery Facility. At the assembly point is a structure of a prefabricated type of adequate size to house emergency equipment and the personnel from the facility.

Emergency equipment consists of a telephone, blankets, coveralls, Beta-Gamma instrument, Air Sampler and a Motor-Generator Set.

The Beta Gamma instrument located in the facility performs a two-fold purpose. It will be used to monitor badges and personnel and then be used by the monitoring team for re-entry to the facility.

Periodically the instrument will be calibrated. The time between instrument operated check will not exceed one week. The instrument will also be placed in a cycle of use with instruments of the same type in use in the Fuels Recovery Facility.

UNITED NUCLEAR CORPORATION (#14)

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PAGE 1 OF 1

EFFECTIVE Feb. 1, 1964

ISSUED ~~December 1, 1963~~ Feb. 1, 1964

SUPERSEDES Dec. 1, 1963

SUBJECT: HEALTH PHYSICS RESPONSIBILITIES

## IV. HEALTH PHYSICS RESPONSIBILITIES

### A. General Responsibilities

The Health Physics Department is responsible to the Manager, Chemical Operations for:

1. Maintenance of conditions at the Scrap Plant facilities at the Wood River Junction plant to insure the protection of all personnel and the public from unnecessary and/or excessive exposure to radiation and health hazards as a result of activities there.

2. Insuring compliance with all applicable Federal and local regulations and contractual commitments.

### B. Specific Responsibilities

The Health Physics Department is responsible to the Manager, Chemical Operations for:

1. Defining operational standards related to health physics.

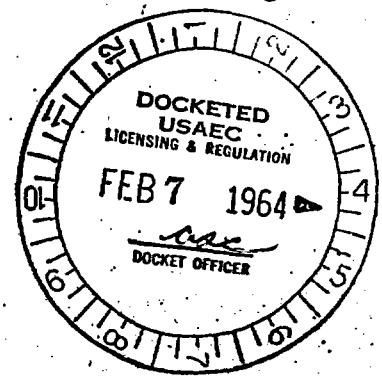
2. Auditing all plant activities to insure compliance with operational standards.

3. Performing an advisory service to the Operations Department for new processes, equipment and procedures in the development stage.

4. Reviewing and approving all planned modifications and/or additions to the plant, equipment, processes and standard operating procedures.

5. Auditing of the medical program for the treatment of all injuries and routine medical examinations.

6. Auditing all records associated with the above responsibilities and as required by Federal and local regulations and contractual commitments.



206. Financial Qualifications

Reference is made to a copy of the 1963 Annual Report of the United Nuclear Corporation, which was included in United Nuclear's SNM-33 License Renewal Application of July 15, 1963.

207. Administrative Procedures to Insure License Compliance

207.1 General Organization of the Chemical Operations

The general organizational structure of the Chemical Operations is shown on Figure 1.

Vice President

The Vice-President, Fuels Division, has general overall responsibility for the Chemical Operations.

Manager, Chemical Operations

The Manager, Chemical Operations, is responsible to the Vice-President, Fuels Division, for all activities of the Chemical Operations.

207.1.1 Operations

Scrap Recovery Superintendent

The Scrap Recovery Superintendent has general responsibility to the Manager, Chemical Operations, for production and continued safe and efficient plant operation. This includes nuclear safety, radiation and industrial hygiene, general safety and uranium accountability.

Shift Supervisor (Foreman)

Responsible to the Superintendent for detailed execution of work and policies set by the superintendent. The shift supervisor directly oversees plant operation.

Technician

Is responsible to shift supervisor for the running of control tests necessary for production. Also provides assistance in the establishment of operation conditions for handling unusual scrap materials.

207.1.2 Supervisor, Nuclear Safety/~~Health Physics~~

The Supervisor, Nuclear Safety/~~Health Physics~~ has the responsibility for:

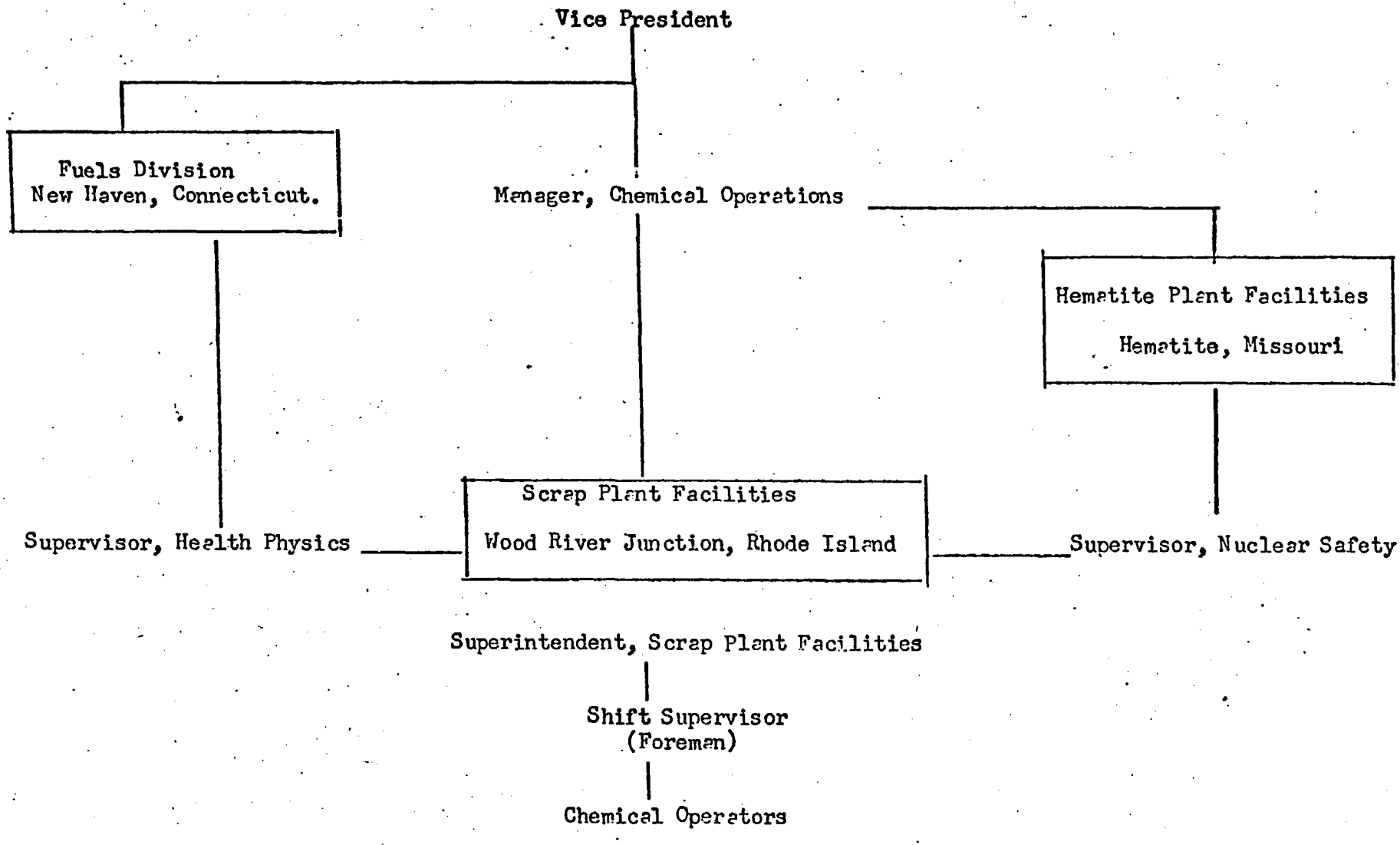



Figure 1

Organization Chart
Scrap Plant Facilities of United Nuclear Corporation at Wood River Junction, Rhode Island.

207.1.2 (Continued)

1. Defining Operational standards related to nuclear safety.

2. Obtaining AEC approval of procedures and equipment involved in processing source and special nuclear material.

3. Auditing all activities as related to criticality.

207.1.3 Supervisor, Health Physics

The Supervisor, Health Physics has the responsibility for:

1. Defining operational standards related to health physics and industrial safety.

2. Audit all activities as related to health physics and industrial safety.

207.2 Description of General Nuclear Safety Procedures

The plant superintendent will make frequent trips through the facility paying special attention to adherence to procedures used. Any violations will immediately be reported to the supervisor in charge for disciplinary action. All new employees will be given a lecture on nuclear safety by a qualified employee during the indoctrination period. Monthly safety meetings will be held at which time special topics such as nuclear safety and health physics problems will be discussed.

Changes to equipment, piping or procedures where nuclear safety is involved will be described in writing subject to the approval by the Supervisor, Nuclear Safety, before such modifications or changes are made.