U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION V

Report No. 70-1257/79-06

Docket No. 70-1257 License No. SNM-1227 Safeguards Group 1

Licensee: Exxon Nuclear Company
2101 Horn Rapids Road
Richland, Washington 99352

Facility Name: Richland Facility

Inspection at: Richland, Washington

Inspection conducted: June 11-15, 1979

Inspectors: W. J. Cooley 7/18/79
W. J. Cooley, Fuel Facilities Inspector — Date Signed

Date Signed

Date Signed

Approved By: F. A. Wenslawski 7/19/79
for H. E. Book, Chief, Fuel Facility and Materials Safety Branch — Date Signed

Summary:

Inspection on June 11-15, 1979 (Report No. 70-1257/79-06)

Areas Inspected: Facility changes and modifications; internal review and audit; Safety Committee activities; employee training; operations review; criticality safety; radiation protection; radioactive waste management; and transportation program. The inspection involved 30 inspector-hours onsite by one inspector.

Results: No items of noncompliance or deviations were identified.

RV Form 219 (2)

DETAILS

1. Persons Contacted

*R. B. Stevenson, Manager, UO_2 Shop Operations
*R. H. Purcell, Manager, Auxiliary Operations
T. C. Probasco, Engineer, Nuclear and Industrial Safety
H. P. Estey, Manager, Licensing and Compliance, Richland Facility
*M. L. Smith, Senior Engineer, Radiological Safety
*R. L. Miles, Supervisor, Radiological Safety
R. H. Schutt, Specialist, Criticality Safety
J. B. Edgar, Manager, Traffic Operations

*Denotes those attending the exit interview.

2. Facility Changes and Modifications

At the time of this inspection the licensee was continuing refurbishing and expanding the chemical liquid waste lagoons. Lagoon No. 4 was being constructed. Lagoon No. 1 had been drained and a double lining of Hyperlon® had been placed in that lagoon. A layer of sand had been placed between the two Hyperlon® liners and sampling system of polyvinyl chloride tubing had been placed in the sand layer to permit sampling for leakage. Lagoon No. 2 had been drained and approximately ten cores had been drilled in its base. The licensee plans on analysing those cores for uranium beta activity. If a positive response to beta activity is obtained, the cores will be chemically analysed for uranium. Similar refurbishing of Lagoon No. 3 is planned. Similar lining and sampling ports will be placed in the newly constructed Lagoon No. 4.

Further monitoring of the lagoons will be provided by 13 test wells. Ten of those wells will be, generally, down stream of the ground water flow with respect to the lagoons. One well will be located upstream of the lagoons and a final well located some distance from the lagoons providing background, ground water information. The above work is planned for completion in 1979.

Since the last inspection the licensee has relocated the Contaminated Material Storage building from the western perimeter of the site to a location near chemical waste storage Lagoon No. 1. During the relocation the licensee has placed the fissile material content of the storage building in seven truck trailers. Some fissile material had been placed in the relocated building which has been renamed the Packaged Radioactive Materials Storage building. The former location of the contaminated materials storage building will be occupied by a maintenance shop to be constructed. There will be no use of radioactive materials in the new maintenance shop.

Additional office space was being constructed at the time of this inspection.

In addition to the above facility changes which were in progress at the time of this inspection, the licensee plans on increased fuel production capacity; improved capability to remove uranium from liquid waste before discharge to the lagoons; installation of a temporary and subsequently a permanent uranium-contaminated clothing laundering facility; and the construction and operation of a waste uranium recovery facility. Those changes and a number of others are projected for initiation during 1979. The proposed changes in facilities and equipment have been submitted to the Nuclear Regulatory Commission (NRC), Division of Fuel Cycle and Material Safety for evaluation, along with the licensee's timely (May 31, 1979) renewal application for the subject license.

3. Internal Review and Audit

This inspection included the review of criticality safety audit reports dating from January to June, 1979. Those audits were conducted independently by the criticality safety specialist and the nuclear safety specialist on a monthly and bi-monthly frequency, respectively. Our review indicated no problems with respect to criticality safety.

This inspection included a review of radiological safety audits conducted at a monthly frequency by the Senior Engineer, Radiological Safety. That review covered the period of January through June, 1979. Recommmendations resulting from those audits included improved housekeeping in the scrap recovery area; and some required decontamination effort in Room 100, scrap recovery area, and blending room. The audits included an extensive wipe survey throughout the mixed oxide building.

The audits treated as a significant problem relatively high airborne concentrations of uranium in the men's change room of the UO_2 building. Those concentrations were attributed to marginal filtered exhaust air flow; location of air sampling equipment between the contaminated clothing bin and the filtered air exhaust port; and conjestion in the change room. Certain actions were identified and assigned to reduce the air concentrations in the mens change room. They included the continued monitoring and emphasis by radiological safety personnel on change room housekeeping; relocation of the filtered exhaust port; evaluation of a number of proposed changes in the change room lay-out; air balancing the exhaust system to improve ventilation; and the elimination of contaminated clothing sorting in the change room with the installation of an on-site contaminated clothing laundry. Those matters were being pursued at the time of this inspection.

4. Safety Committee Activities

This inspection included a review of the meeting minutes of the licensee's Health and Safety Council. That review covered the period from January through May, 1979.

The review indicated that chip guards had been placed on pellet grinder ring gauges to prevent eye injuries from pellet chips (problem mentioned in IE Report 70-1257/79-04, Section 5, dated March 16, 1979). The review indicated the possible relocation of the emergency evacuation staging area due to new construction of office space. The Health and Safety Council minutes also indicated the formation of a subcommittee named ALARA for the purpose of recommending reasonably achievable reductions in potenial exposures.

5. Employee Training

The licensee conducts employee training programs including periodic retraining sessions. About April, 1979, that training program was augmented by special sessions designed to supply the employees with more quantitative type of information such as warning levels for respirator use, warning levels for bioassay repeat sampling, location of air sampling equipment, and air concentration permissible limits. Those special sessions consist of one hour presentations by experts in criticality, radiological and industrial safety. At the time of this inspection, approximately six sessions of that type had been conducted at a frequency of once per week. All employees located in Room 100 of UO_2 plant had been reached on two occasions. The licensee intends to continue those sessions indefinitely in the future. Discussions with licensee personnel including an employee at the UO_2 plant indicated the sessions are well received as indicated by good questions and discussion of problems on the part of employees. The special sessions were instituted, in part, as a result of an expression for need of more quantitative, technical, health physics type information by an employee of the subject licensee.

This inspection included a detailed review of the formal, initial training and retraining sessions on the subject of criticality, radiological, and industrial safety presented to a typical employee. The information was obtained from a review of licensee records of training provided to that employee. Those records indicated an initial indoctrination at the time of hire in the latter part of 1977. There were subsequently 15 training sessions presented to that employee over the subsequent 18 months. While specific sessions were devoted to more than one safety subject, it was possible to weigh those sessions in the ratio of 8:4:3 with respect to radiological safety, criticality safety, and operational type of training. Subjects range to industrial safety, air sampling, exposure limits, bioassay samples, enrichment control, use of survey instruments, storage of containers of fissile material, use of step-off pads, wearing contact lenses and facial hair, criticality safety specifications, and standard operating procedures.

6. Operations Review

This inspection included a visit to the Special Enrichment Storage trailer located adjacent to the UO_2 building. It was observed that the exterior of the trailer was posted with the proper radioactive material warning signs, a prohibition against storing fissile material within ten feet of the trailer wall, and the proper fire zone rating D (no water). The interior of the trailer was used for storage of 7.1% enriched material. That material was contained in 5-gallon pails mounted in a wooden frame which provided one foot surface to surface horizontal spacing. The pails were arranged one-high. Each pail was properly labeled with information as to enrichment, gross, tare, and net weight. The interior of the trailer was posted with a current copy of the criticality safety specification. That specification provided for the one-foot minimum spacing of containers, observed. It provided for a maximum loading of ten kilograms UO_2 per container and restricted movement of the material to ten kilograms maximum at any one time.

During this inspection the temporary storage of fissile material in truck trailers (mentioned in Section 2, above) was visited. The seven trailers in use for that storage were spaced at ten foot intervals. Four sides of each of the trailers exhibited appropriate posting regarding radioactive materials, fire zone classification, and the required separation of ten feet from other fissile material. A view of the interior of one of the trailers indicated that containers of fissile material were spaced in metal grids at a minimum of one foot spacing surface to surface in the horizontal. The appropriate criticality safety specification was posted in the interior of the trailers according to the licensee representative.

During this inspection a visit was made to the relocated Contaminated Material Storage building. Containers of fissile material were spaced at one foot surface to surface spacing horizontally in metal grids. Containers were identified as to gross, tare, and net weight of contents as well as enrichment. The building was posted with the appropriate criticality safety specification and caution radioactive material signs.

All the above storage facilities were secured with locks at the time of this visit. Access to the buildings was provided by the Material Accountability Supervisor.

7. Criticality Safety

One of the planned changes in facilities mentioned in Section 2, above, is the construction of facilities and equipment to reduce the uranium content of low level liquid waste issuing from the conversion areas of the UO_2 plant. That process is planned to incorporate a 10,000 gallon

feed tank, a centrifuge, ion exchange columns and various quarantine tanks in each of three clean-up lines. Preliminary criticality analytical work has been done on that clean-up system.

The quarantine tanks will be typical of those presently installed in the UO_2 building and will be subcritical by geometry at 5% enrichment. The 10,000 gallon feed tank and 20-inch diameter ion exchange columns will be controlled by concentration with consideration to the possibility of precipitation in the large tank and maximum possible loading of the ion exhange columns.

Input into the large feed tank will be at an administratively controlled concentration limit. Typical input concentrations will be about 0.2 grams per liter uranium as uranyl nitrate. The large tank will be provided with a sparge or stirring system, a conical base, and viewing ports.

Using the guide lines and data presented in ARH600, Volume 1, Page 1C-8; Table III.B.2-7; Table III.B.6-3; and Table III.B.6-6, certain tentative parameters have been established. The safe limiting solution concentration at 5% enrichment is taken as 142 grams uranium per liter at a K effective = 0.95. The total subcritical mass of 5% enriched uranium at uranyl nitrate is taken as 57 kilograms uranium at a K effective of 0.95. The total permissible subcritcal mass of 5% enriched uranium as a UO_2 water mixture is taken as 27 kilogram uranium at a K effective of 0.95.

The licensee has conducted and will continue to conduct experiments to determine the maximum loading of the ion exchange column resins. Data obtained to date indicate the maximum loading is less than 27 kilograms uranium. The final analysis is planned for submittal to the NRC for review.

8. Radiation Protection

This inspection included a review of air sample data acquired in the UO_2 building and compiled in monthly reports for months of February through May, 1979. Over that period of time typical sampling included about 3,000 air samples per month. Of those, between 3 and 5% of the total were in excess of the 10 CFR 20 limit of 1×10^{-10} uCi/cc. About 60% of the total indicated positive results in the range of $0.1 - 1 \times 10^{-10}$ uCi/cc. The remaining approximate 37% of the samples were less than 1×10^{-11} uCi/cc. A similar review over the same period of time was made of the air sample data by referring to individual air sample results and by referring to corresponding, narrative reports in the health physics technician log book. Those two sources were consistent in identifying occasions when respiratory protective equipment was used. The use of respiratory protective equipment was indicated in both sources of information when air sample results were in excess of 5×10^{-11} uCi/cc (the licensee's action level). The use of that equipment was indicated in the air sample result records on several

occasions when the air borne concentration was less than 5×10^{-11} uCi/cc. A licensee representative explained that the use of respirators was required for certain operations as a precautionary measure and not always as a result of elevated airborne concentrations.

This inspection included a review of uranalysis bioassay data for the period February through May, 1979. The analysis is performed by an independent laboratory. The limit of detection of the analysis is 10 ug/l.

Approximately 100 bioassay samples of the type are obtained for employees each month. The review of bioassay results for a four month interval indicated that approximately 25% of the samples showed positive results laying between 10 micrograms per liter and 25 micrograms per liter. The licensee's action level for resamples is 25 micrograms per liter for insoluble material and 50 micrograms per liter for soluable material.

Of the approximate 400 samples reviewed during this inspection, two were in excess of 50 micrograms per liter. One of those samples indicated 135 micrograms per liter on January 24, 1979 and the same individual indicated less than 10 micrograms per liter on repeat analysis dated January 30, 1979. A second individual result indicated a 58.9 micrograms per liter on March 22, 1979 and subsequently indicated less that 10 micrograms per liter on April 6, 1979.

The bioassay uranalysis review included results for one individual dated from the hire date in late 1977 through April, 1979. The review indicated a total of 13 analyses performed over 16 months. All results were less than the limit of detection with the exception of one which indicated 27 micrograms per liter.

9. Waste Uranium Recovery

The licensee's plans for the construction of a waste uranium recovery building has been discussed above in this report. A number of uranium recovery processes will be incorporated. Solid waste to be handled includes gloves, papers, rags, prefilters, HEPA filters, glass, small metal parts, etc. It is also anticipated that solid waste from the chemical waste lagoons will be processed for uranium recovery.

The head end of the recovery system will consist of physically sorting the waste material into three categories: nonleachable wastes which are planned for burial; highly uranium contaminated items such as filters which will be campaigned through a shredder; and general refuse which will be processed through a shredder on a continuous basis.

Loose uranium dioxide material will be physically separated during the shredding process, collected in 5-gallon buckets and eventually processed through a uranium scrap recovery facility.

The shredded waste will be segregated into high and low uranium content waste fractions. The high uranium content shredded waste will be leached, the uranium recovered, and eventually processed in the uranium scrap recovery facility. Solids remaining after leaching will be transported to burial.

Using a combination leaching, solvent extraction, precipitation and ion exchange, uranium will be recovered from the chemical lagoon waste. Solid chemical waste from the process will be sent to burial. Liquid chemical waste depleted in uranium will be discharged to the lagoon system.

10. Transportation Program

The licensee's transport program and procedures is contained in Document XN281, Materials Instruction Manual. Management approval of the procedures include those of the Managers, Materials and Purchasing, Manufacturing, Quality Assurance, and Quality Control.

The manual includes a number of procedures which, in general, are addressed to the handling of materials and many of which are addressed to the receipt and shipment of radioactive materials. Following are a number of observations made during a review of materials instuction manual.

Procedure No. 6 entitled "Receipt of UF6" requires a survey of the incoming shipment and inspection of the shipment for damage. References are made in the procedure to the criticality safety specification addressed to the handling of gas cylinders. The procedure requires an inspection of the cylinder and its appurtenances prior to reshipment. The required forms for recording survey and inspection information are illustrated.

Procedure No. 9 is entilted "Receipt of Plutonium Dioxide" and illustrates a typical progressive survey as successive containers of plutonium are opened.

Procedure No. 10 is a comprehensive procedure addressed to the shipment of Exxon fuel assemblies. It addresses contamination and radiation levels; inspection of containers prior to loading; details of container preparation, inspection, and refurbishing; loading procedures; off loading and unpackaging; labeling; and records of package inspection and loading. The procedure also addresses the instructions to be given to the carrier and to escorts. It includes tie-down requirements and hand-to-hand transfer records.

Procedure No. 10 entitled "Procedure for Unloading Model No. 51032-1" is a detailed unloading procedure for the Exxon shipping container.

Similarly, Procedure Nos. 11a and 11 b are addressed to the unloading of Models RA-3 Shipping Container and Model M-51032-1a, a modification of the Exxon shipping container.

Procedure No. 12 discussed the hazards and radiation levels associated with the shipment of mixed oxide waste.

Additional procedures are addressed to the shipment of samples and pellets for analysis to Battelle Northwest Laboratories; the receipt of uranium in forms other than UF6; and the shipment of UF6 cylinders to the Department of Energy.

Procedure No. 22 addresses details of the receipt of empty fuel containers including required surveys, decontamination, opening of containers, inspection for damage, records of inspection results and repair.

Procedure No. 30 addresses the shipment of uranium waste to burial sites indicating the container types, container maximum loading, surveys required, labels required and burial site license limitations.

Records maintained by the licensee with regard to each shipment include an inspection report by personnel of Materials and Purchasing. That report addresses visual inspection of the Model 51032-1 shipping container packaging shell, exterior stencils, exterior closure rings, bolts, washers, etc., strongback assembly, shock mounts, and fuel assembly clamps and retainer bars. Manufacturing operations personnel assemble and load the shipping container with quality control personnel present. Quality Control personnel perform an inspection at the time of loading which is also recorded. That QC inspection is also in the form of a check off list and includes inspection of the shipping container and its parts, location of internal and external excellerometers, and assurance that the containers are properly closed.

The licensee routinely witnesses and inspects the unloading of fuel assembly shipping containers and records the condition of security seals, notes any external damage, observes the interior and exterior excellerometers, notes internal damage, and notes fuel assembly damage, if any.

For each fuel shipment a separate folder containing the records mentioned above and others is maintained by the licensee. That folder contains a completed shipment receipt; export license, if any; fuel assembly packaging inspection report (preshipment); fuel assembly packaging inspection report (completed shipment); shipping record sheet; address label; radioactive shipment certification; instructions to drivers and escorts; bill of lading; QA signature sheet, and AEC 741 Form.

The licensee's Quality Assurance Program for packaging radioactive materials has been submitted to the NRC for review pursuant to 10 CFR 71.51. The identification of that document is XN-NF-439. The overall responsibility assignments for the shipping and receiving of radioactive material is given in that document. Additional procedures in the area of transportation are found in the licensee's radiological safety manual, Document XN-67.

In addition to the Exxon Model No. 51032-1, the licensee uses the RA-3 and CE-250 for the shipment of fuel material. During this inspection, it was

noted that all reference material in Certificate of Compliance 4986 was available at the UO_2 plant. The required backup for Certificate of Compliance 9022 for the Model CE-250 was available at the R and T Center of the licensee.

The licensee possesses 56 Model RA-3 shipping containers for fuel assemblies. Records maintained by the licensee indicated that they were fabricated by Lanzen, Roseville, Michigan. That company provided Exxon with a written certification that the RA-3 containers were manufactured according to the GE drawings listed in Certificate of Compliance No. 4986, Rev. 3, dated November 12, 1976.

11. Management Interview

The scope and results of the inspection were discussed with licensee representatives at the conclusion of the inspection on June 15, 1979. Those persons were informed that no items of noncompliance were observed.