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

Region I

Report No. 70-1143/79-05

Docket No. 70-1143

License No. SNM-1120 Priority 1 Category Pu

Licensee: Westinghouse Electric Corporation
NFD and ARD Plutonium Laboratories
P. O. Box 355

Pittsburgh, Pennsylvaria 15230

Facility Name: Plutonium Fuels Development Laboratories

Inspection at: Cheswick, Pennsylvania

Inspection conducted: March 27-30, 1979

Inspectors: W. W. Kinney 5/15/79
W. W. Kinney, Project Inspector date signed

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date signed

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date signed

Approved by: H. W. Crocker 6/20/79
H. W. Crocker, Chief, Fuel Facility Projects Section, FF&MS Branch date signed

Inspection Summary:
Inspection on March 27-30, 1979 (Report No. 70-1143/79-05)
Areas Inspected: Routine, unannounced inspection by a region based inspector of licensee action on previous inspection findings; organization; operations; nuclear safety; facility modifications and changes; maintenance; internal reviews and audits; calibrations; safety committee activities; housekeeping controls; and nonroutine events. The inspection involved 28 inspector-hours onsite by one NRC region based inspector.
Results: Of the 11 areas inspected no apparent items of noncompliance or deviations were identified in 10 areas. One apparent item of noncompliance was identified in nuclear safety (Deficiency - Failure to maintain spacing for fissile units required by License Condition 16 in that the square surface area for the fuel pins permitted to be stored in a storage rack overlapped the square surface area for fuel pins permitted to be located in a "gatling gun" storage fixture in a glove box extension located directly over the fuel pin storage rack, Paragraph 5.a).

DETAILS

1. Persons Contacted

*C. E. Anthony, General Manager, Electro-Mechanical Division
*W. E. Piros, Manager, Health, Safety, and Services
*J. J. Bastin, Manager, Plutonium Fuels Development Laboratory
*M. L. Ray, Acting Advanced Fuels Laboratory Foreman

The inspector also interviewed 13 other licensee employees during the course of the inspection.

*denotes those present at the exit interview.

2. Licensee Action on Previous Inspection Findings

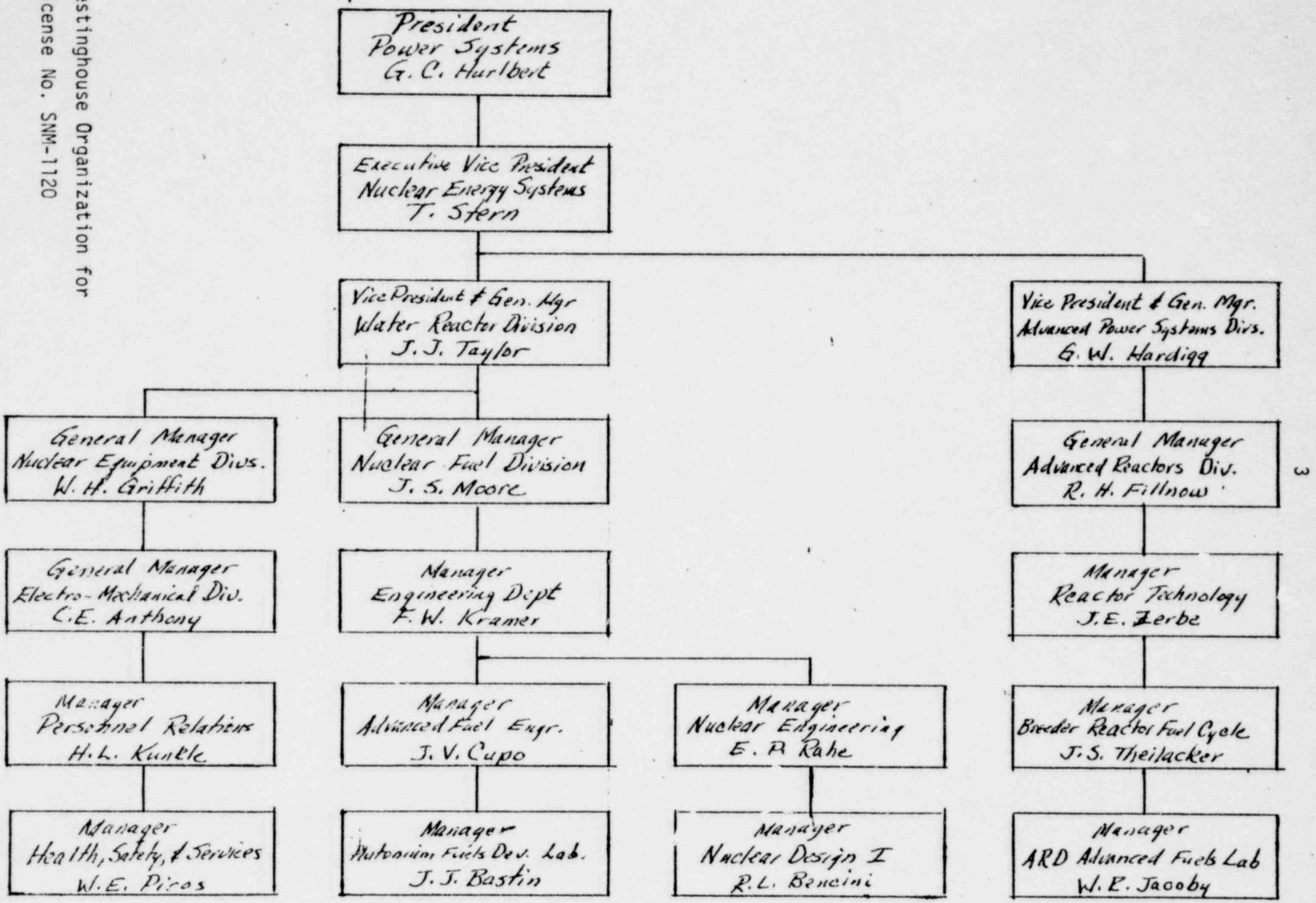
(Closed) Deficiency (78-20-01): The licensee failed to have a nuclear safety sign posted in the Analytical Laboratory Counting Room in Building 8. The inspector verified that the posting was in place in the counting room and that the other required postings were in place in Building 8.

(Closed) Deficiency (78-20-02): The licensee had unauthorized possession of thorium in the ARD Plutonium Laboratories of Building 7. The inspector verified that the licensee moved the thorium to an approved location. The inspector also verified that the licensee issued an instruction letter on License No. SNM-1120 possession limits to 32 staff members. The letter clarified the possession limits for Building 8, Building 7 - Nuclear Fuel Division, and Building 7 - Advanced Reactors Division.

3. Organization

The organizations involved with the activities licensed under SNM-1120 are shown in the figure entitled, "Westinghouse Organization for License No. SNM-1120." As shown in the figure, the Plutonium Fuels Development Laboratory is under the Nuclear Fuel Division; the ARD Advanced Fuels Laboratory is under the Advanced Reactors Division, and Health, Safety, and Services is under the Electro-Mechanical Division. Safety in the activities conducted under License No. SNM-1120 involves many organizational interfaces.

Westinghouse Organization for
License No. SNM-1120



According to License No. SNM-1120, the Manager of the Plutonium Fuels Development Laboratory (PFLD), Mr. J. J. Bastin, bears prime responsibility for overall health protection and safety in the Plutonium Fuels Development Laboratory, Building 8. Also, according to the license, the Manager of the ARD Advanced Fuels Laboratory in Building 8, Dr. W. R. Jacoby, is responsible to the Manager of PFDL in all matters concerning overall health protection and safety within the ARD Advanced Fuels Laboratory.

According to License No. SNM-1120, the Manager of the ARD Cheswick Fuel Facility, Dr. W. R. Jacoby, bears the prime responsibility for overall health protection and safety in the ARD Plutonium Laboratory which occupies a portion of Building 7.

According to the license, both the Manager of the Plutonium Fuels Development Laboratory and the Manager of the ARD Cheswick Fuel Facility consult with the Health, Safety, and Services Manager of the Electro-Mechanical Division, Mr. W. E. Piros, on matters involving radiation protection, industrial hygiene, laboratory safety, and routine nuclear criticality safety. The General Manager of the Elector-Mechanical Division, Mr. C. E. Anthony,has the overall responsibility for the safety of operations at the Cheswick Site.

Mr. J. J. Bastin, current Plutonium Fuels Development Laboratory Manger, does not technically meet the license-required qualifications for this position in that his Bachelor of Science degree is in Administration rather than in one of the Sciences or Engineering. In January, 1978, the licensee requested an amendment to their license to waive the requirement that the B. S. degree of the Manager of the PFDL be in one of the Sciences or Engineering. The license will be amended to waive the subject requirement, according to the Fuel Processing and Fabrication Branch of the NRC Office of Nuclear Material Safety and Safeguards.

4. Operations Review

The inspector performed a physical inspection of the facilities immediately after the entrance interviews. No production activities were taking place at the time of the inspection because of a physical inventory for nuclear material accounting purposes.

The inspector noted that nuclear safety limits were posted at work and storage locations. Also, materials were noted to be in accordance with the nuclear safety limits.

The inspector reviewed five operating procedures in use in the ARD Advanced Fuel Laboratory in Building 8. The inspector then discussed the operations with an operator to assess the operators knowledge of the operations, especially the safety requirements. The operating procedures involved in this review were:

OP-11-800, Revision 4, General Operating Procedure for the ARD Advanced Fuel Laboratory, issued March 13, 1979;

OP-11-802, Revision 1, Powder Receipt, Blending and Milling, issued November 17, 1977;

OP-11-804, Revision 3, Powder Preparation and Blending, issued March 13, 1979;

OP-11-807, Revision 4, Debinding, Sintering, Carbothermic Reduction, and Pressing of Compacts, issued March 13, 1979; and,

OP-11-809, Revision 4, Centerless Grinding, issued March 13, 1979.

ARD Advanced Fuels Laboratory OP-11-800, General Operating Procedures for the ARD Advanced Fuels Laboratory includes many procedures such as the box posting change procedure; instructions for the transfer of fissile material into and out of a glove box; removal of material from a shipping container; etc. The inspector chose to review the procedure for replacing bags and gloves on a glove box and the procedure for bag transfer of materials.

During the review of the procedure for replacing bags and gloves on a glove box, the inspector noted that the procedure called for the operator performing the work to don a mask before starting the operator. However, the procedure did not state when the mask could be removed. All the licensee representa-

tives, including the operator, agreed that the mask could be removed after the job was completed and the contamination surveys showed no contamination to be present. The licensee indicated they would consider this item during the next revision of the procedure.

During the review of the procedure for making a bag transfer of material, the inspector noted that the procedure did not call for operators to wear a mask during this operation. The inspector also noted that the procedure did not call for double-bagging the bagged out material. The licensee stated that they had never suffered a bag rupture or other loss of airborne contamination control during a bag transfer operation; therefore, they do not require that masks be worn on areas roped off during bag transfer operations. The licensee representatives, including the operator, stated that bagged material is always double-bagged. The licensee indicated they would include the double-bagging instructions in the procedure during the next revision.

During the review of the OP-11-802, and 809 procedures, the inspector noted parts of procedures which probably unintentionally imposed unneeded restrictions on the operations. For instance:

-- Item 5.1.1.1 of OP-11-804 stated that under dry operations a 2.2 kilogram fissile material mass limit was in effect and the hydrogenous material was restricted except 100 cc of lubricant was allowed. Item 6.2.1 of this procedure stated that for operation under the 2.2 kilogram fissile material mass limit that all liquids were prohibited from the box. Therefore, item 6.2.1 did not allow the 100 cc of lubricant in the box which item 5.1.1.1 allowed.

-- Item 6.2.2 of OP-11-804 stated that for operation under the 2.2 kilogram fissile mass limit that storage of fissile material was allowed only in containers having an ID no greater than 5.5 inches. The licensee has ball mill vessels in the glovebox with ID's greater than 5.5 inches. There is no reason, from a nuclear safety viewpoint, to impose this additional geometric limit, as well as the mass limit, on the operations.

-- Under the fissile limit sections of OP-11-807 and 809, only the 2.2 kilogram fissile material mass limit was provided. Therefore, under these procedures, the operators could not use the 2.0 liter volume limit or the 220 gram fissile material limit for wet operations in the glove boxes covered by these operations.

The review of the operations with the operators showed the operators were aware of requirements of these procedures. The operator who discussed the procedure for changing bags and gloves on a glove box demonstrated to the inspector by his explanation that he was knowledgeable in the proper methods to change a bag or glove on a glove box with proper contamination control and radiation protection techniques being employed. Discussion with the operator and examination of glove box 2 showed that empty containers were not being kept in the designated area marked by tape as called for in item 6.1.11 of the Precautions section of the procedure. Numerous empty containers were in the glove box and the containers were not in the designated area. The licensee indicated that appropriate action would be taken.

5. Nuclear Safety

a. Isolation and Interaction of Arrays

The licensee put a new welding box and fuel pin storage rack into service in mid February, 1979. The new welding box includes an extension which contains a "gatling gun" storage fixture for storing pins during the welding process. This extension containing the "gatling gun" storage fixture is directly above the fuel pin storage rack with the edge of the extension chamber approximately 9 1/2 inches above the edge of the storage rack.

The Manager of Health, Safety, and Services performed a nuclear interaction evaluation and authorized the establishment of a 3.8 kilogram plutonium and plutonium equivalent of U-235 limit for the fissile material present in the pins stored in the fuel storage rack. This 3.8 mass limit is the Maximum Permissible Value (MPV) for dry ceramic pellets when the plutonium is in the form of PuC which is given in Item 2 of Table 7.1.2 of the License, Maximum Permissible Values Applicable to Subcrits Using Uranium At Any Enrichment as Diluent. The evaluation also authorized 1.02 kilograms of plutonium and plutonium equivalent of U-235 in the "gatling gun" storage fixture which is directly above the fuel pin storage rack and occupies the same horizontal surface area as the fuel pin storage rack. On the basis of the evaluation the fuel pin storage rack was posted with the 3.8 kilogram MPV. Also, the glovebox which included the extension containing the "gatling gun" storage fixture was posted with a sign which stated that all fuel in the glovebox must be located either in the welding/loading fixture or in the storage fixture in the large extension chamber, and no other fuel is permitted in the glovebox. The fact that the licensee allowed

more than a Maximum Permissible Value in the same horizontal surface area is an item of noncompliance with License Condition No. 16.

Condition No. 16 states "Notwithstanding the requirements imposed by paragraph 7.2, page 66, of the application dated June 13, 1969, spacing of fissile units shall be provided as exemplified in Figure 3 of the May 26, 1972 letter (1) using a square surface area for each unit and (2) avoiding overlapping of such areas." In the above instance, the horizontal surface area for the fuel pin storage rack fissile unit of 3.8 kilograms of plutonium was overlapped by the horizontal surface area for the "gatling gun" storage fixture positioned in the glovebox extension chamber. This is not allowed by License Condition 16. It should be noted that Figure 3 of the May 26, 1972 letter shows fissile units on an X-Y plane. The fissile units on the X-Y plane are located in glove boxes; therefore, the X-Y plane is horizontal, and the surface area of concern in License Condition 16 is the horizontal surface area.

Furthermore, if the X-Y plane is considered to be either the side or end vertical plane normal to the horizontal plane, evaluation shows that the square surface areas of adjacent fissile units would overlap.

If the vertical plane is at the side of the fuel pin storage race and the "gatling gun" storage fixture, the square surface area for the material in the "gatling gun" would overlap the square surface area for the Maximum Permissible Value (MPV) of plutonium in the fuel pin storage rack. The fuel in the pins is in a stack of pellets 3 feet long; therefore, the square surface area for the MPV in the storage rack is a 3 foot by 3 foot square. The square surface area for the pins in the "gatling gun" storage fixture would also be a 3 foot by 3 foot square.

If the vertical plane is at the end of the fuel pin storage rack and the "gatling gun" storage fixture, the square surface areas associated with these two fissile units would not overlap. However, the square surface area for a transfer cart used to transfer material to and from the storage rack would overlap the square surface area associated with the MPV of the fuel pin storage rack. It might also overlap the square surface area associated with the "gatling gun."

According to the licensee the total amount of material being processed in the entire ARD Advanced Fuels Laboratory in their current contract

involves significantly less than 3.8 kilograms of plutonium. Therefore, since the time the posting was put up in mid February, there has been no chance that more than 3.8 kilograms of fissile material has been present in both the fuel pin storage rack and the "gatling gun" storage fixture in the glove box extension.

b. Nuclear Safety Postings and Transfer Logs

During the physical inspection of the Plutonium Fuels Development Laboratory and the ARD Advanced Fuels Laboratory in Building 8 and the ARD Plutonium Laboratory in Building 7 the inspector noted that glove boxes and storage areas were posted with nuclear safety signs. The inspector also noted that the transfer logs showing the amount of material present in locations controlled by mass limits were being used, and the logs appeared to be correct.

c. Criticality Monitors

During the inspection of the facilities, the inspector noted the criticality monitors. The monitors were located as required by Figure 6.5.1 of the approved license application. All the monitors appeared to be operating properly. According to the licensee, the alarm setpoints are set between 8 and 15 mr/hr.

Records of the weekly checks of the operability of the Building 8 criticality monitors for the period from December 15, 1978 through March 29, 1979, were examined.

d. Raschig Ring Tanks

The fact that the raschig rings in tanks R-7, R-8, R-12, R-14, and R-15 were inspected and sampled on December 4, 1978, was documented in Inspection Report 70-1143/78-20. The results of the chemical analyses of the sample rings for boron content was not available at the time of that inspection. The inspector inspected the records of the subject raschig ring filled tank inspections for ring level, condition of rings, and B_2O_3 content of the rings. No problems were identified by the inspections. The B_2O_3 content of the rings were within the ANSI N16.4-1971 requirements.

6. Modifications and Changes

As discussed previously, the licensee has committed the new welding box and fuel pin storage rack to service.

The licensee has not completed the installation of the new rod cleaning tanks in the General Development Laboratory in Building 8.

7. Maintenance

The individuals in the maintenance force working in the Plutonium Fuels Development Laboratory (PFDL) are assigned to PFDL from the site Electro-Mechanical Division on at least a 9 month assignment. Most of the maintenance personnel have been assigned to PFDL for years, according to the Maintenance Foreman. There are nine maintenance workers routinely assigned to PFDL. These include two electricians, 2 mechanics, 1 welder, 1 utility man, 1 buildings and grounds man, 1 helper, and 1 janitor.

The licensee uses a permit system for cutting, welding, or open flame operations with portable gas or electrical equipment. This system calls for the following Precautions Against Fire.

a. Obtain a written permit before using portable cutting, welding, or open flame equipment anywhere in the plant except in permanent safe-guarded locations.

b. Before starting, remove all combustible materials practical and protect all other combustibles within 35 feet. In outside work, don't let sparks enter windows or doors.

c. After completion of operation, inspect surrounding areas for smoldering fires before leaving area.

d. Don't use cutting or welding equipment near flammable liquids or on closed tanks which have held flammable liquids or other combustibles. Remove inside deposits before working on ducts.

e. Keep cutting and welding equipment in good condition. Carefully follow manufacturer's instruction for its use and maintenance.

The licensee also uses a lock and tag procedure on electrical equipment. The inspector asked for the written procedure concerning this procedure. The licensee stated this is done as a matter of acceptable practice.

The licensee also has an Administrative Procedure, PFDL-AP-0001, Revision 10, entitled Procedure Designation and Control. Section 2.5 of this procedure addresses Special Procedures and this calls for a Special Procedure to

be used for installation, modification, and maintenance of equipment where nuclear safety is involved. The inspector asked for and received an example of such a special procedure. The procedure was PFDL-SP-03-07-78, Revision 0, Testing the Operation of the Thermal Detector and Spray Head in the Laboratory Ventilation System, dated March 7, 1978. The procedure was prepared by the maintenance foreman, was reviewed by a process engineer and a radiation specialist, and was approved by the Health, Safety, and Services Manager and the PFDL Manager. The special procedure called for radiation protection measures to be taken during the work to be performed in accordance with the special instructions for the work to be performed. The licensee also had a sheet with the Special Procedure which had the signature of the people doing the work stating they had read and understood the procedure and had been constructed in the procedure.

The licensee supplied the following procedures to the inspector as the procedures they must have for administering the maintenance program. These were:

PFDL-AP-0501, Revision 6, Installation, Modification, and Maintenance of Safety Related Equipment, dated December 19, 1978;

PFDL-AP-0502, Revision 2, Records Program for PFDL Safety Related Equipment, dated February 22, 1978;

PFDL-AP-0503, Revision 3, Prevention Maintenance Procedure, dated February 13, 1979;

PFDL-AP-0504, Revision 3, Corrective Action for Safety Related Equipment; and,

PFDL-AP-0507, Procurement and Storage of Safety Related Equipment.

The main thrust of these procedures is to provide for the licensee to meet the requirements of 10 CFR 21, Reporting of Defects and Noncompliance. For instance, in the preventative maintenance program the licensee has identified the pieces of equipment which are safety related. The preventative maintenance cards for these pieces of equipment are pink, while the cards for other equipment are blue. The record system separates the records for the two types of equipment.

The licensee has a Safety Related Nonconformance Report. Anytime a failure or maintenance problem is encountered on a piece of safety related equipment

one of these reports are made out and sent to the Maintenance Foreman. The corrective action is entered on this report. The file of the report is maintained in the foreman's office. A quarterly report on the Safety Related Nonconformance Reports is made by the Maintenance Foreman to the PFDL Manager and the concerned Quality Assurance Manager.

The inspector inspected some of the equipment involved in the preventative maintenance program and reviewed the preventative maintenance records for the equipment. The preventative maintenance sheets for the various pieces of equipment listed the work to be performed in the maintenance activity and the schedule for the performance of the work. The records show the work was done according to the schedule. Any unusual work performed was also recorded on the sheets.

8. Internal Reviews and Audits

The inspector reviewed the records of the quarterly audits of the ARD Plutonium Laboratory by W. E. Piros on March 30, May 17, August 1, and December 5, 1978. No problems in nuclear and radiological safety were discovered in these audits. According to the license, the ARD Cheswick Nuclear Safety Committee performs the quarterly audits specified in the license application. Mr. Piros is a member of this committee, according to the approved license application.

The inspector reviewed the records of the monthly audits of the Plutonium Fuels Development Laboratory and ARD Advanced Fuels Laboratory in Building 8 which were conducted for the months of December 1978 through March 1979. These audits were performed by the Manager of Health, Safety, and Services and the Manager of the Plutonium Fuels Development Laboratory as required by the license. During the December 1978 audit 11 items requiring action were found, and in the January 1979 audit 1 item requiring action was found. The licensee's records showed that these items were corrected satisfactorily.

9. Calibrations

One technician performs the calibration and repair of the radiation survey and measuring instruments including the criticality monitors. This individual also works on some security type equipment and the meteorological instruments.

For the checking of the calibration of the criticality monitors the technician uses two gamma sources. One source placed at the end of the detector

causes the instrument to read between 0.75 and 1 mr/hr. A 9 mCi Cs-137 source is placed at distances of about 1 foot and 1 1/2 feet from the detectors and the instruments and readings are checked to be at 30 mr/hr and 13-14 mr/hr for the source at these distances from the detectors.

For checking the calibration of gamma radiation detection instruments two gamma sources of 200 mCi Cs-137 and 10 mCi Cs-137 are used. The technician checks two readings on each scale of the instrument using these sources at the proper distances from the instruments. For checking the calibration of the alpha radiation detection instruments four alpha sources in a set of standards are used. The sources provide 350, 3,160, 42,400, and 375,180 cpm (2π) for checking the response of the instruments. For the alpha friskers the licensee uses a 600 cpm source to check the response and alarm point of the friskers. The friskers are set to alarm at 100-120 cpm.

The inspector reviewed the calibration, repair, and status records for the radiation detecting instruments. The licensee maintains a card file with the records for two instruments on one card. The calibration checks on the criticality monitors were performed on a January, April, July, October schedule during 1978 and thus far in 1979.

10. Safety Committee

The inspector reviewed the information concerning the Nuclear Criticality Safety Committee. The licensee had a letter dated February 27, 1979, which gave the committee membership to be as follows:

J. V. Cupo, Manager, Advanced Fuel Engineering - Chairman
R. L. Bencini, Manager, Nuclear Design I
W. E. Piros, Manager, Health, Safety, and Services
J. P. Koppel, First Executive Vice President
Mitsabishi Nuclear Fuel Company
B. H. Neuman, Manager, Fuel Cycle Studies, ARD
R. M. Horgos, Senior Engineer, Advanced Fuels Engineering, NFD
W. R. Jacoby, Manager, ARD Advanced Fuels Laboratory, ex officio
J. J. Bastin, Manager, Plutonium Fuels Development Laboratory, ex officio

The inspector reviewed the minutes of the February 19, 1979 meeting. The committee discussed the status of the license renewal; the Bettelle Pacific Northwest Laboratory criticality analyses for the license renewal; a summary of results of NRC inspections during 1977 and 1978; a health physics review

for 1978; facility operations; future NRC regulatory requirements; and the audit responsibilities of the committee. The committee performed an inspection of Building 8. The committee found no items requiring correction from a nuclear criticality safety point of view.

11. Housekeeping Controls

The licensee has a housekeeping policy, which the inspector noted was posted conspicuously in the facility.

According to the licensee, housekeeping is one of the areas inspected during the monthly audits of the PFDL facilities by the Health, Safety, and Services Manager and PFDL Manager.

Fire prevention and safety tours are performed by a member of the Health, Safety, and Services staff and a PFDL foreman. The inspector reviewed the reports of the tours made on November 17, 1978 and February 13, and March 19, 1979. During the tours 2, 8, and 13 items needing correction, respectively, were found. The items were noted to have been corrected.

12. Nonroutine Events

There were no nonroutine events which occurred at any of the facilities licensed under SNM-1120 during the period between December 16, 1978, the date of Inspection 70-1143/78-20, and March 30, 1979, the last date of this inspection.

13. Exit Interview

The inspector met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on March 30, 1979. The inspector presented the scope and findings of the inspection.

The inspector noted that the procedures he reviewed for the ARD Advanced Fuels Laboratory for bag and glove changes and bagging operations had room for minor improvements and the procedures for glove box operations contained apparent inconsistencies and unneeded restrictions on the operations. The licensee indicated they would consider these points and take appropriate action (Paragraph 4).

The inspector noted that a license amendment should be forthcoming soon concerning the qualifications of the Manager of the Plutonium Fuels Development Laboratory (Paragraph 3).

The inspector called Mr. W. E. Piros on April 10, 1979, and informed him of the item of noncompliance with License Condition No. 16 caused by the failure of the licensee to consider License Condition No. 16 in the nuclear safety postings for the amount of fissile material allowed in the fuel pin storage rack and the "gatling gun" storage fixture in a glove box extension located directly above the fuel pin storage rack. This item of noncompliance and the severity level was discussed further with Mr. J. J. Bastin on April 11, 1979 (Paragraph 5.a).