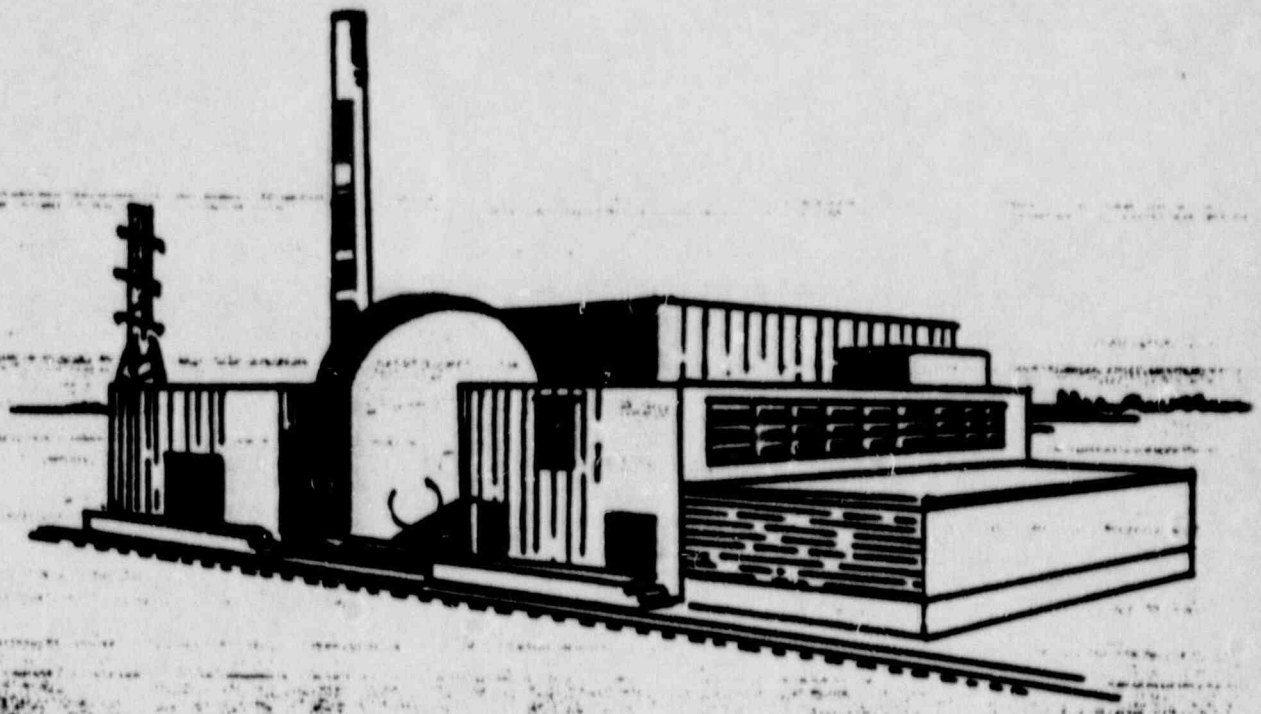

Pathfinder Generating Plant

SIOUX FALLS, SOUTH DAKOTA

REPORT TO UNITED STATES ATOMIC ENERGY COMMISSION

DIVISION OF REACTOR LICENSING

LICENSE NO. DPR-11

SIX-MONTH OPERATING REPORT NO. 7

PLANT OPERATING EXPERIENCE

MAY 14, 1969 to NOVEMBER 14, 1969

NORTHERN STATES POWER COMPANY

PATHFINDER GENERATING PLANT

Six-Month Report No. 7

May 14, 1969 to November 14, 1969

Prepared By

Northern States Power Company

December 2, 1969

TABLE OF CONTENTS

I. INTRODUCTION

Amendment No. 4 to Northern States Power Company's Provisional Facility License No. DPR-11 issued May 14, 1969 for the Pathfinder Generating Plant, requires Northern States to submit:

> A report to the Director, Division of Reactor Licensing of the status of the deactivated Pathfinder facility, including the results of the surveys of radioactivity levels and the status of the special nuclear and byproduct materials stored on the Pathfinder nuclear reactor facility site. The first report shall be filed six months after issuance of this amended facility license and each six months thereafter until such time as NSP files with the Commission's Division of Reactor Licensing its plan for dismantling of the facility, pursuant to Section 50.82 of 10 CFR Part 50, and receives Commission approval thereof.

Changes to the licensed facility are made in accordance with the provisions of Section 50.59 10 CFR 50 which permits changes provided the change does not involve a change in the Technical Specifications or an unreviewed safety question. The licensee is required to report such changes to the Commission.

II. REPORT SUMMARY

This six-month report (NSP 6902) summarizes Pathfinder operations for the first six-month period since issuance of the amended Provisional Facility License No. DPR-11 on May 14, 1969.

Status of the deactivated Pathfinder facility is essentially as reported in the last six-month report (NSP 6901). Reactor components remain unbolted in the reactor vessel with the exception of the demister and vessel head. These two items are stored on the shield pool floor.

All irradiated sections of source rods were placed in a handling basket and hung on the holddown assembly in the reactor vessel. The beryllium annuli for the neutron source combinations are empty.

Fifteen shipments of nuclear fuel were made from Pathfinder as of November 17. All Core I boiler fuel (irradiated and unirradiated) was sent to Nuclear Fuel Services in West Valley, New York. Core II boiler fuel (unirradiated) was sent to United Nuclear Corporation in New Haven, Connecticut and Core II superheater fuel (unirradiated) was sent to Pennsylvania State University in University Park, Pennsylvania. Remaining on site is the Core I superheater fuel which will be sent to the Reactor Chemical Processing Plant in Idaho Falls, Idaho in four shipments beginning late in December 1969. It is anticipated that all nuclear fuel will be off site by the end of February 1970.

Two major areas of concern with regard to chemistry and radiation experience during this reporting period were irradiated fuel element shipments and startup of the fossil fuel fired boilers utilizing contaminated equipment. All fuel element shipments during this period were made without incident. Surveillance of the new operating system since startup shows low radioactivity and radiation levels. No detectable radioactivity was discovered in off-gas or during equipment venting. Low levels of radioactivity in blowdown are collected and handled as liquid waste. It appears that there are no radiological problems associated with operation of the new system. One can expect significant decay of the radioactivity in the new system (primary isotope is Zinc-65) which assures continued safe operation.

A meeting of the Pathfinder Safety Committee was held on September 17. At the conclusion of the meeting, all members agreed that the functions of the Safety Committee had been consummated and agreed that the Committee be disbanded.

III. CHEMISTRY AND RADIATION EXPERIENCE

A. Surveys of Radioactivity Levels

Special radiation surveys of contaminated equipment conducted on a monthly basis revealed the following results:

	Range mR/hr
#11 Boiler	0.02 - 0.70
#12 Boiler	0.01 - 0.15
#13 Boiler	0.02 - 2.0
Deaerator	0.02 - 2.5
Steam Line (boiler building)	0.02 - 0.07
Steam Line (turbine building)	1.0 - 2.8
Feedwater Heaters	0.8 - 6.4
Steam Inlet Lines (turbine governor valves to turbine)	1.0 - 74.0
Condenser Hotwell	3.0 - 5.6

Routine radiation surveys show three high radiation areas. They are the reactor building, the pools cleanup system, and the waste storage yard. The reactor building is a high radiation area due to trapped radioactivity in the water column piping and temporarily stored contaminated valves on the operating floor. The highest radiation level in the reactor building is 300 mR/hr. The pools cleanup area is a high radiation area due to radioactivity in coolers, filters, and demineralizers. The highest radiation level there is 4.4 R/hr. The waste storage yard contains solid waste in 55-gallon drums which read greater than 100 mR/hr. All these areas are controlled as required by 10 CFR 20.

Underwater radiation measurements of radioactive reactor internals show readings ranging up to 8400 R/hr. All internals are stored in the reactor vessel or shield pool. Both the reactor vessel and the shield pool are kept filled with water.

B. Status of Byproduct Material

Listed on Tables 1 and 2 is the byproduct material stored on site. This includes the material covered under the Part 30 license and the material covered under the Part 50 license.

C. Radiochemistry

Weekly analysis of boiler water, feedwater, and main steam condensate show radioactivity levels varying from $< 10^{-8}$ uCi/ml to 3×10^{-5} uCi/ml. The higher levels were detected on startup and are gradually decreasing to undetectable ($< 10^{-8}$ uCi/ml). Approximately 99% of the radioactivity is Zn-65 and 1% Co-60. All liquid is retained in holdup tanks and released under controlled conditions.

D. Health Physics

Radiation exposures during the reporting period were minor. The highest individual exposure for a two-week period was 80 mRem.

Thirty-two in vivo whole body counts were made on 32 individuals on September 24, 1969. Levels of internal deposition were similar in magnitude to the last series of counts. No individual had a total fractional deposition which exceeded 0.06 (6%) of the maximum permissible lung burden. Isotopes of plant origin identified were Co-60 and Zn-65.

E. Routine Radioactivity Releases

1. Liquid released to the Big Sioux River.

Month	**Activity (uCi)	*** Average Concentration (uCi/ml)	*Fraction of MPC
May	1.95×10^{4}	1.16×10^{-7}	0.0039
June	1.45×10^{4}	4.61×10^{-8}	0.0015
July	8.64×10^{3}	3.14×10^{-8}	0.0010
August	1.07×10^{4}	4.11×10^{-8}	0.0014
September	1.19×10^{3}	1.22×10^{-8}	0.0004
October	1.17×10^{3}	1.45×10^{-8}	0.0005

* MPC of 3×10^{-5} uCi/ml based on most restrictive isotope identified by routine gamma spectrometry analysis.

TABLE 1

Summary of Radioactivity on Site

Calculated 11-14-69
(Neglecting Fuel Elements)

Reactor Building	Curies
Boiler Shroud	9250
Grid Plate	11.5
Superheater Structure	11000
Boiler Boxes	22
Steam Dryer	0.13
Steam Separators	550
Holddown	330
Boiler Control Rods	364.0
Vessel Walls	3.13
Separator Support Shelf	4.5
Feedwater Ring	0.03
Neutron Windows	68
Ion Chambers	243
Superheater Control Rods	1.3
Pumps and Recirculation Lines	1.02
	21848.61

Fuel Handling Building	
Spent Resin Tank	10
Purification Coolers and Pipes	0.12
Flash Tank	0.09
Other Tanks	0.03
Storage Pool	1
Other Sources	0.13
	11.37

Turbine and Boiler Building	
Turbine	0.1
Condenser	0.2
Heaters (including deaerator)	0.3
Hydrogen Cooler	0.1
Steam Line (including inlet leads)	0.1
Condensate Pipe	0.1
Boilers	0.01
	0.91

Total estimated activity on site: 21860.89 curies

TABLE 2

Source Inventory
September 9, 1969

Source	Source Description	Assay Date	Activity on Assay Date (uc)	Date of Receipt	Activity on Date of Receipt (uc)	Amount of Original Assay Used (uc)	Buildup or Decay Factor	Activity on Date of Inventory (uc)	Location
PuBe	1" x 12" Cylinder	7/31/64	$5.98 \times 10^{+6}$	8/15/64	$5.98 \times 10^{+6}$	-	1.00	$5.98 \times 10^{+6}$	Source Room
PuBe	1" x 12" Cylinder	11/16/62	$6 \times 10^{+6}$	11/16/62	$6 \times 10^{+6}$	-	1.00	$6 \times 10^{+6}$	Source Room
PuBe	Cylinder	11/12/62	$1 \times 10^{+6}$	11/16/62	$1 \times 10^{+6}$	-	1.00	$1 \times 10^{+6}$	Source Room
	Total PuBe on site = 12.98 curies.								
Sb-124	$2\frac{1}{2}$" x 18" Rod	2/28/65	6.06×10^{9}	3/24/65	4.60×10^{9}	-	*0.012	4.12×10^{1}	Shield Pool
Sb-124	$2\frac{1}{2}$" x 18" Rod	9/26/65	4.62×10^{9}	10/31/65	3.10×10^{9}	-	0.012	3.78×10^{2}	Shield Pool
Sb-124	$2\frac{1}{2}$" x 18" Rod	9/26/65	9.18×10^{9}	9/12/66	8.70×10^{9}	-	0.012	2.25×10^{6}	Shield Pool
	*Decay factor determined from date of last inventory Total Sb-124 on site = 2.25×10^{6} uc								
Co-60	$\frac{1}{4}$" x 11/16" Cylinder	12/14/62	1.01×10^{4}	12/21/62	1.01×10^{4}	-	0.419	4.23×10^{3}	Source Room
Co-60	$\frac{1}{4}$" x 11/16" Cylinder	12/14/62	1.00×10^{5}	12/21/62	1.00×10^{5}	-	0.419	4.19×10^{4}	Source Room
	Total Co-60 on site = 4.61×10^{4} uc								
Am-241	1" Disk	1/24/63	1.82×10^{-3}	1963	1.83×10^{-3}	-	1.00	1.83×10^{-3}	Count Room
	Total Am-241 on site = 1.83×10^{-3}								

TABLE 2

(Continued)

Source	Source Description	Assay Date	Activity on Assay Date (uc)	Date of Receipt	Activity on Date of Receipt (uc)	Amount of Original Assay Used (uc)	Buildup or Decay Factor	Activity on Date of Inventory (uc)	Location
Sr-90 Cl	Liquid (500 cc Reagent Bottle)	6/23/61	2.15	11/21/62	2.07	8.97×10^{-1}	0.844	1.01	Source Room
	Total Sr-90 on site = 1.01 uc								
Zn-65	Liquid (100 cc Flask)		0.59 uc	10/30/67	9.25	5.23	0.148	0.59	Source Room
	Total Zn-65 on site = 0.59 uc								
Cs137Cl	Liquid (50 cc Flask)	8/8/62	$1.39 \times 10^{+2}$	1/1/63	$1.39 \times 10^{+2}$	$9.63 \times 10^{+1}$	0.852	3.64×10^{1}	Source Room
Cs137Cl	Liquid (500 cc Reagent Bottle)	8/8/62	2.79	1/1/63	2.76	5.98×10^{-2}	0.852	2.33	Source Room
Cs137	$\frac{1}{4}$" Copper Tube	8/8/62	2.79	3/14/64	2.69	-	0.852	2.38	Turbine Bldg. Vent Duct
	Total Cs-137 on site = 4.11×10^{1} uc								

*** The activity was determined by gross beta times a correction factor for Zn-65. The efficiency for counting Zn-65 with our counter is less than that of a mixture of fission products.

**** The average concentration is that which was released from the plant without taking credit for dilution in the river.

2. Gaseous Releases

Stack gas and particulate monitors did not detect radioactivity above background. Off-gas did not contain detectable levels of radioactivity during plant operation with fossil fuel fired boilers.

F. Radioactive Shipments

Two shipments of solid radioactive waste were made to Illinois for burial during this reporting period. The shipments contained 9.84 curies in 129 55-gallon drums.

Also during this reporting period, there were 14 fuel shipments which are described in Section IV of this report.

G. Radiation Incidents

There were no radiation incidents during this reporting period.

H. Offsite Monitoring

Environmental data collected during this reporting period showed no increases or deviations. Air sampled continuously at Pathfinder, Sioux Falls and Vermillion showed less than 1.0 pCi/m^3. All fallout pot samples were normal. There were no significant differences in water samples measured upstream or downstream of the effluent ditch. All environmental film badges showed no detectable radiation exposure.

IV. STATUS OF SPECIAL NUCLEAR MATERIAL

A. Current Status

During this reporting period, fourteen shipments of nuclear fuel were made which left only the Core I superheater fuel and 10 irradiated Core I boiler fuel assemblies on site at the end of this period. The remaining 10 boiler assemblies were shipped off site on November 17 and arrangements have been made for the first of the four Core I superheater fuel shipments to be made to Idaho Nuclear before the end of December. Details of all fuel shipments to date are covered below.

In addition to the fuel, accountable enriched uranium on site consists of three fission chambers, four sets of in-core flux detectors and approximately 1800 pieces of U-Al flux wire which total less than seven grams of uranium. Final disposition of this material has not been determined. Two pellet standards for the Low Enriched Superheater assemblies (4 grams of uranium) will be sent to Pennsylvania State University.

The three PuBe sources, 2 six-curie and 1 one-curie, remain on site. Final disposition of these items has not been determined. Detailed accountability of all Special Nuclear Material at Pathfinder as of September 30, 1969 is contained on the Form AEC-578, Material Status Report, which was submitted to the Oak Ridge Production Division.

B. Fuel Shipments

1. Core I Boiler Fuel

As of November 17, all Core I boiler fuel had been sent to Nuclear Fuel Services in West Valley, New York. Shipments were made as listed below.

Shipping Date	Shipment
June 6	32 Zero-power 2.2 w/o assemblies
June 13	14 Irradiated 2.2 w/o assemblies
July 10	14 Irradiated 2.2 w/o assemblies
August 11	14 Irradiated 2.2 w/o assemblies
August 27	4 Zero-power 2.2 w/o assemblies modified, 10 spare 2.2 w/o and 1 spare 3.2 w/o assemblies
September 5	14 Irradiated 2.2 w/o assemblies
October 6	8 Irradiated 2.2 w/o assemblies and 2 irradiated 3.2 w/o assemblies
October 21	10 Irradiated 3.2 w/o assemblies
November 3	10 Irradiated 3.2 w/o assemblies
November 17	10 Irradiated 3.2 w/o assemblies

The shipments of June 6 and August 27 which consisted of zero-power and spare unirradiated assemblies were authorized by AEC License No. SNM-1118, Amendment No. 71-2 and Department of Transportation Second Revised Special Permit No. 5363. Shipments of irradiated fuel were authorized by AEC License No. SNM-1133 and Amendment No. 71-1 to that license, and Department of Transportation Second Revised Special Permit No. 5805.

2. Core II Boiler Fuel

All 96 Core II boiler fuel assemblies were sent to United Nuclear Corporation in New Haven, Connecticut. Three shipments of 32 assemblies each were made on September 15, October 14, and October 30. These shipments were also authorized by AEC License No. SNM-1118, Amendment No. 71-2 and Department of Transportation Second Revised Special Permit No. 5363.

3. Core II Superheater Fuel

The 2 LESH (Low Enriched Superheater) prototype assemblies and 415 standard LESH assemblies were shipped to Pennsylvania State University in two shipments on October 1 and October 7. AEC License No. SNM-1118, Amendment No. 71-3 and Department of Transportation Third Revised Special Permit No. 5261 were authorization for the shipments.

All 15 shipments were by Tri-State Motor Transit Company of Joplin, Missouri.

V. PERSONNEL AND LICENSED FACILITY CHANGES

The Pathfinder plant technical supervisory staff organization remained essentially as reported in the previous six-month report (NSP 6901). Mr. W. T. Gleason, formerly Results Engineer at the Black Dog Steam Plant, replaced Mr. M. N. Bjeldanes as Pathfinder Supervising Engineer on July 1. Senior Licensed Operator, Mr. R. D. Emerson, was transferred to the Prairie Island plant on July 1. There were no other changes in licensed personnel.

All superheater fuel storage racks were removed and sent to Pennsylvania State University with the LESH fuel. Based on the following listed considerations, Operations Committee members concluded that the racks could be removed and shipped under the provisions of 10 CFR 50.59 (a).

1. The AEC has indicated that a Technical Specification change is not necessary for removal of the racks.

2. The superheater fuel storage racks are for the storage of new fuel only.

3. The new LESH fuel will be shipped to Pennsylvania State after issuance of a Part 70 license to Pennsylvania State University. No new fuel is to be received at Pathfinder.

4. The racks are to be removed from the new fuel storage vault only after the fuel has been removed and packaged in approved shipping containers.

5. The fuel storage racks will be removed as part of the Pathfinder dismantling program.

6. Removal of the racks (after the fuel is removed) does not constitute an unreviewed safety question.