REPORT NO. ACNP-6112
Special Distribution

PATHFINDER ATOMIC POWER PLANT

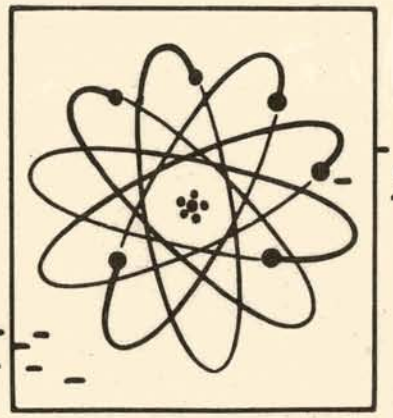
PROGRAM AND ORGANIZATION
for
PREOPERATIONAL AND NUCLEAR TESTING

Supplemental Technical Information
Submitted in Connection with

Application for AEC Type 104b License and Construction Permit for a Utilization Facility Involved in the Conduct of Research and Development Activities Leading to the Demonstration of the Practical Value of the Facility for Commercial Purposes
under
DOCKET NO. 50-130
by
NORTHERN STATES POWER COMPANY
15 SOUTH FIFTH STREET
MINNEAPOLIS 2, MINNESOTA

Prepared by

ALLIS-CHALMERS MANUFACTURING COMPANY
ATOMIC ENERGY DIVISION
Milwaukee 1, Wisconsin



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CONTENTS

1.0 Introduction

The Pathfinder Atomic Power Plant is located on a site on the Big Sioux River, 5.5 miles northeast from the center of Sioux Falls, South Dakota. A complete description of this plant is documented in the Pathfinder Atomic Power Plant Safeguards Report, ACNP-5905. The plant's reactor is of the boiling water type and includes an integral nuclear superheater.

The Pathfinder Atomic Power Plant will be owned and operated by Northern States Power Company of Minneapolis, Minnesota. Allis-Chalmers Manufacturing Company's Pathfinder contract responsibility includes design and construction of the necessary buildings and structures, and design, engineering, furnishing, installation and placing in operation in such buildings the machinery, apparatus, and equipment necessary for the complete nuclear - powered steam turbo-generator plant.

Allis-Chalmers' Nuclear Power Department-Greendale is responsible for Allis-Chalmers performance of the above work. Research and development, engineering and design have been under the direction of a project engineer in that department. The same individual and appropriate members of his staff, together with personnel furnished by Northern States Power Company, under his direction, will conduct the preoperational tests, initial startup of the plant and the tests as described in Section 3 of this report. His staff will be implemented, as required, with other experienced personnel from Allis-Chalmers' Nuclear Power Department-Washington.

The Northern States Power Company will, to the extent necessary, utilize recognized consultants in specialized fields.

The nuclear startup program will be conducted by Allis-Chalmers for Northern States Power Company and Allis-Chalmers. The staff for this program will include Allis-Chalmers specialists in the various engineering categories, and personnel furnished by NSP. As the program progresses and more Northern States Power Company personnel become qualified, and licensed when necessary, they will be assigned to their intended duties to actively participate in the operation of the Pathfinder Atomic Power Plant.

The preoperational and initial startup programs are discussed in Sections 2 and 3 of this report. The organization for the preoperational and initial start-up program is described in Section 4 and experience resumes of Northern States Power Company and Allis-Chalmers personnel are included in Addendum No. 1 to this report.

Detailed procedures and a description of the tests and operations discusses in this report, as well as those for subsequent full power operations, will be prepared in advance, reviewed by appropriate supervisory and safety analysis personnel and when approved will be given to the plant operators to follow. Special attention will be given to the initial operations and/or experiments. For these, a review will be made which includes and analysis of the following items:

1) The purpose and scope of the experiment.
2) A brief summary of applicate theory.
3) The detailed procedures to be followed, including limitations on procedural variations.
4) Cautions to be observed, stating any difficulties peculiar to the experiment that may be expected.

5) The data to be obtained and the range of expected results. This analysis will be submitted to the Operations Committee (See Section 4) for approval prior to the performance of the experiment.

Included in the scope of each experiment will be clearly defined limitations or areas pertaining to reactivity and/or safety of operation. All experiments and operations will be designed and specified by an engineering group which is part of the plant organization and/or the Allis-Chalmers staff at Greendale. The operations staff will load and operate the reactor according to the approved procedure, and will be responsible for the execution of the experiment or operation.

2.0 Preoperational Program

Preoperational tests will be conducted under the direction of Allis-Chalmers. The purpose of this program is to demonstrate that plant components and equipment will function as specified and to demonstrate that the plant is ready for nuclear startup. Included in this program are the following tests:

1) Hydrostatic tests at 1.5 times design pressure on the pressure vessel, piping, and recirculation pumps.
2) Leakage test of the primary system.
3) Tests for proper control system operation.
4) Tests of all safety circuits and components.
5) Control rod checks for freedom of motion in guide tubes and determination of scram time.
6) Fuel loading and "hot" fuel element handling equipment tests and checks of related procedures.
7) Recirculation pump and butterfly valve tests to insure proper operation of these units and their controls.
8) Tests of all other devices and auxiliaries associated with the primary system to assure their proper functioning. Included in this series of tests are those of the liquid level indicators, and the valves in the various lines connected to the primary system.

For continuity of review a nucleus of eight to ten people will participate in both the preoperational and nuclear startup programs insofar as is practical.

3.0 Initial Startup Program

3.1 Introduction

The initial startup program for the Pathfinder Power Plant consists of a series of tests designed to demonstrate the physics performance of the reactor and the performance of the integrated plant operation. These tests are sequenced in their order of increasing reactor power levels, i.e., all tests for a given power level are performed before the power level is raised to the next higher power step. Results from the design analysis and critical facility experiments are utilized in this program. The initial startup program will begin upon completion of those steps of the preoperational program that are considered essential to safety, feasibility, and practicality.

3.2 Initial Core Loading

With the boiler boxes and control rods in the core, poison shims worth approximately 4% $\Delta k/k$ are inserted. Three startup chambers are located in the vessel to monitor the multiplication during fuel loading. A Po-Be neutron source is located in the superheater region. Superheater and boiler fuel is loaded in the dry core and the multiplication is monitored during this process. The reactor vessel head is installed, control rods worth about 4% $\Delta k/k$ are cocked.

The multiplication is monitored as water is added to the vessel. The maximum rate of flow shall not exceed that of both seal water

injection pumps (rated at 30 gpm each) which corresponds to a maximum reactivity addition rate of about two cents per second. The superheater steam passages remain voided (most reactive configuration) during water addition. The calculated shutdown margin of this assembly with all rods and poison shims inserted is 7% Δk/k. At prescribed water levels (at least 20) the multiplication of the assembly is also determined with additional rods worth an estimated 3% Δk/k removed. Count rates with these rods withdrawn will provide further evaluation of the sub-critical margin and control rod worth. Removal of this second rod pattern will terminate before criticality is reached with them out.

The initial core loading and water fill will be performed as though criticality were expected at any point even though the moderated assembly is expected to be 3% Δk/k sub-critical with a rod pattern (4% Δk/k) removed. At any point the water level can be reduced by means of gravity or the purification system shutdown pump (rated capacity 250 gals/min). Criticality shall not be achieved at any time during this test. If criticality is predicted at any time, the core region will be drained and fuel removed to reduce reactivity. Upon completion of the initial core loading and filling a determination that the shutdown margin is at least 4% Δk/k will be made. The recirculation pumps are operated in order to test operation with a loaded core. The core is completely shutdown during this test.

Preparatory to further testing, the reactor source (10^{10}n/sec) is loaded in the core and the Po-Be source is removed. In order to do this the reactor vessel is completely filled including the superheater steam passages. (Calculations and critical facility measurements show that flooding the superheater steam passages will contribute about -0.5% $\Delta k/k$.) Following the source exchange the normal reactor water level is established and the superheater steam passages are drained.

3.3 Phase I, 10 kw (th) or Less

1. Initial Criticality

During the initial approach to criticality the multiplication of the reactor source is monitored by the normal reactor startup instrumentation (3 channels with high sensitivity BF_3 chambers).

Criticality is attained by the withdrawal of control rods. After the reactor is critical at a low power, a rod drop measurement is done to determine the shutdown margin. The decaying count rates of chambers located within the reactor vessel are recorded.

2. Initial Cold Core Flooding Coefficient

With the reactor shut down the superheater steam passages are flooded. The reactor is then brought to a low power level and the reactivity difference evaluated by a calibrated boiler control rod.

3. Nuclear Instrumentation Calibration

Standardized foils and flux wires are irradiated in a typical section of the core at a reactor power corresponding to about

3 decades above source power. This data is then analyzed to calibrate the instrumentation. This is also used to evaluate boiler-superheater power sharing and to verify design calculations.

4. Establishment of the Reference Core

Shim will be removed until the core is just sub-critical with the most reactive rod withdrawn and the superheater flooded. This yields a shutdown margin of about 3% $\Delta k/k$. Positive shim fuel elements (3.2 w/o U-235 enrichment) are also available if needed. Following the establishment of the reference core, additional shutdown margin data is recorded.

5. Reference Core Temperature Coefficient

The temperature coefficient is determined from about 70 F to 180 F. The reactor vessel is vented and the superheater is in the flooded condition during these measurements. Heating is done by means of the startup heater. Recirculation pump operation is used to promote a uniform core temperature.

6. Reference Core Cold Flooding Coefficient

The cold flooding coefficient of the reference core is determined similarly to the initial cold core flooding coefficient.

7. Control Rod Calibration

Core reactivity and control rod calibration is done by boron addition. Boron (12-1/2% disodium octoborate tetahydrate) is added to the moderator water in steps of different concentrations

with the superheater steam passages drained. At each concentration the critical positions of the control system is determined for different rod programs, and the rod worths are determined. The concentration is increased to the point where homogeneous poison is holding down all of the core reactivity. Recirculation pump operation is used to maintain homogeneity. At a boron concentration near the maximum a temperature coefficient determination (from about 70 F to about 180 F), will be made in the manner of the temperature coefficient tests described in Paragraph 5. A number of 3.2% elements will be substituted for 2.2% elements to determine their worth if not done in Paragraph 4. They are then removed. Boron is removed by the dilution method, with additional rod calibrations done at different concentrations.

8. Cold Core Pressurization

The superheater steam passages will be flooded and the reactor water level increased until the vessel is filled with water. The reactor system is then gradually pressurized. Calibrated rods are used to determine any reactivity change resulting from the pressurization. This is expected to be negligible.

3.4 Phase II, 5 mw (th) or Less

1. Non-Boiling Temperature Coefficient

With the superheater flooded the reactor is pressurized up to 600 psig with nitrogen gas. The purification system pressure controller then maintains this pressure. The reactor is then taken

critical at a low power with superheater rods fully inserted. A slow heating rate is established with the startup heater. Heating proceeds in this manner to about 440 F. The temperature coefficient over this range is measured with the control system by allowing the reactivity loss due to temperature to cancel out positive periods. The purification system pressure control system is adjusted to maintain approximately 50 F subcooling to suppress boiling. Purification system flow through the superheater steam passages is established to suppress boiling in the superheater. The temperature effect on control rod calibration is investigated at different points during this test.

2. Hot Core Flooding Coefficient

The reactivity change associated with hot water in the superheater steam passages is determined by means of calibrated control rods. This test is performed in the same manner as the cold core flooding coefficient.

3. Superheater Radiative Cooling Ability

With the superheater drained, the steam line isolation valves closed, and the boiler water temperature near its operating point, reactor power is slowly increased in steps. At each step the superheater fuel temperature is measured by thermocouples on special instrumented assemblies (conditioned by successful development of couple attachment). The test is terminated at the power level at which superheater fuel temperatures are approaching a pre-determined limit.

4. Power Coefficient

With the reactor shutdown, steam flow to the condenser is established by opening the bypass isolation valve. Superheater temperatures and boiler temperature and pressure are monitored during this initial steam flow. Reactor power is increased with the superheater power fraction suppressed by means of the rod program. The test is terminated by reactor shutdown after the superheater fuel temperatures are measured for several steam flow rates and power levels. The rod position data collected during this test are analyzed to determine the 5 mw power coefficient.

5. Fluid Dynamics Reactivity Effects

The reactor is brought to a power less than 5 mw (th) with the superheater power depressed and the steam routed to the condenser. The reactivity associated with changes in the feedwater temperature, feedwater flow, recirculation flow, reactor pressure, reactor temperature and steam flow is determined.

6. Flux Map

Flux wires are loaded into a typical section of the core (superheater and boiler). Using the startup procedure established in the tests above, the wires are exposed, and steam routed to the condenser. Reactor temperatures, superheater in-core ion chamber readings and reactor nuclear instrumentation readings are recorded. The data is analyzed to determine superheater-boiler power sharing,

reactor hot spots, and reactor nuclear instruments calibration. On completion of these tests the oscillator rod is loaded in the core.

7. Transfer Function

The oscillator rod is calibrated in several positions while at power with steam flow routed to the condenser. Transfer function measurements are made over a frequency range from about 0.01 cycles/sec to about 12 cycles/sec.

8. Process Systems Tests

While operating with steam routed to the condenser the performance of the various systems of the plant are thoroughly evaluated at this power level.

3.5 Phase III, Full Power or Less

1. Initial Power Increase

During Phase III power is increased in about five steps, starting from some power near 5 mw (th) and going to full power. At each higher power level the tests listed below are performed.

2. Power Calibration

At each power level a thermodynamic calibration of reactor power is obtained at steady state conditions.

3. Water Level Calibration

Calibration of the water level indication is done at each power level with different coolant conditions.

4. Superheated Steam Operation

Information on the relation between steam flow and superheater fuel temperatures will have been generated under steps 3 and 4 of Phase II. In Phase III the superheater performance will be further evaluated at each power step.

5. Response to Scram and Runback

At each power level the response of the reactor and power plant as a whole to scram and rod runback operations are evaluated. At each power level these actions are initiated with several different initial conditions and pertinent parameters are recorded.

6. Fluid Dynamics Reactivity Effects

At each power level the reactivity change associated with a change in the following variables is determined: feedwater temperature, feedwater flow, recirculation flow, reactor pressure, reactor temperature and steam flow. The changes in these variables are made initially on manual control and then after operational integrity is established, automatic operation is tested and used.

7. Flux Maps

Flux maps for a typical section of the core are obtained at several power levels.

8. Radiation Surveys

At each power level a radiation survey of the plant is made using portable and fixed instruments.

9. Ion Chamber Noise Analysis

Analysis of the ion chamber noise is done preparatory to transfer function tests.

10. Transfer Function

Transfer function measurements are made at several power levels. The data will also be analyzed for the superheater-boiler phase shift. The frequency range investigated extends from about 0.01 cycles/sec to about 12 cycles/sec. After extrapolation of the stability margin to full power, the oscillator rod is removed from the core.

11. Xenon Reactivity

The reactivity associated with Xe is determined at full power by operation until near equilibrium poisoning is reached -- then decreasing the reactor power substantially and following the resultant reactivity changes with rod movement. The amount of poison present at any time is determined by calibrated control rods.

12. Process Systems Tests

At each power level the performance and response of all pertinent systems of the plant are thoroughly evaluated.

13. Routine Operation

The facility will be started and shut down numerous times to adequately train additional operating personnel. Various tests will be run relative to crud activity build up, off gas decay, performance tests of mechanical equipment not possible during the preoperational check out, etc.

4.0 Organization

The first chart in Addendum No. 2 shows the organization for the initial operation of Pathfinder. During the initial testing period, key positions will be occupied by Allis-Chalmers personnel. Northern States Power Company personnel will be included in various positions and will train alongside Allis-Chalmers people. As soon as they qualify, it is planned that Northern States personnel will take over responsibility for their respective positions. The operations personnel for Pathfinder (Operations Supervisor and Shift Supervisors) will be available at the Pathfinder site about nine months prior to criticality for formal training on Pathfinder and to participate in the pre-operational tests. When Northern States Power Company personnel assume full responsibility for the plant, the organizational structure will remain essentially the same. The Northern States Power Company operations organization is shown in the second chart in Addendum No. 2. It will be noted that the operations responsibility, the safety review responsibility and the planning and analysis of experiments or operations are clearly separated. It should be recognized, however, that the existance of these review groups will not relieve the operations Supervisor from the concern and responsibility for safe operation.

If questions regarding the safe operation of the plant arise and cannot be readily resolved, the plant will be shut down and the problems resolved. In cases where differences of opinion occur at any organizational level during the startup program they will be referred to the next level of

supervision for resolution. Where differences of opinion occur between the startup staff and the Operations Committee, the matter will be resolved in the interest of safety by the Plant Supervisor. If deemed necessary, he will be able to confer with the Safety Committee for aid.

Plant Supervisor

The Pathfinder organization will be directed by the Plant Supervisor who will have complete operational responsibility for the plant. He will also be responsible for safe operation of the plant within the operating license and the policies prescribed by the Safety Committee. He will supervise the activities of the Radiation Safety Group, the Operations Group, the Nuclear Engineering Group, the Plant Results Group, and will also co-ordinate the functions of the Operations Committee.

Operations Committee

The Operations Committee will consist of specialists in reactor analysis and performance, health physics, power plant operation and reactor components. At least one man from each specialty will serve on the Committee. The responsibility of this Committee is to ascertain that all operations will be and are being conducted in a safe manner. A discussion of the responsibilities and the functions of the Pathfinder Safety Committee and those of the Pathfinder Operations Committee, which is an operations arm of the Safety Committee, is appended as Addendum No. 4.

Radiation Safety Engineer

The Radiation Safety Engineer will be responsible for the radiation safety (health physics) of the plant. He will plan routine and special radiation surveys, determine the allowable exposure time and the protective clothing requirements for personnel working in areas where radiation exists, and insure that adequate records are kept of radiation surveys, station personnel and visitor exposure, and the radioactive material transferred within the plant.

Operations Supervisor (Licensed)

The Operations Supervisor is responsible for the security, operation and maintenance of the reactor, the safety and actions of all personnel involved in reactor startup and operation and the safety of the equipment. He shall direct and coordinate the activities of the shift supervisors and other plant operators. He must examine and approve, before performance starts, all tests, test procedures and operating procedures. He shall also brief the Shift Supervisors and Plant Operators on the nature of any experiment or test before performance.

Shift Supervisors (Licensed)

A Shift Supervisor will be responsible for the operation of the reactor and plant in the absence of the Operations Supervisor or at any other time this responsibility may be delegated to him. He will insure that all operations are conducted according to approved procedures and that operating records are kept. In the absence of the Operations Supervisor, he will be responsible for the security of the plant and the safety and actions of all personnel.

A sufficient number of people with these qualifications will be provided to permit shift operations, one of whom will be on duty at all times when the plant is in operation.

Plant Equipment Operators

These personnel will operate the plant under the direction of a shift supervisor. They will be familiar with all procedures pertinent to the operation of the plant and capable of operating the various components including the reactor and capable of handling fuel.

Nuclear Engineering and Plant Results Groups

The members of these groups will initially include advisory personnel furnished by Allis-Chalmers including engineers and scientists who participated in the design of the reactor and the power plant. The appropriate advisory personnel will be present at the Pathfinder Reactor site during the initial startup and testing. These groups, together with personnel at the Allis-Chalmers Greendale Laboratory will prepare the test specifications and will determine which data shall be recorded during any experiment and test. Data collected will be analyzed by this staff and results will be made available to the Operations Supervisor, the Operations Committee, and others. Responsibility of the staff includes evaluation of all important parameters, comparisons of reactor performance with calculated predictions, and the reporting of any and all discrepancies to the Operations Supervisor. These groups will include Northern States personnel who will eventually assume responsibility for these activities.

5.0 Training

The experience in nuclear technology possessed by the personnel included in the Pathfinder organization for startup and initial operation is thorough and extensive. The experience and training of the various individuals is detailed in Addendum No. I of this report. Attention is particularly directed to the experience resumes of the following who have participated in the startup and/or operation of reactor and critical facilities.

L. M. Fead	L. L. Bach
R. A. Hartfield	J. B. Brokaw
S. D. MacKay	C. E. Larson
F. A. Maura	R. T. McKaughan
G. E. Norwood	R. A. Mielke
Andrew Selep	G. H. Nells
R. H. Vollmer	W. A. Sparrow
W. E. Anderson	A. E. Swanson

ADDENDUM NO. 1

EXPERIENCE RESUMES

Allis-Chalmers Manufacturing Company

(AC - 1) M. R. Beebe
(AC - 2) D. H. Crimmins
(AC - 3) R. L. Davie
(AC - 4) L. M. Fead
(AC - 5) Gunvald Froystad
(AC - 6) K. H. Gruenwald
(AC - 7) R. A. Hartfield
(AC - 8) R. J. Holl
(AC - 9) R. W. Klecker
(AC - 10) Patrick Lacy
(AC - 11) S. D. MacKay
(AC - 12) F. A. Maura
(AC - 13) R. G. Michel
(AC - 14) Dale Mohr
(AC - 15) G. E. Norwood
(AC - 16) G. E. Panter
(AC - 17) D. A. Patterson
(AC - 18) Andrew Selep
(AC - 19) N. C. Sher
(AC - 20) J. T. Stone
(AC - 21) D. H. Swanson
(AC - 22) R. H. Vollmer

Northern States Power Company

(NSP-1) W. E. Anderson
(NSP-2) L. L. Bach
(NSP-3) J. B. Brokaw
(NSP-4) R. B. Keely
(NSP-5) C. E. Larson
(NSP-6) R. T. McKaughan
(NSP-7) R. A. Mielke
(NSP-8) G. H. Neils
(NSP-9) W. A. Sparrow
(NSP-10) A. E. Swanson
(NSP-11) R. F. Wagner

Maurice R. Beebe — Supervisor, Health Physics

Mr. Beebe received his B.A. degree in Physics from Alfred University, Alfred, New York in 1951. In 1952 he received a Masters degree in Physics and Education from Alfred University. In 1952-53 he was an AEC Fellow in Radiological Physics at the University of Rochester. From August, 1953 to November, 1956 he was a member of the staff of the Brookhaven National Laboratory Health Physics Division. From November, 1956 to August, 1961 he was Health Physicist and member of the Scientific Research Staff of Republic Aviation Corporation. He joined Allis-Chalmers in August, 1961. He is certified in Health Physics by the American Board of Health Physics.

Mr. Beebe is supervisor of Health Physics. As supervisor, he coordinates overall safety programs for the Atomic Energy Division. He supervises Health Physics at the Nuclear Power Department-Greendale Laboratories, and acts as a company consultant on radiation safety. He has had considerable experience in research and development in industrial hygiene and health physics, in nuclear instrumentation and in radiation dosimetry.

He is a member of the Wisconsin Industrial Commission Committee on Radiation Safety Practices and is a charter member of the Health Physics Society, a member of the American Nuclear Society, and of the American Industrial Hygiene Association.

David H. Crimmins — Nuclear Scientist

Mr. Crimmins received his B.S. degree in Electrical Engineering from the University of Detroit in 1957. He received his M.S. degree in Mechanical Engineering with the Nuclear option from California Institute of Technology in 1960. He has completed advanced courses in nuclear theory and servo-mechanisms at the University of Wisconsin-Milwaukee.

Mr. Crimmins is a Nuclear Scientist in the Nuclear Power Department-Greendale. He is responsible for evaluating reactor controls, safeguards, and reactor kinetics. He has had four years of professional experience. In addition to this experience, he completed about three years as a student engineer with the Detroit Edison Company, where he worked on power plant design and operation.

He is a member of the American Nuclear Society and the American Institute of Electrical Engineers. In 1959 he was the recipient of an AEC scholarship at California Institute of Technology.

Richard L. Davie — Engineer

Mr. Davie received his B.S. degree in Marine Engineering from the State of New York, Maritime College in 1956. He has also taken graduate courses in reactor physics and mathematics at the University of Wisconsin-Milwaukee.

Mr. Davie has had five years of professional experience. As an Engineer in the Nuclear Power Department-Greendale, he is responsible for the design of the reactor water purification system for the Pathfinder Atomic Power Plant. Other experience with the Department has included: shaft vibration studies, conceptual design of water lubricated journal bearings, preliminary pressure rise calculations for containment, and heat transfer, fluid flow and thermodynamic calculations pertaining to other major systems and components in Pathfinder. Mr. Davie has also had some experience in the Steam Design Section of Allis-Chalmers Thermal Power Department.

Prior to joining Allis-Chalmers, he served as licensed Marine Engineer on ships of the United Fruit Company.

Louis M. Fead — Engineer

Mr. Fead received his B.S. degree from the United States Naval Academy in 1954. In addition he has completed the following formal courses while serving with the U.S. Navy: Officers Submarine School (6 months), Advanced Nuclear Power School (6 months), S1W power reactor plant Chief Operator's course (6 months), and S3W Naval Nuclear Power Plant specialized course (6 weeks).

Mr. Fead joined Allis-Chalmers in February 1961 following voluntary resignation of his Naval Commission and is employed as an Engineer at the Nuclear Power Department - Washington and is assigned to the operations section.

In the U.S. Navy Mr. Fead served 18 months aboard a small carrier primarily as Assistant Navigator, 2-1/2 years aboard a conventional submarine progressively as Supply and Commisary Officer, Assistant Engineer, Communications Officer, Operations Officer and Chief Engineer, and finally nearly two years aboard the Nuclear Submarine "Halibut" as Engineering Watch Officer-Guidance Officer. Engineering experience in connection with his assignment to the "Halibut" included duties in the S3W plant during construction, testing and operations at sea, liaison between engineers of different specialties to coordinate tests, and supervision of a group responsible for maintenance and operation of missile guidance radar and other shipboard electronics.

Gunvald Froystad — Engineer

Mr. Froystad received a B.S. degree in Electrical Engineering from the University of Wisconsin in 1948. He has over eleven years professional experience in the design and testing of reactor components and associated equipment.

He has been with Allis-Chalmers since 1948 and has participated in studies of a Gas-Cooled Reactor Power Plant for submarine applications. He has done considerable work in Nuclear Power Laboratory and has contributed to the development of reactor components for numerous reactor projects. Experienced in erection, instrumentation, testing and data evaluation of various types reactor plant components. Components include handling mechanisms, hermetically sealed pumps, motors, blowers and other special equipment for reactor cycles. He has supervised the design and installation of instrumentation and control panels for the research and development program associated with the Pathfinder Atomic Power Plant. This program covered heat transfer loop, corrosion loops, control rod drive tests, reactor vessel closure tests and others.

Kenneth H. Gruenwald

Supervisor
Systems Engineering

Mr. Gruenwald received his B.S. degree in Mechanical Engineering from the University of Wisconsin in 1942. He has also completed advanced studies at Illinois Institute of Technology, University of Wisconsin, and Argonne National Laboratory. He is a registered Professional Engineer in the State of Wisconsin. He has had a total of eighteen years of professional experience in the power equipment and nuclear fields.

Mr. Gruenwald is Supervisor of the Systems Design Section at the Nuclear Power Department-Greendale. He is responsible for optimization of the nuclear power plant cycle for the Pathfinder Atomic Power Plant and development of internal reactor steam separators, controlled recirculation system and auxiliary equipment.

Before beginning his present assignment, he was active in the development of the Allis-Chalmers WA Series of impulse turbines and is credited with many mechanical improvements on shaft seals and seal systems. As a consultant to Argonne National Laboratory on the EBWR project, he was responsible for design coordination of the reactor pressure control system, special turbine seals, air recovery and drying systems, and related auxiliaries. He was also active in development of a number of other reactor components such as hermetically sealed pumps and blowers and control rod drives.

He is author of an AIEE Conference Paper on special features of the 5000-kw EBWR turbine condenser and pump.

He is a member of the American Society of Mechanical Engineers. He served on the Papers Review Subcommittee, Nuclear Engineering Division, ASME and on Subcommittee No. 2, ASA Sectional Committee N6, Reactor Safety Standards.

Richard A. Hartfield — Engineer

Mr. Hartfield received his Bachelor's degree in Mechanical Engineering from Rensselaer Polytechnic Institute in 1953. He attended some classes at the International School of Nuclear Science & Engineering at Argonne National Laboratory and has completed graduate courses in mathematics at the University of Wisconsin-Milwaukee. He has had seven years of professional experience in the nuclear field.

Mr. Hartfield is an Engineer in the Nuclear Power Department-Greendale. He was responsible for formulating the instrumentation specifications for the Allis-Chalmers Critical Facility. He also coordinated the efforts of the core and mechanical design groups to insure design compatibility of components for the facility. He was actively concerned with the erection of the facility and worked on various design difficulties during the initial phase of operation. He received Operator License OP-775 for operation of the facility on March 23, 1960, and has been active in the operation of the facility since the date of startup.

For a year and one-half, he was on loan to Argonne National Laboratory where he worked as a physicist on the Fast Breeder Reactor Project. Part of this work involved mockup tests in the ZPR III fast critical assembly. He also made a number of analyses with respect to the EBR II and various ZPR III experiments. He contributed to a number of technical reports.

He is a member of the American Society of Mechanical Engineers, the American Nuclear Society and Sigma Xi.

Richard J. Holl

Supervisor
Reactor Physics

Mr. Holl received his B.S. and M.S. degree in Physics from the University of Wisconsin in 1954 and 1955. He attended the Oak Ridge School of Reactor Technology and graduated in 1956. He has completed graduate courses for a Doctor's degree in Nuclear Science at the University of Michigan, and is preparing his thesis.

Mr. Holl has had five years of professional experience in the nuclear field. As Supervisor of the Reactor Physics Section in the Nuclear Power Department-Greendale, he is responsible for the determination of reactor statics and shielding requirements for the Pathfinder Atomic Power Plant.

He is a co-applicant for a patent on the controlled recirculation boiling reactor with integral nuclear superheater.

He is a member of the American Nuclear Society.

Raymond W. Klecker — Manager of Engineering

Mr. Klecker received his B.S. degree in Electrical Engineering from the University of Southern California in 1949. He is a graduate of the Oak Ridge School of Reactor Technology. He has had twelve years of professional experience in the nuclear field.

Mr. Klecker is Manager of Engineering in the Nuclear Power Department-Greendale, and is also responsible for management of the Pathfinder project.

He has had extensive experience in electrical and nuclear engineering including engineering analysis and design of reactor components. In 1953 he was assigned by Allis-Chalmers to Atomic Power Development Associates in Detroit where he served about three years as Head of the Instrumentation and Control Section. In that capacity he was responsible for specifying a safe and stable control system for the reactor of the Enrico Fermi Power Plant and for development of all controls, instrumentation and devices that affected plant dynamics. This involved a number of investigations and evaluations of the stability of fast-breeder reactor systems.

In 1956 he was appointed Supervisory Engineer in Charge of Reactor Design at Allis-Chalmers. He was responsible for analysis and engineering design of various nuclear reactors that were being considered by Allis-Chalmers for development. These reactors included a series of pool-type training reactors and a controlled recirculation boiling water reactor.

In 1958 he was appointed Project Engineer of the Nuclear Power Department-Greendale, and assumed responsibilities for technical coordination and direction of the Pathfinder project. In 1961 he was appointed Manager of Engineering.

He is a member of the American Institute of Electrical Engineers, the American Nuclear Society, Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi. He is an active member of the American Standards Association Committee N6 on Reactor Safety Standards and Sub-committee N6.4 on Nuclear Dynamics and Control Requirements. He is co-applicant for a patent on the controlled recirculation boiling reactor with integral nuclear superheater, which is being developed for the Pathfinder Plant.

Patrick S. Lacy — Senior Physicist

Mr. Lacy received his B.S. degree in Physics from St. Thomas College in 1952. He received his M.S. degree in Physics from the University of Minnesota in 1955. He has completed additional graduate courses in Physics at the University of Pittsburgh.

Mr. Lacy has had five years of professional experience, all in the nuclear power field. His present duties in the Nuclear Power Department-Greendale include nuclear design for Pathfinder and analysis of critical facility experiments.

Prior to his employment at Allis-Chalmers in 1960 he participated as Group Leader in the nuclear design on the PWR Shippingport core. This work included both the physics design and physics analysis of the operating core.

He is the author of several papers which have been presented at American Nuclear Society meetings and has contributed to an article in the Proceedings of the 1958 Geneva Conference.

Mr. Lacy is a member of the American Nuclear Society.

David MacKay — Nuclear Engineer

Mr. MacKay has over seven years experience in the field of nuclear engineering. He joined the staff of Allis-Chalmers as a Nuclear Engineer in the Operations Section of the Nuclear Power Department-Washington. He has written a course of instruction in basic reactor theory and operation especially designed for the Elk River Reactor personnel. Mr. MacKay, at present, is the assistant in charge of the Operations Section at Allis-Chalmers.

Previously Mr. MacKay was employed by Alco Products, Inc., for three years. As a Nuclear Engineer, his main duty was to outline the various nuclear tests to be conducted on the APPR core. Upon approval by management of these proposed tests, Mr. MacKay would write the test procedures and submit them to the Operations Section. He would then participate in conducting the tests at the reactor and review the test data at completion of the tests. The reduction of the test data and writing of a test report was Mr. MacKay's responsibility. He was also a reactor supervisor for the critical facilities at Alco. As supervisor he was responsible for all tests conducted and complete safety of the facility. Mr. MacKay also served as an instructor to the Army personnel in reactor operation and basic reactor theory.

Before his employment at Alco, Mr. MacKay worked four years at the Knolls Atomic Power Laboratory. There he participated in the startup and operation of various critical assemblies. His duties varied from a reactor operator to reactor supervisor in charge of operation.

Mr. MacKay's work has been documented in notes for internal distribution as well as the following publications available through TISE.

APAE 21 - "Extended Zero Power Experiments on APPR" - by MacKay and Grisler

APAE 178 - "APPR-1, Research and Development Program Interim Report on Core Measurements" - by S. D. MacKay, Project Engineer

Frederico A. Maura — Engineer

Mr. Maura received a bachelor's degree in Electrical Engineering from the Virginia Military Institute. He has had over three years of professional experience, including two in nuclear engineering.

With Allis-Chalmers, Mr. Maura is a member of the Operations Section in the Nuclear Power Department-Washington.

Mr. Maura worked for over a year as a test engineer for the Duquesne Light Company at the Shippingport Atomic Power Station. Later, he bacame a shift reactor engineer. He was responsible for the safety of the reactor and the checkout and alignment of reactor instrumentation and controls. He also directed operations required for pre-critical tests of controls and instrumentation and calculated control rod position for criticality.

Mr. Maura had previously been a member of the United States Army Signal Corps as an electrical engineer in communications.

Robert G. Michel — Project Engineer

Mr. Michel received his B.S. degree in Mechanical Engineering from Marquette University in 1948. He has also completed advanced studies at the Illinois Institute of Technology. He has had twelve years of professional experience, ten in the nuclear field.

Mr. Michel's present position is Project Engineer, Nuclear Power Department-Greendale. He is responsible for the technical coordination of the Pathfinder Project. Mr. Michel's previous position was that of Assistant Project Engineer.

Mr. Michel was previously Supervisor, Mechanical Engineering, Nuclear Power Department-Greendale in which capacity he was responsible for the mechanical design of reactor vessels, internal support structures, control rod drive mechanisms, and the recirculation system for the Pathfinder Reactor. He has had considerable experience in the design of various reactor components, including control rod drive mechanisms, canned-rotor pumps, hydraulic-fluid piston bearings, pressure vessels, shielding, large rotating shielding plugs, and hydraulic servos using liquid metals as the hydraulic fluid. He is also experienced in making cost estimates and project schedules and in coordinating the efforts of various subcontractors.

He has been granted a patent for a rotating shaft seal for gas flow machines.

Dale Mohr — Nuclear Scientist

Mr. Mohr received his B. S. degree in Mechanical Engineering and in Mathematics from the University of Michigan in 1956 and 1957, respectively. He received his M. S. degree in Nuclear Engineering from the University of Michigan in 1958.

Mr. Mohr is a Nuclear Scientist in the Nuclear Power Department - Greendale. He has been active in the reactor simulation studies that are being conducted to determine Pathfinder reactor dynamics and to analyze the reactor's response to various normal and accidental disturbances.

He has had three years of professional experience. He has had experience in reactor dynamics and control, accident analysis, and reactor simulation. Before coming to Allis-Chalmers, he participated in summer programs at Bell Aircraft Corporation and Boeing Airplane Company, where he worked on structural design problems for aircraft and missiles. During on summer, he participated in the research and design program for TREAT at Argonne National Laboratory.

He is a member of the American Society of Mechanical Engineers and the Society of Automotive Engineers. He is an Engineer-in-Training in the State of Michigan.

George E. Norwood — Engineer - Senior

Mr. Norwood received a bachelor's degree in Chemical Engineering from the University of Texas. He has five years of experience directly related to the nuclear field.

Since joining the staff of Allis-Chalmers Nuclear Power Department-Washington in 1957 he has held various positions. He worked with the Wright-Patterson project group on the design of a test reactor for the Air Force. He has worked on the hazards analysis of the Wright-Patterson reactor, the Gas-Cooled reactor, the Cambridge Research reactor study, the Pool Training reactor, and the Elk River Power reactor. As a member of the Operations Group, he was the Allis-Chalmers representative at the MIT initial loading, critical experiments and full power tests.

Mr. Norwood has an Italian Government operator's license for the CNRN reactor and also a license from AEC.

Prior to joining Allis-Chalmers, Mr. Norwood was employed by Pratt and Whitney Aircraft where he did analytical work on the design of a nuclear reactor for aircraft propulsion.

He is a member of the American Nuclear Society.

George E. Panter

Supervisor
Chemical Section

Mr. Panter received his B.S. degree in Chemistry from the University of Wisconsin in 1949. He received his M.S. degree in Chemistry from the same school in 1950. He has completed additional graduate courses in Metallurgy and Industrial Water & Waste Treatment at the University of Wisconsin-Milwaukee. He has twelve years of professional experience, four in the nuclear field.

As Supervisor of the Chemical Section, Mr. Panter coordinates materials information and corrosion evaluations. He is responsible for the chemical aspects of water processing, waste handling and reactor water purification for the Pathfinder Atomic Power Plant. Previous assignments involved dynamic corrosion testing of aluminum, Zircaloy and steel. Corrosion testing of stainless steel exposed to saturated and superheated steam as well as static autoclave corrosion studies have been under his direction.

Prior to joining Allis-Chalmers Mr. Panter served as Director of Research and Development with the Hawaiian Sugar Company.

He is a member of the American Chemical Society and the National Association of Corrosion Engineers.

David A. Patterson

Supervisor
Fuel Development

Mr. Patterson received his B. S. degree in Mechanical Engineering from Colorado State University in 1955. He has taken graduate courses in Metallurgy at Oregon State College. He is an engineer-in-training in the State of Colorado. He has had four years of professional experience in the nuclear field.

Mr. Patterson is Supervisor of the Fuel Development Section in the Nuclear Power Department - Greendale. As Supervisor, he has been responsible for the mechanical design and experimental stress analysis of boiler and superheater fuel elements for the Pathfinder Reactor, and for the development of various low and high enrichment fuel materials and manufacturing processes. He is experienced in the design of test assemblies and the specification of test conditions for irradiation experiments of fuel elements.

He has had considerable experience in research, development, and fabrication of plutonium-bearing fuel elements. These fuel elements were developed for cores of the Plutonium Recycle Test Reactor (PRTR) and its Critical Facility, the MTR at Arco, Idaho, and the Hanford Production Reactors.

He is a member of the American Society of Mechanical Engineers and the American Society of Testing Materials.

Andrew Selep — Nuclear Scientist

Mr. Selep received his B. S. degree in Mechanical Engineering (Summa Cum Laude) in 1953 from the Polytechnic Institute of Brooklyn. He has also taken graduate courses in Mechanical Engineering from the University of Wisconsin - Milwaukee and has completed courses in Nuclear Theory and Reactor Problems at the International School of Nuclear Science and Engineering at Argonne National Laboratory.

Mr. Selep is a Nuclear Scientist in the Experimental Physics Section of Allis-Chalmers Nuclear Power Department-Greendale. His present duties include participation in the experimental programs being conducted in the Allis-Chalmers Critical Facility and the evaluation of results.

Previous assignments have included safeguards analyses and preparation of hazards summary reports. He participated in the design of control rod drives for the Pathfinder Atomic Power plant and has also formulated designs for an oscillator rod for Pathfinder for post-construction testing.

He has had six years of professional experience. He has had extensive engineering experience in the nuclear and power equipment fields. He has had considerable experience in the engineering,design, and test of reactor components. In 1956, he was assigned to the Argonne National Laboratory where he worked on the design of the Argonaut.

He is a member of the American Nuclear Society. He is a member of Pi Tau Sigma and Tau Beta Pi.

Neil C. Sher — Nuclear Scientist

Mr. Sher received his B.S. and M.S. degrees in Chemical Engineering from the University of Minnesota in 1954 and 1955.

During his undergraduate and graduate years at the University of Minnesota, he served as Research Assistant engaged in studies of the transient behavior of natural circulation loops.

Mr. Sher is a Nuclear Scientist at the Nuclear Power Department-Greendale. He has had over five years of professional experience in the nuclear field. Presently in charge of the Heat Transfer Section, he is responsible for heat transfer and fluid flow studies of the Pathfinder coolant system using both predictive and experimental techniques.

Prior to joining Allis-Chalmers, he was a Senior Engineer at Westinghouse Electric Corporation where he was active in experimental heat transfer and pressure drop studies. He also has had experience in core design and analysis.

He prepared his master's thesis on two-phase fluid flow. He helped prepare the first detailed reactor thermal design criteria for naval reactors. He suggested a method for estimating boiling pressure drop which is currently recommended for reactor design by Argonne National Laboratory and which is being used in the Pathfinder program.

He is an associate member of the American Institute of Chemical Engineers.

He is author of "Void Fractions in Two-Phase, Steam-Water Flow," AICHE Journal, March 1957; "Pressure Drops in Rectangular Channels at 2000 PSIA," Reactor Heat Transfer Conference, 1956; "Thermal Design Criteria for Pressurized Water Reactors," Nucleonics, November 1958; and "Pressure Losses," Reactor Heat Transfer and Fluid Flow Handbook, Chapter III, NR-AEC (to be published).

John T. Stone — Nuclear Scientist

Mr. Stone received his B.S. degree in Electrical Engineering from the University of Michigan in 1956 and his M.S. degree in Nuclear Engineering from the University of Michigan in 1957. He has completed course work for his Doctor's degree and is preparing his thesis on the dynamics of coupled reactor systems.

Mr. Stone is a Nuclear Scientist in the Nuclear Power Department-Greendale. He is responsible for various dynamic reactor studies for the Pathfinder Reactor. This involves the determination of reactor behavior during various transients using an IBM-704 computer-simulator, and the evaluation of plant control and instrumentation systems.

He is a member of the American Nuclear Society.

David H. Swanson — Engineer

Mr. Swanson received his B.S. degree in Mechanical Engineering from Kansas State College in 1956. He has also completed various courses in Business Statistics and Personnel Management at the University of Wisconsin-Milwaukee.

Mr. Swanson is an Engineer in the Nuclear Power Department-Greendale. His present duties include the design and evaluation of various power plant and reactor auxiliary systems and equipment for the Pathfinder Project.

He has had seven years of professional experience, five in the nuclear field. He has had experience in the design of hydraulic and steam turbines, motors and generators and electrical control equipment. He has made significant contributions to the development of hermetically sealed pumps and motors, electromagnetic pumps and flowmeters, gas drying and recovery systems, and steam separators for use with boiling water reactors.

He is co-applicant for a patent on a centrifugal steam separator. He is a frequent speaker at various engineering society meetings.

He is a member of the American Society of Mechanical Engineers.

Richard H. Vollmer

Supervisor
Experimental Physics

Mr. Vollmer received his B.S. degree in Physics from the University of Notre Dame in 1952. He has also completed graduate courses at the University of South Carolina and the University of Wisconsin.

Mr. Vollmer is supervisor of the Experimental Physics Section at the Nuclear Power Department-Greendale. His duties have included responsibility for the experimental determination of nuclear parameters for the Pathfinder core.

He has had eight years of professional experience, all in the nuclear field. He has had considerable experience in experimental reactor work at Argonne National Laboratory and Savannah River Laboratory relative to the determination of lattice constants, flux shapes, power distribution, control rod worth and kinetic behavior. He has had extensive experience in nuclear design of boiling water reactors, and high-flux test reactors. He was responsibile for core physics design of several reactors now under construction and assisted in the nuclear startup of West Germany's first reactor.

He is a member of the American Nuclear Society.

W. E. Anderson

Mr. Anderson was selected as a Shift Supervisor for the Pathfinder Plant in July, 1960. He is a high school graduate and served on active duty with the U.S. Navy for about 2½ years during World War II with a final rating of Machinist Mate, First Class. During his service he attended several schools which involved classroom work in mathematics, basic engineering, blueprint reading, etc. He graduated from the four-month Machinist Mate's school as "honor man" in a class of 80 men. He worked in the engine room and stood watch on a shift for approximately one and one-half years during this service.

He started with Northern States Power Company in April, 1946, at the Sioux Falls Steam Plant in the operating section. He qualified as a Steam Plant Operator (head of the shift) at the Lawrence Steam Plant in Sioux Falls in 1953 and relieved the Steam Plant Operator classification until May, 1960 at which time he was promoted to Steam Plant Operator.

On August 22, 1960, he was transferred to the Northern States Power Minneapolis office to attend an accelerated two-month Nuclear Theory Course. This course was presented by the Pathfinder Plant Results Engineer and Radiation & Chemical Engineer and included mathematics, physics, radiation protection and detection, reactor theory, instrumentation and reactor control.

Subsequent to this, Mr. Anderson was assigned to the Allis-Chalmers Greendale Laboratories for four months' experience in the operation of the Allis-Chalmers Critical Facility and lectures on Pathfinder system and component design. Work on the Critical Facility included assistance in fuel loading and core alterations, assistance in experimental operations, reactor operation under direct supervision and participation in the performance, data taking and analysis of control rod calibration experiments. During this period of training, Mr. Anderson was given an oral and operating proficiency test on the Critical Facility by Allis-Chalmers personnel, similar to the AEC operating test required for Allis-Chalmers operators, and he successfully passed these tests.

On March 15, 1961, Mr. Anderson reported to the MTR reactor at Idaho Falls for a six-month work experience assignment in reactor operations. During this period of training he accumulated about 160 hours of responsible reactor console operating time on the MTR. In addition to this, he engineered experiments on this reactor, assisted in the insertion and removal of fuel elements and experiments into and out of the reactor, participated in some health physics and contamination control work and other duties pertinent to MTR reactor operation.

On September 18, 1961, Mr. Anderson was transferred to the Pathfinder Plant site to begin training on the Pathfinder Facility, supervise preoperational check-out procedures and instruct other Pathfinder operating personnel.

L. L. Bach

Mr. Bach has been selected for the position of Plant Superintendent at the Pathfinder Atomic Power Plant. He has worked for Northern States Power Company for about 33 years primarily in connection with steam plant operation and was the Plant Superintendent of the Fargo Steam Plant from 1942 to July 1959. He obtained a degree in Mechanical Engineering from North Dakota AC in 1940.

During the spring of 1959, he attended a course in Nuclear Physics at North Dakota AC. He then attended the second Shippingport Nuclear Power Station Supervisors' Course from the middle of July 1959 until about the first of December 1959. After completing the course at the Shippingport Nuclear Power Station, Mr. Bach was assigned to the Nuclear Power Department of Northern States Power Company in the Minneapolis office to assist in the selection of Pathfinder personnel; to review for comment and become thoroughly familiar with Pathfinder facility design; and to participate in other training experiences and meetings in connection with Pathfinder design.

In June 1961, Mr. Bach was transferred to the Pathfinder Plant site along with other Pathfinder supervisory personnel. In addition to his normal administrative duties at the site, he will be active in the formulation of a training program for Pathfinder personnel, and will continue to participate in and become thoroughly familiar with Pathfinder construction and design.

J. B. Brokaw

Mr. Brokaw was selected in July, 1960, as a Shift Supervisor for the Pathfinder Plant. Mr. Brokaw was on active duty with the Army for about three years during World War II and again for two years during the Korean "police action". He presently holds a rank of Major in the Field Artillery with the South Dakota National Guard. In his 18 years' service in the Army and National Guard he has attended many training schools, has acted as an instructor on numerous occasions and has demonstrated his supervisory ability.

He came to work for Northern States Power Company in June 1946 in the operating section of the Sioux Falls Steam Plant. Since 1953, he has been relieving the Steam Plant Operator (head of the shift) at the Lawrence Steam Plant in Sioux Falls.

On August 22, 1960, he was transferred to the Northern States Power Minneapolis office to attend an accelerated two-month Nuclear Theory Course. This course was presented by the Pathfinder Plant Results Engineer and Radiation & Chemical Engineer and included mathematics, physics, radiation protection and detection, reactor theory, instrumentation and reactor control.

Subsequent to this, Mr. Brokaw was assigned to Allis-Chalmers Greendale Laboratories for four months' experience in the operation of the Allis-Chalmers Critical Facility and lectures on Pathfinder system and component design. Work on the Critical Facility included assistance in fuel loading and core alterations, assistance in experimental operations, reactor operation under direct supervision and participation in the performance, data taking and analysis of control rod calibration experiments. During this period of training, Mr. Brokaw was given an oral and operating proficiency test on the Critical Facility by Allis-Chalmers personnel, similar to the AEC operating test required for Allis-Chalmers operators, and he successfully passed these tests.

On March 15, 1961, Mr. Brokaw reported to the ETR reactor at Idaho Falls for a six-month work experience assignment in reactor operations. During this period of training he accumulated about 160 hours of responsible reactor console operating time on the ETR. In addition to this, he engineered experiments on this reactor, assisted in the insertion and removal of fuel elements and experiments into and out of the reactor, participated in some health physics and contamination control work and other duties pertinent to ETR reactor operation.

On September 18, 1961, Mr. Brokaw was transferred to the Pathfinder Plant site to begin training on the Pathfinder Facility, supervise pre-operational check-out procedures, and instruct other Pathfinder operating personnel.

R. B. Keely

Mr. Keely was selected as the Radiation & Chemical Engineer for the Pathfinder Atomic Power Plant. He graduated "with distinction" as a Chemical Engineer from the University of Minnesota in 1950. Subsequent to graduation he worked at the Oak Ridge National Laboratory for about 8 years in connection with various fuel separation processes, including work as a shift supervisor, and some experience in the Health Physics field.

On August 15, 1959, he came to work for Northern States Power Company and was assigned to the Black Dog Steam Plant to obtain experience in the operation of a conventional power plant. In November 1959, he attended a course in Basic Radiological Health at the Taft Sanitary Engineering Center in Cincinnati, Ohio. During January and February 1960, he attended three other courses at the Taft Sanitary Engineering Center; Radioactive Pollutants in Air; Radioactive Pollutants in Water and Radionuclides in Water. At the end of January 1960, he completed his training in conventional plant operation and was assigned to the Nuclear Power Department at the Northern States Power Minneapolis office for work in connection with Pathfinder Plant design, health physics, chemistry, etc. He has attended various Pathfinder design conferences and society meetings in connection with radiation safety and nuclear plant chemistry. He has assumed responsibility for the direction of the Pathfinder Preoperational Environmental Monitoring program and Meteorological investigations.

In December 1960, he reported to the Hanford Atomic Products Operation for a three-month work experience assignment in health physics. This training included orientation in exposure evaluation and records, bioassays, calibration and environmental monitoring; participation in reactor radiation protection procedures; participation in reactor facility radiation monitoring; and miscellaneous work in connection with laboratory techniques, meteorology, etc.

In June, 1961, Mr. Keely was transferred to the Pathfinder Plant site to become familiar with the Pathfinder Plant; to establish radiation protection procedures; train personnel; set up radiation safety and chemistry laboratories and procedures; and otherwise assume the full responsibilities of his position.

C. E. Larson

Mr. Larson has been selected for the position of Plant Nuclear Engineer at the Pathfinder Plant. Mr. Larson graduated as an Electrical Engineer from the University of Wisconsin in 1958 with a high scholastic average. After completing a tour of active duty as an officer in the Army Signal Corps, he joined Northern States Power Company in June of 1959 and was assigned to the High Bridge Steam Plant for work in the "Results" group. He attended a course in Reactor Theory at the University of Minnesota taught by Dr. Isbin during the fall and winter quarters of the 1959-1960 school year.

In April 1960, Mr. Larson was assigned to the Allis-Chalmers Greendale Laboratories for work in connection with the Allis-Chalmers Critical Facility and Pathfinder reactor design. On November 18, 1960, he received an AEC Reactor Operator's license (OP-820) for the Allis-Chalmers Critical Facility. Subsequent to this, he became familiar with the physics calculational techniques for the Pathfinder reactor core, participating in various physics calculations and the analysis of their results. Specifically, he worked on Pathfinder core coefficient calculations and three-dimensional flux distribution calculations. He was a co-author of an ANS paper presented in November 1961, which concerned the later subject. Early in October 1961, Mr. Larson was reassigned to spend the majority of his time with the Allis-Chalmers dynamics group. During this period of training he will become familiar with the dynamic behavior of the Pathfinder reactor system under normal and abnormal operating conditions. His training will include the reviewing of the dynamics equations and working with these on the analog computer. The feedwater and pressure control systems with their effect on reactor operation, will also be studied. If time allows, Mr. Larson will also be concerned with the planning of post-construction dynamic experiments.

It is anticipated that Mr. Larson will complete the assignment at Allis-Chalmers early in 1962 and will be transferred to the Pathfinder Plant site to become thoroughly acquainted with the facility and to participate in various phases of the preoperational check-outs and preparations for start-up of the Pathfinder reactor.

R. T. McKaughan

Mr. McKaughan was selected as a Shift Supervisor for the Pathfinder Plant in July 1960. Mr. McKaughan is a high school graduate with additional schooling during his military service. He spent about 2½ years in the Air Force during World War II with a rating of First Lieutenant (Pilot). He piloted medium bombers and served as a Flight Instructor with the Air Force.

He came to work for Northern States Power Company in October 1945 at the Sioux Falls Steam Plant in the operating section. In 1951 he reached the postion of Steam Plant Operator (head of the shift) at the Lawrence Steam Plant and held that position until selected for the Pathfinder Plant.

On August 22, 1960, he was transferred to the Northern States Power Minneapolis office to attend an accelerated two-month Nuclear Theory Course. This course was presented by the Pathfinder Plant Results Engineer and Radiation & Chemical Engineer and included mathematics, physics, radiation protection and detection, reactor theory, instrumentation and reactor control.

Subsequent to this, Mr. McKaughan was assigned to Allis-Chalmers Greendale Laboratories for four months' experience in the operation of the Allis-Chalmers Critical Facility and lectures on Pathfinder system and component design. Work on the Critical Facility included assistance in fuel loading and core alterations, assistance in experimental operations, reactor operation under direct supervision and participation in the performance, data taking and analysis of control rod calibration experiments. During this period of training, Mr. McKaughan was given an oral and operating proficiency test on the Critical Facility by Allis-Chalmers personnel, similar to the AEC operating test required for Allis-Chalmers operators, and he successfully passed these tests.

On March 15, 1961, Mr. McKaughan reported to the MTR reactor at Idaho Falls for a six-month work experience assignment in reactor operations. During this period of training he accumulated about 165 hours of responsible reactor console operating time on the MTR. In addition to this, he engineered experiments on this reactor, assisted in the insertion and removal of fuel elements and experiments into and out of the reactor, participated in some health physics and contamination control work and other duties pertinent to MTR reactor operation.

On September 18, 1961, Mr. McKaughan was transferred to the Pathfinder Plant site to begin training on the Pathfinder facility, supervise pre-operational check-out procedures and instruct other Pathfinder operating personnel.

R. A. Mielke

Mr. Mielke was selected as a Shift Supervisor for the Pathfinder Plant in July 1960. Mr. Mielke held a First Lieutenant's commission in the Maritime Service during World War II serving as a Second Engineer in the Merchant Marine for a period of almost 4 years. He also held an Ensign's commission in the Navy Reserve. In 1946, while working as an "Engineer" at the Veterans' Hospital in Minneapolis, he attended the University of Minnesota evenings taking physics for three quarters and mathematics for one quarter. He worked as a Plant Operator for about a year and as a Dispatcher for about a year for the Dairyland Power Cooperative in LaCrosse, Wisconsin.

In November 1949, Mr. Mielke came to work for Northern States Power as a Steam Plant Operator (head of the shift) at the Red Wing Steam Plant, which position he held until selection for Pathfinder.

On August 22, 1960, he was transferred to the Northern States Power Minneapolis office to attend an accelerated two-month Nuclear Theory Course. This course was presented by the Pathfinder Plant Results Engineer and Radiation & Chemical Engineer and included mathematics, physics, radiation protection and detection, reactor theory, instrumentation and reactor control.

Subsequent to this, Mr. Mielke was assigned to Allis-Chalmers Greendale Laboratories for four months' experience in the operation of the Allis-Chalmers Critical Facility and lectures on Pathfinder System and component design. Work on the Critical Facility included assistance in fuel loading and core alterations, assistance in experimental operations, reactor operation under direct supervision and participation in the performance, data taking and analysis of control rod calibration experiments. During this period of training, Mr. Mielke was given an oral and operating proficiency test on the Critical Facility by Allis-Chalmers personnel, similar to the AEC operating test required for Allis-Chalmers operators, and he successfully passed these tests.

On March 15, 1961, Mr. Mielke reported to the MTR reactor at Idaho Falls for a six-month work experience assignment in reactor operations. During this period of training he accumulated about 190 hours of responsible reactor console operating time on the MTR. In addition to this, he engineered experiments on this reactor, assisted in the insertion and removal of fuel elements and experiments into and out of the reactor, participated in some health physics and contamination control work and other duties pertinent to MTR reactor operation.

On September 18, 1961, Mr. Mielke was transferred to the Pathfinder Plant site to begin training on the Pathfinder facility, supervise preoperational check-out procedures and instruct other Pathfinder operating personnel.

G. H. Neils

Mr. Neils has been selected as the Plant Results Engineer for the Pathfinder Plant. Mr. Neils graduated as an Electrical Engineer from the University of North Dakota in 1955. He than joined Northern States Power Company and was assigned to several steam plants for work in the "Results" group and gained wide experience in steam plant operation.

Mr. Neils attended the First Shippingport Nuclear Power Station Supervisors' Course from February 9, 1959 through July 10, 1959. He was then assigned to the Greendale Laboratories of Allis-Chalmers Manufacturing Company in Milwaukee, Wisconsin for work in connection with Pathfinder control and instrumentation design and for experience in the operation of the Critical Facility at Greendale Laboratories. During early 1960, his work at the Greendale Laboratories was primarily in connection with the operation of, and physics testing in, the Critical Facility. On March 30, 1960, he received an AEC Reactor Operator's license (OP-776) for the Allis-Chalmers Critical Facility.

Subsequently, Mr. Neils was assigned to the Nuclear Power Department of Northern States Power to review for comment and become thoroughly acquainted with Pathfinder design; to act as an instructor for training of other personnel; and to participate in other training experiences. He attended numerous conferences with the Allis-Chalmers group in connection with Pathfinder design.

In June 1961, Mr. Neils was transferred to the Pathfinder Plant site to continue the above mentioned duties and to assume further responsibility as Plant Results Engineer in connection with plant construction and equipment check-outs.

W. A. Sparrow

Mr. Sparrow was selected as a Shift Supervisor for the Pathfinder Plant in July 1960. Mr. Sparrow attended Mayville State Teachers College for one year and North Dakota AC for one year taking primarily courses in mathematics and science.

He started work with Northern States Power Company in 1944 at the Fargo Steam Plant in the operating section. He progressed through various positions in plant operation and for the last six years was primarily concerned with electrical operation and maintenance at the Fargo Steam Plant.

On August 22, 1960, he was transferred to the Northern States Power Minneapolis office to attend an accelerated two-month Nuclear Theory Course. This course was presented by the Pathfinder Plant Results Engineer and Radiation & Chemical Engineer and included mathematics, physics, radiation protection and detection, reactor theory, instrumentation and reactor control.

Subsequent to this, Mr. Sparrow was assigned to Allis-Chalmers Greendale Laboratories for four months' experience in the operation of the Allis-Chalmers Critical Facility and lectures on Pathfinder system and component design. Work on the Critical Facility included assistance in fuel loading and core alterations, assistance in experimental operations, reactor operation under direct supervision and participation in the performance, data taking and analysis of control rod calibration experiments. During this period of training, Mr. Sparrow was given an oral and operating proficiency test on the Critical Facility by Allis-Chalmers personnel, similar to the AEC operating test required for Allis-Chalmers operators, and he successfully passed these tests.

On March 15, 1961, Mr. Sparrow reported to the ETR reactor at Idaho Falls for a six-month work experience assignment in reactor operation. During this period of training he accumulated about 140 hours of responsible reactor console operating time on the ETR. In addition to this, he engineered experiments on this reactor, assisted in the insertion and removal of fuel elements and experiments into and out of the reactor, participated in some health physics and contamination control work and other duties pertinent to ETR reactor operation.

On September 18, 1961, Mr. Sparrow was transferred to the Pathfinder Plant site to begin training on the Pathfinder Facility, supervise preoperational check-out procedures and instruct other Pathfinder operating personnel.

A. E. Swanson

Mr. Swanson has been selected for the position of Assistant Plant Superintendent of the Pathfinder Atomic Power Plant. Mr. Swanson is a graduate Mechanical Engineer from the University of Minnesota who has worked for Northern States Power for about 14 years. In his 14 years with Northern States Power he has accumulated a wealth of information in regard to the operation control and maintenance of steam plants. Mr. Swanson is a registered Professional Engineer (Mechanical Engineer) in the States of Minnesota and South Dakota. He is an active member of the Minnesota Section of the ASME and is a past Chairman of that group.

Mr. Swanson completed courses in Atomic Physics and Differential Equations at the University of Minnesota in the spring and summer of 1959. On September 15, 1959, he was assigned to the Argonne National Laboratory as a "loan employee" for a two-year period of work in connection with reactor engineering and boiling water reactor operation.

Mr. Swanson was assigned regular staff duties under the direction of the EBWR project manager during his training at Argonne. This included such things as commenting on manufacturer and architect-engineering drawings, evaluation of bid proposals with his recommendation, preparing progress reports, etc. He also participated in some of the hazard evaluation of the changes to the EBWR system.

He actively participated in the removal of the components from EBWR (control rods, shrouds, dry pipes, etc.), and held responsible positions as a staff representative in the reloading of the EBWR Core I and in loading of Core IA (spiked elements with 5 ft. core). He is a contributer to the EBWR 100 MW Design Manual and Operating Manual. He has conducted and planned tests of the EBWR Test Program. He coordinated the first phase of the EBWR 100 MW operator training program and presented many of the lectures.

After successfully passing examinations (oral and written) he operated EBWR during numerous critical experiments and various power operations. The critical experiments were part of those initially conducted to determine the characteristics of the new spiked core and for the calibration of new control rods. He has spent approximately 250 hours of active participation in startups and operation of EBWR.

During the winter of 1960, Mr. Swanson attended classes at the International Institute of Nuclear Science and Engineering. He spent a portion of the latter part of 1960 and early 1961 at the Allis-Chalmers Greendale Laboratory during periods of inactivity in the EBWR program. The work at the Greendale Laboratories was in connection with Critical Facility operation, participation in Pathfinder design work and coordination of the preparation of the Pathfinder Operations Manual.

A. E. Swanson, Cont'd.

Mr. Swanson was transferred to the Pathfinder Plant site in September 1961, to assume his responsibilities as Assistant Plant Superintendent; to participate in directing operator training and equipment check-outs; and to gain a thorough acquaintance with the Pathfinder Facility.

R. F. Wagner

Mr. Wagner was selected in July, 1960, to be the Instrumentation Supervisor at the Pathfinder Plant. He attended South Dakota College for two years taking Electrical Engineering at which time he entered World War II service with the Air Force for a period of almost three years. During his military service he was an instructor in aircraft radio and radar equipment maintenance, plus other instructing duties on teletype equipment.

He joined Northern States Power Company in 1946 in the Meter Department and transferred to the Lawrence Steam Plant in Sioux Falls in 1947 in the operating section. After about five years of overall steam plant operating experience he was promoted to the position of Station Electrician. Part of his duties in this position included the calibration and maintenance of electronic equipment. Outside of work for the Company, one of his hobbies is electronics and he is an amateur radio operator.

On August 22, 1960, he was transferred to the Northern States Power Minneapolis office to attend an accelerated two-month Nuclear Theory Course. This course was presented by the Pathfinder Plant Results Engineer and Radiation & Chemical Engineer and included mathematics, physics, radiation protection and detection, reactor theory, instrumentation and reactor control.

In January 1961, Mr. Wagner reported to the Savannah River Plant for a three-month work experience assignment in connection with nuclear and radiation instrumentation. Subsequent to this assignment he made several trips to participate in check-outs of Pathfinder nuclear instrumentation and the Pathfinder reactor pressure control system at the equipment manufacturers' facilities.

In June 1961, Mr. Wagner was transferred to the Pathfinder Plant site along with his instrument group. The instrument group, under Mr. Wagner's direction, are engaged in check-out and calibration of various instrumentation systems in preparation for equipment start-ups.

ADDENDUM NO. 2

PROJECT ORGANIZATION CHARTS

AND

PERSONNEL ASSIGNMENTS

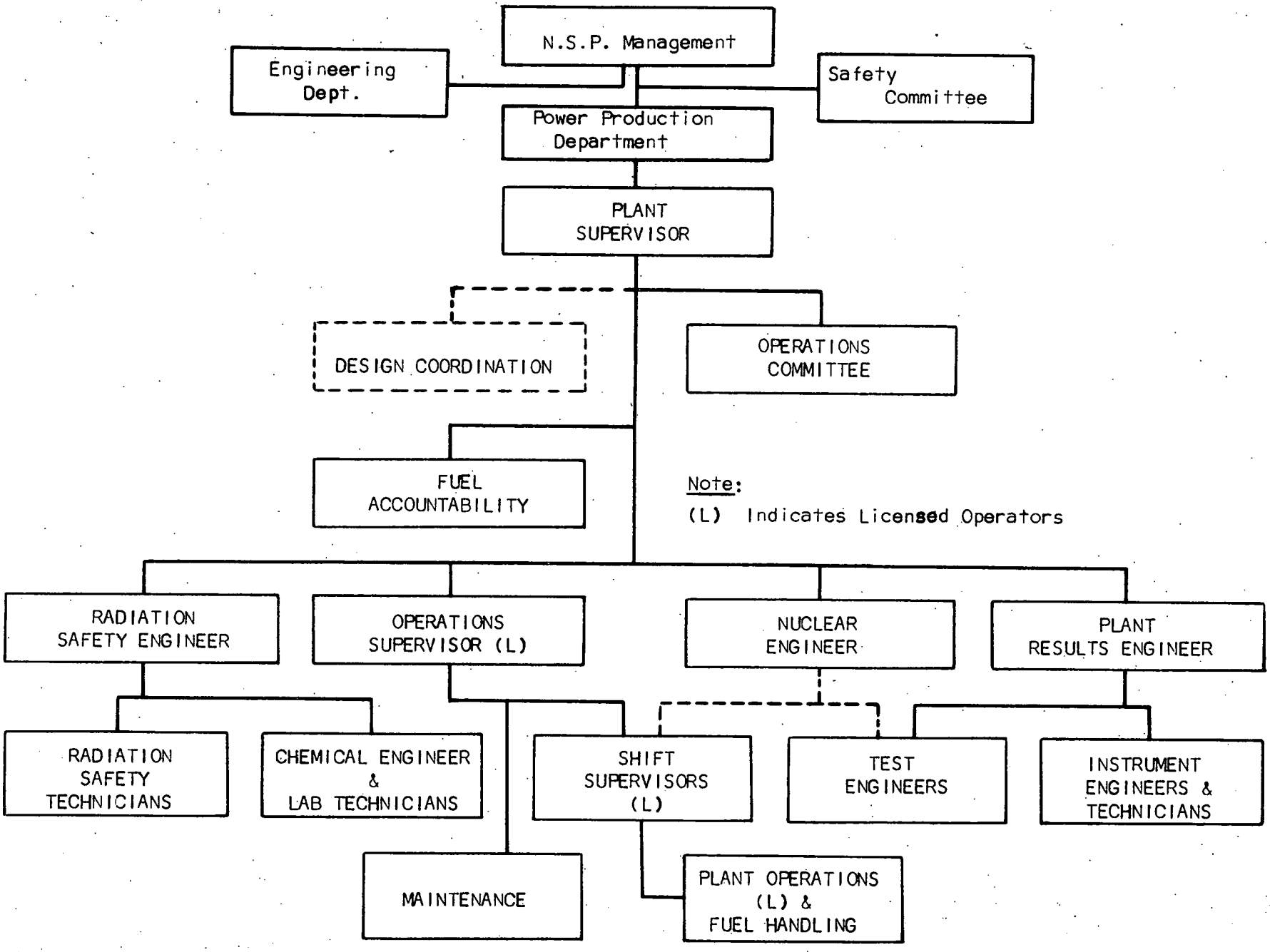

N.S.P. Management
Engineering Dept.
Safety Committee
Power Production Department
PLANT SUPERVISOR
DESIGN COORDINATION
OPERATIONS COMMITTEE
FUEL ACCOUNTABILITY
Note:
(L) Indicates Licensed Operators
RADIATION SAFETY ENGINEER
OPERATIONS SUPERVISOR (L)
NUCLEAR ENGINEER
PLANT RESULTS ENGINEER
RADIATION SAFETY TECHNICIANS
CHEMICAL ENGINEER & LAB TECHNICIANS
SHIFT SUPERVISORS (L)
TEST ENGINEERS
INSTRUMENT ENGINEERS & TECHNICIANS
MAINTENANCE
PLANT OPERATIONS (L) & FUEL HANDLING

Chart No. I

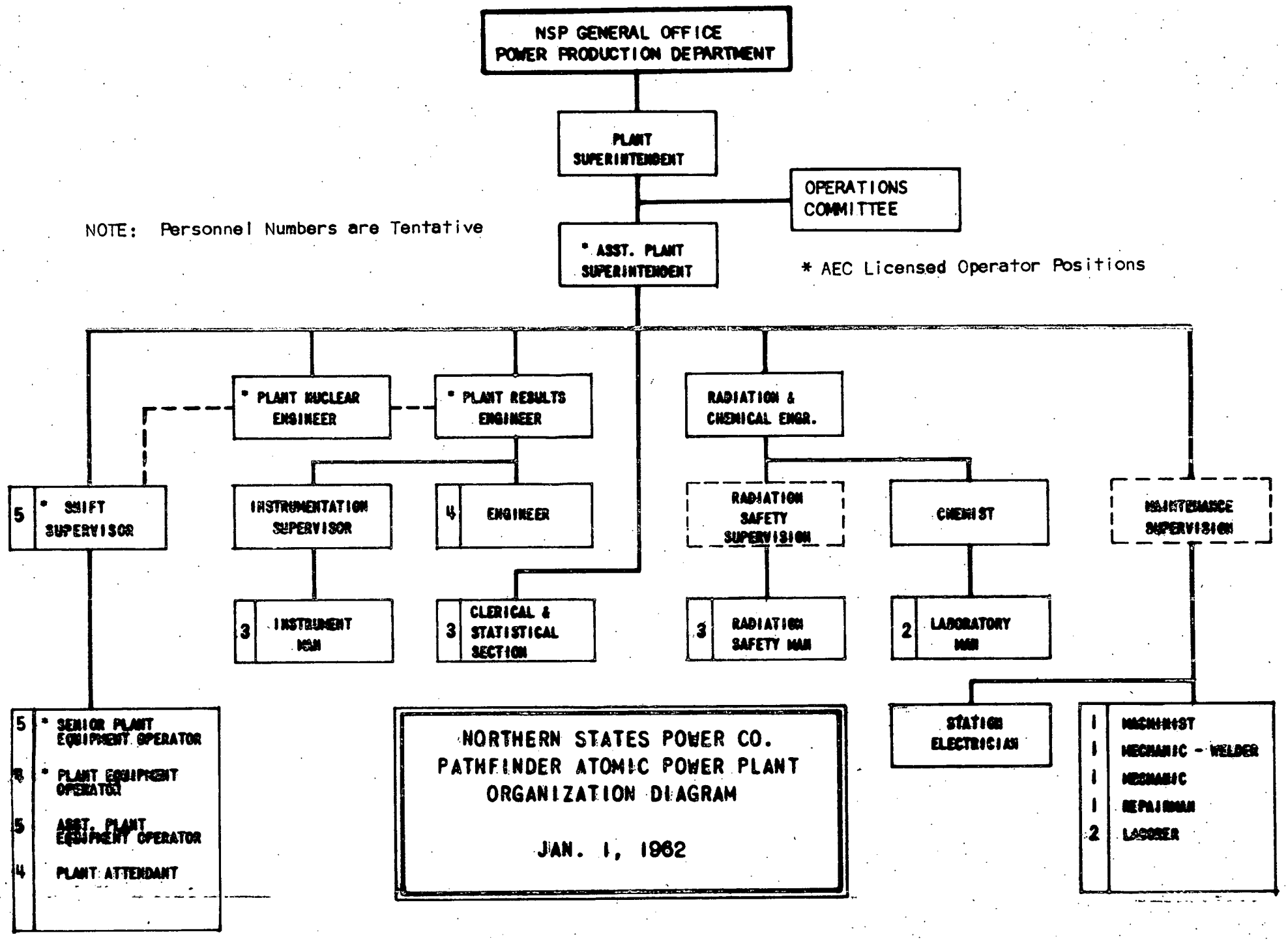

NSP GENERAL OFFICE
POWER PRODUCTION DEPARTMENT
PLANT SUPERINTENDENT
OPERATIONS COMMITTEE
NOTE: Personnel Numbers are Tentative
* ASST. PLANT SUPERINTENDENT
* AEC Licensed Operator Positions
* PLANT NUCLEAR ENGINEER
* PLANT RESULTS ENGINEER
RADIATION & CHEMICAL ENGR.
5 * SHIFT SUPERVISOR
INSTRUMENTATION SUPERVISOR
4 ENGINEER
RADIATION SAFETY SUPERVISION
CHEMIST
MAINTENANCE SUPERVISION
3 INSTRUMENT MAN
3 CLERICAL & STATISTICAL SECTION
3 RADIATION SAFETY MAN
2 LABORATORY MAN
5 * SENIOR PLANT EQUIPMENT OPERATOR
8 * PLANT EQUIPMENT OPERATOR
5 ASST. PLANT EQUIPMENT OPERATOR
4 PLANT ATTENDANT
STATION ELECTRICIAN
1 MACHINIST
1 MECHANIC - WELDER
1 MECHANIC
1 REPAIRMAN
2 LAGGER
NORTHERN STATES POWER CO.
PATHFINDER ATOMIC POWER PLANT
ORGANIZATION DIAGRAM
JAN. 1, 1962

Chart No. 2

PERSONNEL ASSIGNMENTS
for
PREOPERATIONAL & NUCLEAR TESTING

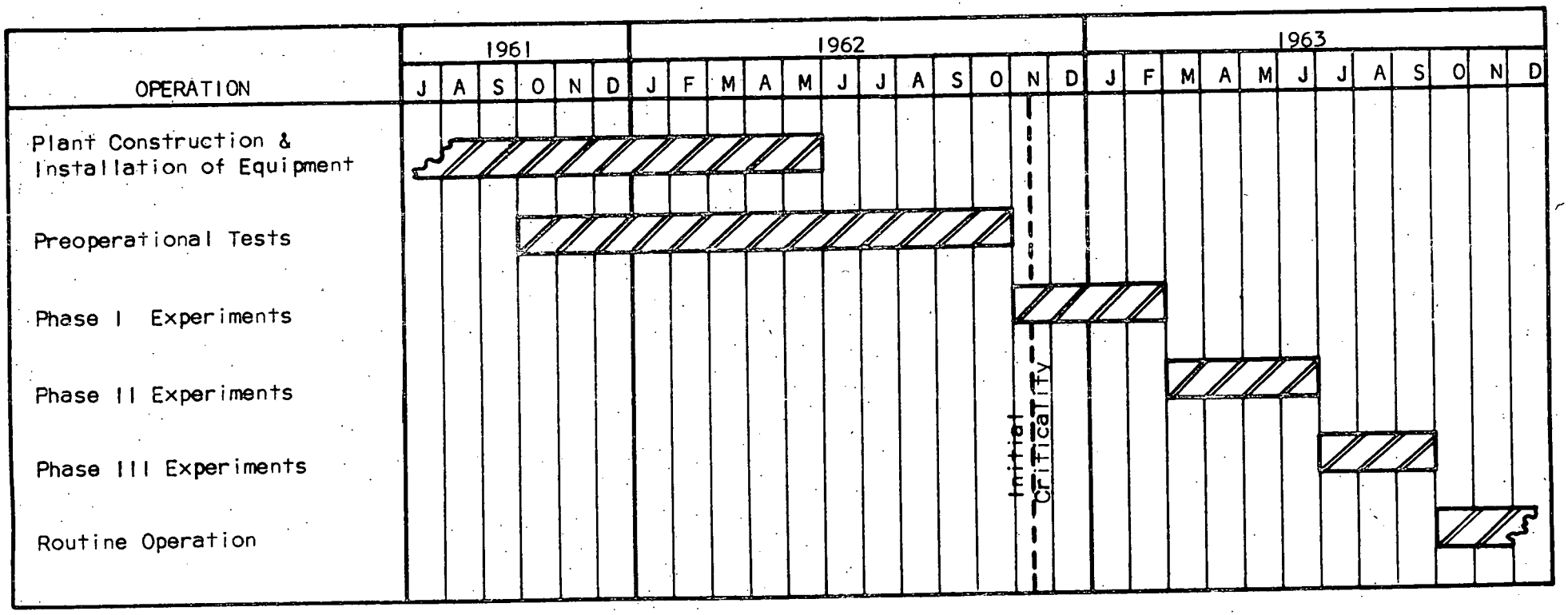
Personnel from Allis-Chalmers and Northern States have been tentatively assigned to various positions in the Pathfinder Atomic Power Plant Organization as follows:

POSITION	ALLIS-CHALMERS MANUFACTURING COMPANY	NORTHERN STATES POWER COMPANY
Plant Supervisor	R. W. Klecker	L. L. Bach
Operations Supervisor	S. D. MacKay	A. E. Swanson
Shift Supervisors	L. M. Fead G. Froystad R. A. Hartfield F. A. Maura D. Mohr G. E. Norwood	W. E. Anderson J. B. Brokaw R. T. McKaughan R. A. Mielke W. A. Sparrow
Radiation Safety Engineer		R. B. Keely
Nuclear Engineer	R. J. Holl R. H. Vollmer D. Crimmins J. T. Stone N. Sher D. Patterson P. Lacy A. Selep	C. E. Larson
Plant Results Engineer	G. Panter D. Swanson R. Davie R. Michel K. Gruenwald	G. H. Neils
Operations Committee	R. Klecker R. Holl, physics M. Beebe, health-physics R. Vollmer, reactor operations N. Sher, heat transfer	L. L. Bach C. E. Larson, physics R. B. Keely, health-physics A. E. Swanson, reactor operations G. H. Neils, engineering and instrumentation.

ADDENDUM NO. 3

PROJECT SCHEDULE

The following is a schedule of the Pathfinder operations outlined in this report.



ADDENDUM NO. 4

PATHFINDER OPERATIONS COMMITTEE

AND

PATHFINDER SAFETY COMMITTEE

PATHFINDER OPERATIONS COMMITTEE
AND
PATHFINDER SAFETY COMMITTEE

To insure strict adherence to established safeguards regulations and operations criteria, operations and other activities at the Pathfinder Atomic Power Plant will be reviewed by two committees, a Safety Committee and an Operations Committee.

The general purpose of the Safety Committee is to identify any potential nuclear hazards to the public or plant operating staff that might arise in the operation of the Pathfinder plant and to provide advice on the action required to minimize the potential hazard. The committee shall give advice to NSP management to assist it in assuring safe operation of the plant and adherence to AEC license requirements. It is the responsibility of the Pathfinder Safety Committee to conduct evaluations of the nuclear safeguards aspects of proposed tests or experiments, reactor core alterations or changes in plant components or operating procedures.

The general purpose of the Operations Committee is to identify initially and minimize any potential nuclear hazard associated with the Pathfinder plant. Proposals which clearly fall within the scope of proposals previously approved by the Safety Committee and which do not involve an "unreviewed safety question" (i.e., are within the scope of the AEC operating license) are to be reviewed and evaluated by the Operations Committee. Proposals of a type not previously reviewed by the Safety Committee or potentially not within the scope of the AEC operating license are to be identified and referred with comment to the Safety Committee for evaluation.

PATHFINDER OPERATIONS COMMITTEE

Responsibilities and Duties

This committee shall initially review and evaluate all proposed tests and experiments, reactor core alterations and changes in plant components or operating procedures. The committee shall determine if the proposal can in fact be carried out safely and within the AEC license requirements. Generally, the proposal shall be submitted by a sponsor or sponsors who are technically most familiar with the proposal. If a proposal requires modifications to meet acceptance, the sponsor will be in a position to determine if the modifications affect the original objectives of the proposal. The committee will be able to enlist the aid of other NSP technical departments and outside consultants as required.

Committee Makeup

This committee will be composed of the following, of whom one will be chairman:

1. Pathfinder Plant Superintendent
2. Pathfinder Assistant Plant Superintendent
3. Radiation and Chemical Engineer
4. Plant Results Engineer
5. Plant Nuclear Engineer
6. NSP Management - ex. officio

Committee Function

The committee shall initially examine, review and evaluate all matters involving:

1. Written procedures and proposed changes which might involve nuclear hazards including plant startup, initial criticality, power

escalation from criticality to design, power, testing, experiments, plant and reactor components, routine operation, maintenance, fueling, fuel storage and shipment, waste disposal, decontamination, radiation monitoring, record keeping and emergencies.

2. Significant deviations from expected plant performance which might change the potential nuclear hazards previously considered or might be considered as incidents.

3. Submissions to the AEC or agencies of the State of South Dakota which involve nuclear hazards.

Committee Decisions

After a careful examination, review and evaluation of proposals clearly falling within the scope of proposals previously approved by the Safety Committee, the committee shall decide on one of the following:

1. Disapprove the proposal and suggest modification.

2. Unanimously approve the proposal if it is clearly within the requirements of the AEC operating license and does not involve an "unreviewed safety question." The committee shall inform NSP management of this decision for prompt notification of the proper authorities, AEC, state agencies and others. If the committee has any doubt about this determination the proposal shall be submitted to the Pathfinder Safety Committee for evaluation.

If the proposal does not fall within the scope of proposals previously reviewed by the Pathfinder Safety Committee or constitutes an "unreviewed safety question," the committee shall decide on one of the following:

1. Disapprove the proposal and suggest modification.

2. Accept the proposal, prepare an analysis and submit to the Safety Committee for review.

Committee Records

An appointed secretary shall keep a prudent record of the Committee proceedings.

PATHFINDER SAFETY COMMITTEE

Responsibilities and Duties

This committee is the senior advisory group with the responsibility for advising NSP management on nuclear safety for all proposals involving tests, experiments, reactor core alterations, power levels, plant component changes and operating procedure modifications. The committee will meet to examine, review and evaluate proposals and comments submitted by the Operations Committee. In addition, the committee is to define clearly its own decisions to assist the Operations Committee in its evaluations.

Committee Makeup

This committee will be composed of experienced, technically qualified individuals of whom one will be chairman.

Included in the Committee Membership will be;

1. A representative of NSP management.

2. A senior member of the Pathfinder Operating Staff.

3. A senior member of the reactor and plant designer's staff.

4. An experienced independent nuclear safeguards consultant.

In addition the membership shall include experienced senior individuals possessing the following technical skills: (1) Reactor Heat Transfer and

Hydraulics, (2) Reactor Physics, (3) Reactor and Plant Kinetics and Stability, (4) Radiation and Coolant Chemistry, (5) Instrumentation, (6) Plant Systems Design and Operation.

Appropriate technical personnel shall always be in attendance and a quorum shall be constituted by 75% of the total committee membership. The secretary for the committee shall be a member of the Pathfinder Operations Committee and shall keep a prudent record of all proceedings.

Committee Function

The committee shall follow procedures established by the chairman and carefully review and evaluate all matters referred to it by the Operations Committee or by NSP management. The committee shall report, through correspondence of the chairman, to NSP management. Typical proposals shall involve:

1. Written procedures and proposed changes which might involve nuclear hazards including plant startup, initial criticality, power escalation from criticality to design power, testing, experiments, plant and reactor components, routine operation, maintenance, fueling, fuel storage and shipment, waste disposal, decontamination, radiation monitoring, record keeping and emergencies.
2. Significant deviations from expected plant performance which might have nuclear hazards or which might be considered as incidents.
3. Submissions to the AEC or agencies of the State of South Dakota which involve nuclear hazards.
4. Any special matter at the request of NSP management.

Committee Decisions

After proper consideration the committee shall arrive at one of the following decisions with clear definition for each matter presented to it:

1. Disapprove the proposal and recommend that it be dropped.
2. Disapprove the proposal and suggest modifications necessary for resubmittal to the Safety or Operations Committee.
3. Unaniamously approve the proposal and find that it is within the limitations of the requirements of the AEC operating license and does not involve an "unreviewed safety question." The committee shall direct that the Commission be notified promptly that a change is being made based on the evaluation above.
4. Unanimously approve, the proposal, but indicate that it is not within the limits of the operating license of the AEC or other agencies and, therefore, requires specific approval of proper authorities. The committee shall request that a submittal be prepared with appropriate hazards analysis for its review and subsequent transmittal to the proper agencies.