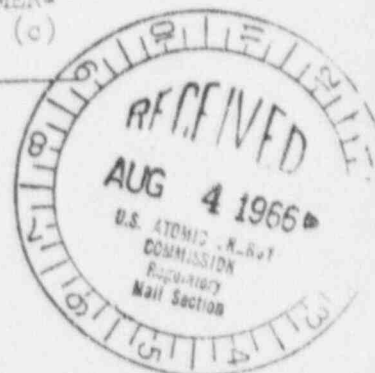


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See Reports Section for info

APPLICATION FOR (a) 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, (b) SPECIAL NUCLEAR MATERIAL LICENSE AND (c) BY-PRODUCT MATERIAL LICENSE



Name of Applicant

Northern States Power Company

Address of Applicant

1000 Nicollet Avenue - Minneapolis, Minnesota 55401

Description of Business

Applicant is a public utility which furnishes various utility services, principally electric, in central and southern Minnesota, including the cities of Minneapolis and St Paul and parts of North Dakota and South Dakota. Applicant's only wholly owned public utility subsidiary, Northern States Power Company, a Wisconsin Corporation, furnishes various utility services, principally electric, in west central Wisconsin. Applicant and its subsidiary are herein collectively referred to as "NSP" and their combined electrical systems as the "NSP System".

State Where Incorporated

Minnesota

Names, Home Addresses, Office and Citizenship of Directors and Principal Officers

<u>Name</u>	<u>Home Address</u>	<u>Office Held</u>	<u>Citizenship</u>
Allen, Allen S	3540 James Ave So. Apt #105 Minneapolis, Minnesota 55408	Director and Chairman	U.S.
Ewald, Earl	11615 Timberline Road Hopkins, Minnesota 55343	President General Manager Chief Executive Officer and Director	U.S.
Dayton, K N	Long Lake, Minnesota	Director	U.S.
Duffy, S P	3540 James Ave So. Apt #205 Minneapolis, Minnesota 55408	Director	U.S.
Engels, R H	152 Hawthorne Road Hopkins, Minnesota 55343	Executive Vice President and Director	U.S.

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<u>Name</u>	<u>Home Address</u>	<u>Office Held</u>	<u>Citizenship</u>
Angus, John L.	1009 - 10th St South Fargo, North Dakota 58101	Director	U.S.
Barlisch, P. A.	Route 3, Box 240 E Wayzata, Minnesota 55391	Director	U.S.
Jackson, A B	483 Grand Avenue St Paul, Minnesota 55102	Director	U.S.
MacFarlane, Robert S	740 River Drive Apt #20E St Paul, Minnesota 55116	Director	U.S.
McDowell, P H	40 Sunny Crest Sioux Falls, South Dak. 57105	Director	U.S.
Mintz, D C	133 South 15th Street LaCrosse, Wisconsin 54601	Director	U.S.
Reels, James F Jr	2213 Edgcombe Road St Paul, Minnesota 55116	Vice President, Manager St Paul Division and Director	U.S.
Wilson, Dr O Meredith	176 N Mississippi River Blvd - St Paul, Minn. 55104	Director	U.S.
Furter, J Roscoe	4805 Rolling Green Pkwy Minneapolis, Minn. 55424	Vice President and Manager Mpls Division	U.S.
Furter, Richard D	5404 Oaklawn Avenue Minneapolis, Minnesota 55424	Vice President	U.S.
Hoffmann, J W	1851 Wellesley Avenue St Paul, Minnesota 55105	Vice President	U.S.
Johnson, G F	4721 Annaway Drive Minneapolis, Minn. 55436	Vice President- Finance	U.S.
Larkin, Wade	5305 W Highwood Drive Minneapolis, Minn. 55436	Vice President- Personnel	U.S.
Larson, Clayton K	5528 Chantrey Road Minneapolis, Minn. 55436	Vice President and Comptroller	U.S.
McElroy, D F	2700 E Minnehaha Parkway Minneapolis, Minn. 55406	Vice President- Engineering	U.S.

<u>Name</u>	<u>Home Address</u>	<u>Office Held</u>	<u>Citizenship</u>
Nelson, Donald E	4328 Philbrook Lane Minneapolis, Minn. 55424	Vice President and General Counsel	U.S.
Shogren, A G	5701 Abbott Ave South Minneapolis, Minn. 55410	Treasurer	U.S.
Stoddart, J E	Box 146-S, Route 1 Wayzata, Minn. 55491	Vice President Marketing	U.S.
Vance, M D	6833 Queen Ave South Minneapolis, Minn. 55423	Secretary	U.S.
Willson, E A	5440 Normandale Road Minneapolis, Minn. 55436	Vice President- Operation	U.S.

Applicant is not owned, controlled or dominated by an alien, a foreign corporation or foreign government.

Applicant is not acting as an agent or representative of another person in filing this application.

Class of Licenses Applied For - Class 104b (Utilization Facility) License and Construction Permit, Special Nuclear Material License, and By-product Material License.

The utilization facility will be a nuclear power plant to be located near Monticello, Minnesota and will be operated as a part of the NSP System. The reactor will be a Boiling Water Type, capable of operation at a thermal power level of approximately 1,469 megawatts. The power plant, called the Monticello Nuclear Generating Plant, will have a gross electrical output of 493.8 megawatts.

#### Term of License

License January 1, 1970 to January 1, 2010

Construction Permit February 1, 1967 to December 31, 1970.

No other licenses have been issued or applied for in connection with the proposed utilization facility.

#### Financial Qualifications

NSP's total operating revenues for 1965 were \$236.9 million. Net income after taxes, bond, interest, and other income deductions was \$34.7 million. At the end of 1965, total utility plant was valued at \$913.0 million on an original cost basis. Depreciation reserves amount to \$212.0 million, leaving net utility plant at \$701.0 million. Long-term debt at the end of the year amounted to \$325.3 million. A copy of NSP's annual report to shareholders and a certified copy of Applicant's financial statements for 1965 are included as a part of this Application.

#### Technical Qualifications

The NSP System furnishes electrical utility service at retail in 596 communities, at wholesale for resale in 40 additional communities, at retail to many rural and farm customers throughout the territory served, and at wholesale to 5 other utility companies. Of the communities served with electricity, 401 are located in Minnesota, 182 in Wisconsin, 18 in North Dakota, and 35 in South Dakota. Electrical utility service is supplied to about 50% of the people in Minnesota, about 20% of the people in North Dakota, and about 10% of the people in South Dakota and Wisconsin. Of the approximately 2.7 million people in the service area, about 62% live in the Minneapolis and St Paul metropolitan area.

The map on pages 16 and 17 of the 1965 Annual Report to Shareholders shows the principal transmission lines of the NSP System.

The principal generating capacity of the NSP System is in three steam plants, located on rivers in the Minneapolis-St Paul area, having an aggregate capability of 1,458,800 kw. The total system capability including these plants is as follows:

Steam: 1,858,500 kw in 18 plants

Hydro: 167,640 kw in 30 plants

Diesel: 39,620 kw in 21 plants

Gas Turbine: 62,000 kw in 1 plant

Total 2,127,760 kw as of December 31, 1965

Additional generating capacity is being provided by the installation of a conventional unit of 550,000 kw capacity at the Allen S King Plant, located on the St Croix River at Oak Park Heights, Minnesota. Scheduled "initial operation" of this plant is May 1968.

The Pathfinder Atomic Power Plant (described on page 6 of this Application) will be operating at full power, 58,000 kw., and become part of the NSP System generating capability in late 1966.

The NSP System hourly integrated peak for 1965 was 1,775,000 kw; the 1965 instantaneous peak was 1,990,616 kw, and the 1965 net generation of the NSP System was 10,377,671,000 kilowatt hours.

Since 1946 the NSP System load has grown at a cumulative annual rate of about 7 percent. As a result of this growth, additional capacity of about 900 mw will be required about 1970. The 58 mw Pathfinder Atomic Power Plant, the 550 mw Allen S King Power Plant, and the 493.8 mw Monticello Nuclear Generating Plant will meet system generation requirements in 1970.

The following demand figures are for the NSP System as determined from the load growth trends since 1963 projected at an annual cumulative increase of approximately 7 percent with minor adjustments for loss of preference customer loads to the USBR System.

Technical Qualifications-continued

Peak Demand in MW\*

<u>Year</u>	<u>Actual</u>	<u>Projected</u>
1963	1,671	
1964	1,827	
1965	1,975	
1966		2,097
1967		2,258
1968		2,432
1969		2,619
1970		2,821
1971		3,039
1972		3,273

\*Hourly Integrated Peak

In 1952, Foster Wheeler Corporation and the Pioneer Service & Engineering Company entered into a contract with the Atomic Energy Commission to study the feasibility of utilizing nuclear energy for the generation of electric power. As a client of Pioneer Service & Engineering Company, Applicant participated in a number of conferences dealing with these studies. Two of Applicant's engineers obtained "Q" clearances so that they could receive classified information relating to the feasibility studies.

In 1955, Applicant, Minneapolis Honeywell Regulator Company and General Mills, Inc. organized the Minnesota Nuclear Operations Group which includes in its membership the University of Minnesota and nineteen additional major manufacturing firms. The purpose of the Group has been to promote the use of nuclear energy in Minnesota. A major project of the Minnesota Nuclear Operations Group has been to give the University of Minnesota a gamma irradiation facility. To this end, the Group raised among its members about \$70,000 with which the University has constructed a 1,000 curie facility which was put in service in 1957. Also, the group has been assisting the State of Minnesota in drafting legislation for the regulation of radiation hazards.

In 1955, Applicant also joined with Otter Tail Power Company, Minnkota Power Cooperative, Inc. and Central Power Cooperative, Inc. (the latter two incorporated in North Dakota) in making a gift of \$100,000 payable \$20,000 per year, to enable the University of Minnesota to use nuclear materials in agricultural research.



Technical Qualifications-continued

In April 1956, Applicant became Access Permit Holder No. 874 in order to receive classified material.

In November 1957, Applicant entered into a contract with the United States of America, acting through United States Atomic Energy Commission, to build and operate a 66 mw Nuclear Power Plant. The plant, known as the Pathfinder Atomic Power Plant, located 3-1/2 miles northeast of Sioux Falls, South Dakota, was completed in March 1964 and first phased electrically into the NSP System in July, 1966. The Pathfinder Plant is an advanced type controlled recirculation boiler water reactor with an integral nuclear superheater capable of producing 190 mw<sub>t</sub> at 724°F @600 psig (reactor).

Under the terms of the contract, AEC participated in the financing of the research and development activities associated with the fuel and plant design and waived fuel use charges for the first five years of operation. A group of 10 utilities (including Applicant) organized as the Central Utilities Atomic Power Association (CUAPA) assisted with the financing of research and development work for the Pathfinder Plant.

Applicant has trained 50 supervisors, operators and maintenance personnel at various Commission facilities, including EBWR at Argonne, the test reactors at Idaho Falls, Idaho, and the Shippingport reactor, Pittsburgh, Pa. and at the critical facilities of the Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin for its Pathfinder Atomic Power Plant.

This crew has been responsible for the fuel loading, the pre-critical experiments, the establishment of the critical fuel arrangement, the post critical experiments and the escalation of reactor power to initial power operation of 40 mw<sub>t</sub>. The Allis-Chalmers Manufacturing Company, engineers and designer and builder of the plant, assisted with the development of test procedures and supervision of the reactor operation.

Applicant employs more than 300 persons possessing technical degrees, with electrical, mechanical, and civil engineering degrees predominating. Two engineers, one assigned to the Engineering Department and one to the Operating Department, have completed training at the Oak Ridge School of Reactor Technology.

The staff for the Monticello Nuclear Generating Plant will be drawn from the Pathfinder crew and crews of other production plants of Applicant. A training program will be initiated to train the staff utilizing the Pathfinder Plant and if it is deemed desirable, other facilities including those of the General Electric Company at San Jose and Vallejos, California.

In order to protect the health and safety of the public and plant personnel, standards and procedures will be maintained in compliance with the regulations in CFR Title 10, Chapter 1, Part 20.

### Estimated Cost of Plant and Initial Fuel

Applicant has entered into a contract with the General Electric Company (GE) whereby GE will design, engineer and construct the reactor and turbo-generator portions of the plant which include the reactor building and its contents the turbo-generator building and its contents, control room, waste disposal facilities, laboratories, shops and office areas of the plant. The contract with GE provides for escalation of the firm price based on increases in specific labor and material indices. The Applicant will design, engineer and construct the "balance of plant", not included in the GE Contract. Principal structures and work included in the "balance of plant" are the screenhouse, river water intake and discharge structures, cooling towers, circulating water canals, roadways, railroad, parking areas, exterior fire protection, site landscaping, fencing, water wells and substation.

The estimated cost of the Monticello Nuclear Plant is as follows:

Gross Construction Cost of Plant	\$ 62,650,000
Overhead and General Costs	3,400,000
Interest During Construction	4,000,000
Taxes During Construction	3,000,000
Site Studies, Monitoring and Surveys	275,000
Permits, State and Federal	125,000
Consultants' Fees	100,000
Miscellaneous Cost, Includes Plant Equipment, Training and Licenses of Operators	850,000
Total	\$ 75,000,000
345/115 KV Substation and Transmission Outlets	5,000,000
Total Project Cost Including Substation and Outlets	\$ 80,000,000

The initial fuel for the plant will be furnished by GE; however, the agreement with GE for the first fuel loading and successive fuel loadings is yet to be negotiated. The first fuel loading, including spare elements, is estimated to cost \$19,200,000.

### Special Nuclear Material

A Special Nuclear Material license to permit the Applicant to possess Special Nuclear Material contained in the fuel for use in its utilization facility is required by October 1, 1969.

Applicant, through its fuel supplier, desires withdrawal of the first enriched U-235 beginning in July 1968. The estimated schedule of subsequent withdrawals, annual transfers and cumulative requirements of Special Nuclear Material is in accordance with the schedule set forth on the next page.

The assumptions used in preparing the schedule are:

#### Power Output

<u>Fiscal Year</u>	<u>Thermal</u>	<u>Net Electrical</u>
1971	1469 mw	472 mw
1972	1600 mw	520 mw
1973	1674 mw	545 mw

#### Uranium Content of Core Load

95,341 kg

#### First Core Enrichment

2.16 w/o U-235

#### Reload Enrichment

2.49 w/o U-235

#### Total Assemblies in Core

484

#### Scrap

##### Manufacturers

Recoverable

7%

Non recoverable

1%

##### Reprocessing

U-235 not recoverable

1.3%

Pu not recoverable

2.0%

#### Schedule

Withdrawal of U for reload: 1 year prior to start of cycle

Return of manufacturing scrap: 1 year after withdrawal

Return of separation products: 1 year after discharge

#### Capacity Factor

<u>Fiscal Year</u>	<u>Capacity Factor</u>
1971-78	.88
1978	.79
1980	.76
1981	.65
1982	.61
1983	.56
1984-85	.49
1986	.48
1987-89	.43



U and Pu Balances-All Elements to Y-12

Fiscal Year	U-235 Withdrawals From AEC	Scrap U-235	Return to AEC		Initial Enrichment U-235		Elements Wt.%	Discharged Enrichment U-235 Wt.%	Elements Wt.%	Yearly Transfer U-235	Cumulative Transfer U-235					
			U-235 Fissile	Pu Total	U-235	Wt.%										
1969	2238.4	0	0	0	0	2.16				2238.4	2238.4					
1970	0	156.6	0	0	0	-				-156.6	2081.8					
1971	709.1	0	0	0	0	2.49				709.1	2790.9					
1972	645.1	49.7	0	0	0	2.49				595.4	3386.3					
1973	709.1	45.2	0	0	0	2.49				663.9	4050.2					
1974	645.2	49.7	509.7	216.2	291.3	2.49	254	1.350		85.8	4136.0					
1975	645.1	45.2	219.1	121.7	173.1	2.49	97	.826	36	380.8	4516.8					
1976	645.2	45.2	186.8	114.1	166.7	2.49	97	.725	24	413.2	4930.0					
1977	709.1	45.2	210.5	115.8	169.2	2.49	109	.836	12	453.4	5383.4					
1978	709.1	49.6	209.8	115.8	169.3	2.49	109	.892	12	449.7	5833.1					
1979	453.2	49.6	231.5	127.3	155.8	2.49	121	.897	12	172.1	6005.2					
1980	581.1	31.8	180.7	105.3	155.6	2.49	85	.875	24	363.6	6373.8					
1981	511.8	46.7	186.6	104.8	153.7	2.49	109	.908		284.5	6658.3					

#### Financing

NSP has had a continuing construction program for which net construction expenditures in the ten year period 1956 through 1965 have aggregated \$472 million. Of the funds required for these construction expenditures, about 50% have been obtained from internal sources and the balance from new capital through the sale of bonds, preferred stock and common stock. All construction is financed on the basis of annual requirements with no separate financing being made for any specific projects. The capital expenditures by Applicant for the Monticello Nuclear Generating Plant are estimated in the following table for the years 1966 through 1970. The total construction expenditures for NSP for these years are also shown to show the relative magnitude of the Monticello Nuclear Generating Plant expenditures.

#### ESTIMATED CONSTRUCTION EXPENDITURES

<u>Year</u>	<u>Applicant's Monticello Nuclear Plant*</u>	<u>NSP</u>
1966	\$ 250,000	\$ 82,000,000
1967	15,750,000	93,000,000
1968	35,000,000	90,000,000
1969	14,000,000	88,000,000
1970	10,000,000	62,000,000
Total	\$ 75,000,000	\$ 415,000,000

\*Outlets and Substation not included.

NSP has financed successfully its requirements for construction expenditures in the past and it anticipates that it will be able to successfully finance its present and future capital requirements. Part of the 1966 construction expenditures is being financed through the sale of \$45,000,000 in first mortgage bonds. In 1967 - 1970, additional capital securities will be sold, but the amount and kind have not been determined. Fuel expenses for Monticello Nuclear Generating Plant presently estimated at \$5.95 million per year will represent less than 3 $\frac{1}{2}$ % of the NSP's total operating expenses and will not impose any undue burden on the operations.

#### Insurance

Under Commission Regulation CFR, Title 10, Part 140.11, Applicant will be required to take out and to maintain financial protection in an amount based upon the thermal energy capacity of the Monticello Nuclear Generating Plant, i.e. 1,469 megawatts. Applicant will provide this protection in the form of liability insurance policies. Proof of this protection will be supplied at a later date at which time steps will be taken to enter into an agreement of indemnity with the United States of America, acting through the Atomic Energy Commission.

Access to Restricted Areas

Applicant agrees not to permit any individual to have access to restricted data until the Civil Service Commission shall have made an investigation and report to the ABC on the character, association and loyalty of such individuals and the ABC have determined that permitting such persons to have access to restricted data will not endanger the common defense and security.

Construction Dates

Earliest date for start	January 1, 1967
Latest date for start	May 1, 1967
Earliest date for completion	October 1, 1969
Latest date for completion	February 1, 1970

(Completion represents completion of construction prior to the introduction of fuel).

This Application contains no restricted or other defense information.

Included as Part II of this Application is a copy of the Facility Description and Safety Analysis Report for the Monticello Nuclear Generating Plant.

NORTHERN STATES POWER COMPANY

By



D F McElroy

Vice President-Engineering

State of Minnesota)

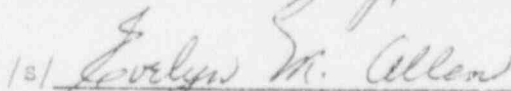
) SS.

County of Hennepin)

D F McElroy, being first duly sworn, says that he is the Vice President-Engineering of Northern States Power Company, a Corporation organized and existing under and by virtue of the laws of the State of Minnesota, that he executed the foregoing Application for the purpose therein set forth, that the statements made in said Application are true and correct to the best of his knowledge and belief, that he was authorized to execute said Application on behalf of said Corporation, and that the seal affixed is the corporate seal of said Corporation.

Subscribed and sworn to before me this 25<sup>th</sup> day of July 1966.

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Notary Public, Hennepin County, Minnesota  
My Commission Expires

EVELYN M. ALLEN

Notary Public, Hennepin County, Minn  
My Commission Expires Dec. 6, 1968

## REACTOR DATA INPUT FORM

## A. IDENTIFYING &amp; DESCRIPTIVE DATA

## REACTORS

01. PROGRAM CODE <b>211</b>	12. PROJ. NO.	03. DOCKET NO. <b>50-263</b>	09. TASK NO.	10. TYPE OF REACTOR	11. CLASS OF REACTOR
18. APPLICANT					19. NAME OF REACTOR
21. STREET-BUILDING				POWER LEVEL	
				TYPE	UNIT
				65.	66.
				67.	68.
24. IITY				27. STATE	30. ZIP
				ELEC.	
				69.	70.
				71.	72.
				THER.	

## B. ACTION DATA

## BASIC PROCESSING STAGES

PRE-APPLICATION CONSIDERATION		ACTIV. CD. <b>31</b>	74. FIRST ACTION			76. END ACTION (DATE APPL. CONSID.)		
			YR.	MO.	DAY	YR.	MO.	DAY
PROCESSING APPLICA. FOR CONSTRUCTION		<b>35</b>	APPLIC. REC.			CONSTRUCTION PER. ISSUED		
			33. YR.	MO.	DAY	76. NO.	77. YR.	MO.
						<b>CPR-31670619</b>	LATEST COMPL. DATE	<b>700201</b>
PROCESSING OPERATING AUTHORITY		<b>36</b>	STARTED			PRDV. OF. AUTHORITY ISSUED		
PROVIS- IONAL			80. YR.	MO.	DAY	81. NO.	82. YR.	MO.
							EXPIRATION DATE	
FULL TERM		<b>38</b>	STARTED			FULL TERM AUTH. ISSUED		
			84. YR.	MO.	DAY	85. NO.	86. YR.	MO.

## SUPPLEMENTARY ACTION

TASK NO. (SAME AS FIELD 09)	86. DATE SUPPLE. REQUEST REC'D.	YR.	MO.	DAY	88. bbb	87. DATE SUPPLEMENTARY REQUEST (TASK) COMPLETED	YR.	MO.	DAY
42. PURPOSE OF REQUEST (TASK)					54. RESULT OF TASK (AM. NO., CH/ IGE NO., ETC.)				

## C. STATISTICS

TYPE OF ACTION REQUESTED AND TAKEN		48. REQ.	51. TAK.	52. VOID INPUT ENTERED UNDER CODES IN FIELDS 01, 03 OR 12, AND 09 AS RECORDED ABOVE AND ACTIVITY CODE _____
A	REACTOR CONCEPT REVIEW			55. CONSOLIDATE INPUT ENTERED UNDER CODES IN FIELDS 01, 03 OR 12, AND 09 AS RECORDED ABOVE AND ACTIVITY CODE _____ WITH PROG. _____ PROJ. _____ TASK _____ ACT. _____
B	PRELIMINARY SITE REVIEW			
C	PRECONSTRUCTION STAGE REVIEW			
D	CONSTRUCTION PERMIT (C.P. REVIEW)			
E	AUTHORITY TO OPERATE (OP. STAGE REVIEW)			
F	AUTHORITY TO POSSESS ONLY			
G	AMENDMENT TO CONSTRUCTION PERMIT			
H	AMENDMENT TO OPERATING LICENSE			
I	CHANGE TO TECHNICAL SPECIFICATIONS			
J	EXEMPTION			
K	CONSTRUCTION PERMIT EXTENSION			
L	OPERATING LICENSE (OR AUTHORITY) EXTENSION			
M	DRL ORDER			
N	SPECIAL AUTHORITY			
T	LICENSE (OR AUTHORITY) TERMINATED OR EXPIRED			
O	OTHER (EXPLAIN)			