



Department of Energy

Washington, DC 20585

January 19, 2001

The Honorable Robert C. Byrd
Chairman
Committee on Appropriations
United States House of Representatives
Washington, D.C. 20510

Dear Senator Byrd:

Enclosed is the Department of Energy's report entitled, "Spent Fuel Management Alternatives Available to Northern States Power Company Inc. and the Federal Government for the Prairie Island Nuclear Plant, Units 1 & 2." This report was developed as directed by the conference report accompanying the FY2001 Energy and Water Development Appropriations Bill.

If you have any questions regarding this Plan, please contact Nick Chumbris, Director of the Office of Congressional Liaison, at 202-586-2777.

Sincerely,

A handwritten signature in black ink that reads "Ivan Itkin".

Ivan Itkin, Director
Office of Civilian Radioactive
Waste Management

Enclosure

cc:
The Honorable Ted Stevens



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Department of Energy

Washington, DC 20585

January 19, 2001

The Honorable C.W. Bill Young
Chairman
House Appropriations Committee
United States House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

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Ivan Itkin, Director
Office of Civilian Radioactive
Waste Management

Enclosure

cc:

The Honorable David R. Obey



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Identical letters were sent to the ranking minority member of the committees.

U.S. DEPARTMENT OF ENERGY

**OFFICE OF CIVILIAN RADIOACTIVE
WASTE MANAGEMENT**

**REPORT TO THE COMMITTEES
ON APPROPRIATIONS**

**SPENT FUEL MANAGEMENT
ALTERNATIVES AVAILABLE TO
NORTHERN STATES POWER
COMPANY INC. AND THE FEDERAL
GOVERNMENT FOR THE PRAIRIE
ISLAND NUCLEAR PLANT,
UNITS 1 & 2**

JANUARY 2001

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1. Introduction

This report summarizes to the best of our knowledge, the alternatives that may be available to Northern States Power Company (NSP) and the Federal Government to allow NSP to continue operations at Prairie Island Units 1 and 2. Prairie Island Units 1 and 2 are currently licensed by the Nuclear Regulatory Commission to operate through 2013 and 2014 respectively.¹

This report has been prepared by the Office of Civilian Radioactive Waste Management (OCRWM) on behalf of the Secretary of Energy in response to congressional direction contained in the conference report accompanying the FY 2001 Energy and Water Development Appropriations Bill.

The conference report directs that

" . . . not later than 90 days after enactment of the fiscal year 2001 Energy and Water Development Appropriations Act, the Secretary of Energy shall submit to Congress a report containing a description of all alternatives that are available to Northern States Power Company and the Federal government to allow the company to continue to operate the Prairie Island nuclear generating plant until the end of the term of the license issued to the company by the Nuclear Regulatory Commission, in view of a law of the State of Minnesota that limits the quantity of spent nuclear fuel that may be stored at the plant, assuming that the existing Federal and State laws remain unchanged."

In this regard, the Department of Energy (DOE) has identified various Spent Nuclear Fuel (SNF) management strategy alternatives that may be available to NSP and the Federal Government to address the SNF storage requirements at the Prairie Island Units 1 and 2 such that operations may continue through the full period of the current operating licenses.

In identifying the potential alternatives available to NSP for addressing Prairie Island spent fuel management, the Department has not attempted to interpret any laws enacted by the State of Minnesota that may govern decisions regarding implementation of any alternative. Furthermore, the Department takes no position on the degree to which any of these alternatives may be or have been applied at Prairie Island, nor the degree to which they may be effective, alone or in combination, in extending the duration of operation of the Prairie Island Units 1 and 2.

2. NSP's plant background and current SNF storage at the Prairie Island Units 1 and 2

The following background and current status summary is based on publicly available information extracted from Form 10-K405 for NSP filed on March 29, 2000.

¹ United States Nuclear Regulatory Commission Information Digest, NUREG-1350, Volume II, 1999 Edition, Appendix A

NSP operates three nuclear generating plants at two sites in Minnesota: the Monticello plant site and the Prairie Island Units 1 and 2 site. The Monticello plant, located approximately 28 miles southeast of Minneapolis, is a Boiling Water Reactor that began operation in 1971 and is licensed to operate until 2010. Prairie Island Units 1 and 2 located approximately 30 miles northwest of Minneapolis are Pressurized Water Reactors, that began operation in 1973 and 1974 and are licensed to operate until 2013 and 2014, respectively.

NSP, with regulatory and legislative approval, has been providing on-site storage of SNF at the Monticello site and Prairie Island Units 1 and 2. In 1979, NSP began expanding the SNF storage facilities at its Monticello plant by replacement of the racks in the storage pool. In 1987, NSP completed the shipment of 1,058 SNF assemblies from the Monticello plant to a General Electric storage facility in Morris, Illinois. The Monticello plant is expected to have sufficient pool storage capacity to the end of its current operating license in 2010.

The SNF storage pool for Prairie Island Units 1 and 2 has undergone two storage rack replacements. The storage pool was nearly filled before a scheduled refueling in June 1995, and adequate space for a subsequent refueling was no longer available. In 1989, NSP proposed construction of a temporary, on-site dry cask storage facility for the SNF at Prairie Island Units 1 and 2. In May 1994, the Governor of Minnesota signed into law a bill authorizing NSP to install spent fuel storage casks at Prairie Island. However, the statute limits additional on-site storage expansion to a total of 17 casks equivalent storage capacity.²

NSP has determined that the 17 casks will permit Prairie Island Unit 1 and 2 operation until 2007. As of December 31, 1999, nine storage casks were loaded and stored on the Prairie Island site. Plans call for the loading of two additional casks each year until 2003.

Based on publicly available data from the Energy Information Administrations' 1998 RW-859, Nuclear Fuel Data Forms DOE has determined that with current pool capacity, NSP would have to operate Prairie Island Units 1 and 2 without full core discharge capability in order to operate through 2007 without exceeding the 17 casks authorized.³ Nuclear utilities generally reserve sufficient pool storage space to accommodate discharge of the entire core should plant operations require such an action.

NSP is participating in a consortium of several other utilities to establish a private facility for interim storage of SNF. On June 20, 1997, PFS, L.L.C. submitted an application to the NRC for a license to operate a temporary storage facility for SNF on the Reservation of the Skull Valley Band of Goshute Indians located near Tooele County, Utah, approximately 50 miles southwest of Salt Lake City, Utah. The site for this facility will cover 820 acres of the reservation's 18,000 acres.⁴ The spent fuel storage casks will be stored on about 100 of these 820 acres. The dry cask storage system that PFS proposes to use at the PFS facility is

² Minnesota Law, Chapter 641-S.F. No. 1706, Sec. 2., (d)

³ as of December 31, 1998

⁴ NRC Docket 72-22, Section 1.1.2 General Description of the Private Fuel Storage Facility. Reference, <http://www.nrc.gov/NRC/NMSS/SFPO/SER/PFS/index.html>

Holtec International's HI-STORM 100 Cask System. The cask system is a canister-based storage system that stores spent fuel in a vertical orientation. The PFS is designed to store up to 40,000 metric tons of uranium in the form of SNF from commercial nuclear power plants in sealed metal canisters. The SNF assemblies are placed in sealed canisters, which are then placed inside a steel and concrete storage cask. The PFS will consist of approximately 4,000 storage casks.

The PFS LLC will undertake the development, licensing, construction and operation of the storage facility. Early in October 2000, the NRC staff issued its safety evaluation report (SER) on PFS's application to build a SNF storage facility on the Reservation.⁵ The NRC's review found that the facility and the casks that would store the spent fuel would be safe and would meet regulatory requirements. In addition, in July 2000, a Draft Environmental Impact Statement was released by the NRC which found that there would be no significant adverse impacts to the environment from construction of the facility and a new rail line connecting the site to the existing Union Pacific railroad.

The PFS plans to be operational and able to accept the first shipment of SNF by 2003. However, the project still faces significant political opposition in Utah and, possibly, the States along the transportation corridors.

3. SNF Management Options Available to NSP

Spent fuel management options available to NSP that could contribute to the maintenance of operational capabilities at the Prairie Island Generating Station through the term of its Nuclear Regulatory Commission (NRC) license fall into two general categories. These include: (A) plant operational or fuel cycle changes and/or (B) shipment to off-site, temporary non-federal storage facilities.

A. Plant modifications and/or operational, or fuel cycle changes

- *Additional spent fuel pool re-racking*

Pool re-racking is the process of replacing existing SNF storage racks in the pool with racks that provide increased storage density. Increased rack density is achieved by providing more closely spaced fuel storage locations. It may also be possible to provide additional SNF storage racks in spent fuel pool areas normally reserved for plant maintenance or cask loading operations.

- *Utilizing pool space reserved for maintenance of a full core discharge*

As noted above, nuclear utilities generally reserve sufficient pool storage space to accommodate discharge of the entire core. For Prairie Island Units 1 and 2, which share a common pool, this would provide space for approximately 121

⁵ SER, NRC Docket 72-22

assemblies.⁶ Should NSP choose to use this space for SNF storage, it could provide sufficient additional storage to accommodate approximately three fuel cycle discharges based upon discharge projections provided by NSP on the RW-859 Forms.

- *Reducing spent fuel discharges*

The amount of SNF discharged by the Prairie Island plant can be decreased by reducing the amount of electricity generated by the plant, by effectively throttling the plant-operating level downward. Normal nuclear industry practice is to operate plants at full capacity as base-load generation. Limiting generation might allow either an increase in fuel cycle length, (and prolonged time between required refueling), or decrease the amount of SNF generated at each refueling. This alternative could adversely affect the cost of producing power at the Prairie Island Units.

- *Increasing the average fuel burn-up*

Nuclear fuel must be removed from the reactor when it no longer contains sufficient remaining energy for the efficient production of power. The term used to describe the overall thermal energy produced by a nuclear fuel assembly is burn-up. Assemblies with higher allowable burn-up can remain in the reactor longer, and can thus produce more electrical power, than those with lower allowable burn-up. Increasing the average burn-up of the assemblies used at Prairie Island would result in the generation of less spent fuel while maintaining the level of power generation.

- *Rod consolidation*

A SNF assembly contains many individual fuel rods. The individual rods are mounted in a structural frame, typically referred to as a skeleton. This frame maintains the spacing between each rod to allow for optimal operation in the reactor. SNF assembly rod consolidation is the process of removing the fuel rods from assemblies and placing them in a canister that allows for the storage of the rods with minimal spacing. In this manner, it is possible to store the rods from more than one assembly in a canister that has the same size as one fuel assembly and would therefore take up one storage rack location. The resulting fuel skeletons, from which the rods were removed, would then be compacted into a debris canister that is generally stored in the pool. The possible benefit of successful rod consolidation is an increase in the number of SNF assemblies that can be stored in any given spent fuel pool storage rack.

In the 1980's, DOE, the utility industry, and several nuclear equipment vendors developed consolidation processes and equipment; and several utilities undertook demonstration projects to test the processes and equipment. NSP demonstrated

⁶ DOE/RW-0431-Rev 1 Spent Fuel Storage Requirements 1994 – 2042, dated June 1995. For reactors that share a common SNF storage pool, the industry operating practice is to maintain only a single full core discharge capability.

the consolidation of 36 assemblies at Prairie Island in late 1987. These demonstrations encountered numerous and varied difficulties, which were not easily resolvable. To date, no utility has pursued rod consolidation as a means of expanding onsite storage capacity for SNF.⁷

B. Shipment to off-site, temporary non-federal storage facilities

- *Shipment to a licensed commercial facility*

Transport of the SNF to licensed off-site storage facilities has been successfully done in the United States for many years. This includes transshipment of SNF to other reactor sites owned by the utility. Shipments could also be made to a licensed facility owned by another company, such as another utility site, the proposed Private Fuel Storage (PFS) facility which is currently undergoing licensing review by the NRC, or the Owl Creek Project planned for Wyoming by the NEW Company.⁸ Current plans call for the PFS facility to begin accepting SNF in 2003.⁹

Suitable NRC licensed transportation casks are commercially available to support transport under this option.

- *Out-of-country shipment to storage facilities regulated by the respective national competent authority*

The acceptability of this option and its consistency with United States non-proliferation policy would depend on the long-term plans for the SNF. The Department has previously reviewed a request for overseas storage of SNF from another utility. In the review, the Department determined that, if the contractual agreement between utility and the overseas facility operator precludes chemical reprocessing, and it provides for return to the United States of the SNF once a Federal repository is available, that such storage would likely be viewed as consistent with United States non-proliferation policy.¹⁰

Whenever the SNF is stored while outside the country, U.S. policy and law require that effective International Atomic Energy Agency safeguards, adequate physical protection, and a peaceful uses agreement for cooperation pursuant to Section 123 of the Atomic Energy Act of 1954 are in place. Subsequent transfers between facilities, if any, and the return of the SNF to the United States must meet the requirements of pertinent peaceful uses agreement.

⁷ Report entitled "Considerations for the Consolidation of BWR Fuel", EPRI NP-6783, Dated March 1990.

⁸ Reference NRC Docket Number 72-22. On June 20, 1997, Private Fuel Storage Limited Liability Company submitted an application to the NRC for a 10 CFR Part 72 license to receive, possess, store, and transfer power reactor spent fuel, and other radioactive materials associated with spent fuel storage, at an independent spent fuel storage installation.

⁹ See Section 2 for a description of NSP's efforts on the PFS.

¹⁰ DOE letter to Yankee Atomic Electric Company, dated February 4, 1998

The Department would not support a request to ship the SNF overseas for chemical reprocessing.

4. Federal Government Alternatives

- *DOE waste acceptance under the provisions of the Atomic Energy Act of 1954 as amended*

Prior to the enactment of the Nuclear Waste Policy Act of 1982 (NWPA), DOE had authority, and continues to have authority, to accept SNF in certain circumstances pursuant to the Atomic Energy Act of 1954. 42 U.S.C. § 2075. However, those authorities must be interpreted in light of the provisions of the NWPA.

The NWPA provides that in return for payment of fees by utilities, DOE will dispose of commercial spent nuclear fuel. 42 U.S.C. § 10222. The restrictions of the NWPA circumscribe DOE's authority to begin those disposal services. These restrictions require that certain milestones be met before the Department can dispose of commercial spent nuclear fuel at either an interim storage site or permanent disposal facility.

- *Implementation of the Secretary's "Take Title" approach*

In remarks made before the Committee on Commerce's Subcommittee on Energy and Power, in March 1999, the Secretary of Energy proposed a "Take Title" approach whereby the Department could offer to take title to SNF consistent with acceptance schedules provided under its contracts with utilities. By taking title to the SNF the Department could either assume financial responsibility for the utility's continued management of the SNF or possibly assume possession and responsibility for management of the SNF. As part of the agreement to take title, the Department could agree either to reimburse the utility for the incremental cost of storing that SNF or to take a more direct role in the management of the SNF and storage facilities.

If NSP or another utility expressed interest in this option, the Department would seek the necessary legal and contractual determinations regarding specific details for implementation. However, it is undetermined whether this remedy would be effective in mitigating NSP's situation under Minnesota law.