SAFETY EVALUATION REPORT

CONCERNING THE

PRIVATE FUEL STORAGE FACILITY

Docket No. 72-22

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ACRONYMS

AAS	Alternate Alarm Station
ACM	Advanced Cruise Missile
ACRAM	Aircraft Crash Risk Analysis Methodology
AFI	Air Force Instruction
ALARA	As Low As Reasonably Achievable
ALCM	Air Launched Cruise Missile
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASLB	Atomic Safety and Licensing Board
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BDU	Bomb Dummy Unit
BWR	Boiling Water Reactor
CALCM	Conventional Air Launched Cruise Missile
CPIA	Chemical Propulsion Information Agency
CPT	Cone Penetrometer Test
DOD	U. S. Department of Defense
DOE	U. S. Department of Energy
DOT	U. S. Department of Transportation
DSHA	Deterministic Seismic Hazard Analysis
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FSAR	Final Safety Analysis Report
FTS	Flight Termination System
FY	Fiscal Year
HMR	Hydrometeorological Report
IM&TE	Instruments, Measuring, and Test Equipment
ISFSI	Independent Spent Fuel Storage Installation
LCO	Limiting Conditions for Operation
LES	Louisiana Energy Services
LLEA	Local Law Enforcement Agency
M	Magnitude
MOA	Military Operating Area
MPC	Multi-Purpose Canister
MTU	Metric Tons of Uranium
NRC	U. S. Nuclear Regulatory Commission
NFPA	National Fire Protection Association
O&M	Operating and Maintenance
PAS	Primary Alarm Station
PFS	Private Fuel Storage, Limited Liability Company
PFS Facility	Private Fuel Storage Facility
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSHA	Probabilistic Seismic Hazard Analysis
PWR	Pressurized Water Reactor
QA	Quality Assurance
RAI	Requests for Additional Information
RCRA	Resource Conservation Recovery Act

ACRONYMS (continued)

SAR	Safety Analysis Report
SER	Safety Evaluation Report
SFPE	Society of Fire Protection Engineers
SLCIA	Salt Lake City International Airport
SPT	Standard Penetration Test
SR	Surveillance Requirement
TLD	Thermoluminescent Dosimeters
TMI-2	Three Mile Island Unit-2
TNT	Trinitroluene
UAV	Uninhabited Aerial Vehicle
UBC	Uniform Building Code
UPS	Uninterruptible Power Supply
USDA	U.S. Department of Agriculture
UTTR	Utah Test and Training Range
WSEP	Weapons System Evaluation Program

EXECUTIVE SUMMARY

On June 20, 1997, Private Fuel Storage, L.L.C. (PFS), submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a license to operate a temporary storage facility for spent nuclear fuel on the Reservation of the Skull Valley Band of Goshute Indians (the Reservation). The Skull Valley Band is formally recognized as an Indian Tribe by the Federal Government. The application consists of several different documents:

1. A **License Application**, in which the applicant describes itself and provides some general and financial information;

2. A **Safety Analysis Report**, in which the applicant describes its plans for building, operating, maintaining, and funding the cleanup and decommissioning of the proposed Facility;

3. An **Emergency Plan**, in which the applicant describes its plan for resolving any emergencies that happen during the Facility's operation;

4. A **Safeguards and Physical Security Plan** (this document is not released to the public), in which the applicant describes its plans for ensuring that the Facility and nuclear material are appropriately protected; and

5. An **Environmental Report**, in which the applicant provides the information that the NRC staff uses in developing its Environmental Impact Statement (EIS) on the proposed Facility. (A draft EIS was published in June 2000, and a Final EIS is expected to be published in early 2001.)

The NRC staff documents its review and conclusions on the safety-related aspects of an application in a Safety Evaluation Report (SER). This SER documents the NRC staff's review and conclusions concerning the first four documents of the PFS license application. Although this Executive Summary provides the reader with some brief overview and summary of the SER, for a full discussion of the NRC staff's safety evaluation and conclusions about PFS's compliance with the applicable regulatory requirements of 10 CFR Part 72, please consult the SER.

The facility that PFS proposes to build (called the PFS Facility) would store spent fuel, that was used to generate power at commercial nuclear power plants in the United States, in large metal and concrete containers that are called storage casks. This method of storing spent fuel is called dry cask storage technology. This is to differentiate it from wet storage, which is a method of storing the spent fuel in a large pool of water.

PFS proposes to locate the PFS Facility on the Reservation of the Skull Valley Band of Goshute Indians. The Reservation is 27 miles west-southwest of Tooele City, Utah. The site for this Facility will cover 820 acres of the Reservation's 18,000 acres. The spent fuel storage casks will be stored on about 100 of these 820 acres. As a Federally-recognized Indian Tribe, the Skull Valley Band is recognized as a sovereign, sub-national political entity, and its Reservation is not considered to be part of the State of Utah. For purposes of geographic orientation, the Reservation is surrounded by Tooele County, Utah.

PFS has requested an initial 20-year license. Before the end of this first 20 years, PFS may submit an application to renew the license. In accordance with NRC's licensing requirements and with PFS's lease arrangements with the Skull Valley Band, all spent fuel would be transferred offsite and the Facility would be ready for decommissioning (that is, returning it in a clean and safe condition to the Skull Valley Band for any use that they choose) by the end of a second term.

While transportation of the spent fuel from the nuclear power plants to the proposed PFS Facility is not considered in this license application, it is obviously a topic of interest. Interstate Highway 80 and the Union Pacific Railroad main line are approximately 24 miles north of the proposed site. Shipping casks that have been approved by NRC will be used to transport the spent fuel to the Facility. Currently, the closest rail service goes only to an area north of the Skull Valley Indian Reservation. One of two approaches could be used to take the shipping casks to the proposed Facility. PFS proposes that the shipping casks will either be off-loaded at a new transfer facility to be built near Timpie, Utah, where they would be loaded onto heavy haul tractor trailers for transport to the PFS Facility, or PFS will build a new railroad line connecting the PFS Facility directly to the Union Pacific main line. The PFS Facility will be accessed by a new road from the Skull Valley Road as shown in Figure 1.1-1 of the Safety Analysis Report.

Description of the Storage Cask

The dry cask storage system that PFS proposes to use at the PFS Facility is Holtec International's HI-STORM 100 Cask System (the cask system). The cask system is a canister-based storage system that stores spent fuel in a vertical orientation (the cask and the fuel rods inside of them are, in effect, standing up). The HI-STORM 100 Cask System consists of three parts:

1. the multi-purpose canister (MPC),
2. the HI-TRAC transfer cask, and
3. the HI-STORM 100 storage overpack.

The MPC is called the confinement system for the spent fuel. It is the metal canister in which the fuel is sealed. The HI-TRAC transfer cask provides radiation shielding and structural protection of the MPC during transfer operations. When the spent fuel arrives at the PFS Facility, this MPC will be in an NRC-certified transportation cask. The HI-TRAC transfer cask will be used to move the MPC from the shipping cask into the HI-STORM storage overpack. The storage overpack provides radiation shielding and structural protection of the MPC during storage. The HI-STORM system can be used to store either pressurized water reactor (PWR) fuel assemblies or boiling water reactor (BWR) fuel assemblies. The HI-STORM 100 Cask System does not rely on any active cooling systems to remove spent fuel decay heat.

The HI-STORM 100 Cask System has been approved by the NRC for use under the general license provisions of 10 CFR Part 72, Subpart K. The HI-STORM 100 Cask System is approved under Certificate of Compliance No. 1014, effective date May 31, 2000, Docket No. 72-1014. The NRC staff evaluated the cask system for general use for dry storage. This evaluation is documented in the NRC's "Holtec International HI-STORM 100 Cask System Safety Evaluation Report", which was issued with the certificate of compliance (the regulatory

document by which NRC allows general use of any approved storage or transportation cask). To demonstrate that the HI-STORM 100 Cask System was acceptable for use at the PFS Facility, PFS evaluated the HI-STORM system against the parameters and conditions specific to the Facility. The NRC staff reviewed the PFS evaluation and, as discussed in this SER, the staff finds that the HI-STORM 100 Cask System is acceptable for use at the PFS Facility under the site-specific license provisions of 10 CFR Part 72.

SAFETY OF FACILITY

In its evaluation of the application, the NRC staff determined that PFS showed that its proposed Facility and the HI-STORM cask design are structurally sound and will ensure that the spent fuel will remain within the cask and maintain a sound structure during all phases of operation for both normal operating conditions and accidents. PFS included analyses of all natural and man-made phenomena, including an in-depth study of potential seismic activity at the PFS Facility. The applicant used a probabilistic seismic hazard analysis approach, rather than a deterministic method required by 10 CFR Part 72 regulations, to analyze potential seismic activity. However, the staff agreed during its review that an exemption to the requirement to use deterministic methods is acceptable because PFS's probabilistic approach considered a full range of seismic factors. The NRC staff performed confirmatory analyses of the PFS probabilistic approach. The confirmatory analyses gave the staff confidence that the approach was acceptable. The PFS probabilistic approach showed that the Facility will remain safe during any credible seismic activity. After reviewing the applicant's analyses and performing additional confirmatory calculations, the NRC staff concluded that the PFS Facility and HI-STORM design is structurally safe and will meet regulatory requirements.

The NRC staff also determined that PFS has shown that the spent nuclear fuel within the storage casks will remain subcritical (that is, unable to sustain a nuclear chain reaction) during all phases of operation for both normal and credible accident conditions. PFS provided radiation dose estimates for the surrounding public and the workers at the Facility. The HI-STORM storage canister will be welded closed to prevent leakage of radioactive material. The canister is surrounded by a thick wall of concrete and steel to shield the area outside of the cask from direct radiation during storage.

The amount of radiation to which a person is exposed is called a dose. PFS has estimated that members of the public near the proposed Facility would receive doses below NRC's regulatory requirements, which for normal conditions of operation is 25 mrem/yr and for credible accidents is 5 rem/yr. PFS also calculated radiation dose rates within the vicinity of individual casks to demonstrate that workers at the proposed Facility will not receive doses that exceed 5 rem/yr, NRC's annual regulatory limits for workers at nuclear facilities. These radiation dose limits have been established by the NRC to prevent any undue risk and to ensure the safety of all members of the public and workers at a nuclear facility. PFS also described its radiation protection program, which employs an As Low As Reasonably Achievable (ALARA) radiation protection principle. The operating PFS Facility would also monitor radiation doses received by the workers and dose rates within the vicinity of the storage pad to verify that radiation dose limits are not exceeded. The NRC staff reviewed PFS's analyses and performed additional confirmatory calculations and concluded that the PFS Facility and HI-STORM design are radiologically safe and will meet regulatory requirements.

PFS was required to demonstrate that all of the important parts of its proposed Facility would continue to perform their designed functions during normal conditions and during any of the accidents that might reasonably be expected to occur. The NRC staff concluded that, as required by 10 CFR Part 72, PFS has provided acceptable analyses of the design and performance of these "structures, systems, and components important to safety" under credible, off-normal and accident scenarios. Among the "off-normal accidents" analyzed by PFS were a cask drop from a height of less than ten inches (the maximum allowable lift height for the cask), partial blockage of the cask vents, and certain operational events. Applicable accident events analyzed by PFS included cask tipover, cask drop from the maximum lift height, flood, fire and explosion, lightning, earthquake, loss of shielding, adiabatic heatup of the cask, tornadoes and missiles generated by natural phenomena, accidents at nearby sites, building structural failure effects on structures, systems, and components, and an unlikely (or non-mechanistic) failure of the confinement boundary. Hazards from nearby sites that were considered included offsite explosions, aircraft crashes, and other potential hazards from nearby military facilities. Based on its evaluation of these events, the staff concluded that they do not pose a credible hazard to the Facility.

The staff further concluded that PFS's analyses of off-normal and accident events demonstrate that the proposed Facility will be sited, designed, constructed, and operated so that during all credible off-normal and accident events, public health and safety will be adequately protected and the capability to retrieve fuel from the Facility will be preserved.

Other Requirements

To demonstrate its financial qualifications, PFS identified anticipated sources of funds to construct its Facility, indicating that much of the total revenue will be required from its customers as prepayments before they ship fuel to the Facility. Appropriate license conditions have been developed and stated in this SER providing reasonable assurance of the applicant's financial qualifications.

The NRC staff also found PFS's emergency plan and safeguards and physical security plans to be acceptable. The emergency plan appropriately described PFS's program for responding to onsite emergencies. It also described plans for seeking offsite assistance, if needed. The safeguards and physical protection plan were also found to meet NRC requirements.

References

Holtec International. *Final Safety Analysis Report for the HI-STORM 100 Cask System*. Docket No. 72-1014. August 2000.

Nuclear Regulatory Commission. *Certificate of Compliance No. 1014, Amendment No. 0*. Docket No. 72-1014. Effective Date: May 31, 2000.

Nuclear Regulatory Commission. *Holtec International HI-STORM 100 Cask System Safety Evaluation Report*. Docket No. 72-1014. May 2000.

Nuclear Regulatory Commission. *Draft Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah, NUREG-1714.* Docket No. 72-22. June 2000.

Private Fuel Storage Limited Liability Company. *License Application for the Private Fuel Storage Facility*. Docket Number 72-22. June 20, 1997, as amended May 22 and August 28, 1998; May 19, August 10, August 27, September 8, September 21, and December 16, 1999; and February 2, March 17, April 14, May 8, June 23, June 28, July 18, July 27, August 11, August 31, September 14, and September 25, 2000.

Private Fuel Storage Limited Liability Company. *Safety Analysis Report for the Private Fuel Storage Facility, Revision 18*. Docket Number 72-22. September 25, 2000.

Private Fuel Storage Limited Liability Company. *Emergency Plan for the Private Fuel Storage Facility, Revision 10*. Docket Number 72-22. August 31, 2000.

Private Fuel Storage Limited Liability Company. *Private Fuel Storage, L.L.C. Independent Spent Fuel Storage Installation Security Plan, Revision 2*. Docket Number 72-22. June 8, 1999.

Private Fuel Storage Limited Liability Company. *Private Fuel Storage, L.L.C. Independent Spent Fuel Storage Installation Safeguards Contingency Plan, Revision 1*. Docket Number 72-22. June 8, 1999.

Private Fuel Storage Limited Liability Company. *Private Fuel Storage, L.L.C. Independent Spent Fuel Storage Installation Security Training and Qualification Plan, Revision 1*. Docket Number 72-22. June 8, 1999.

Private Fuel Storage Limited Liability Company. *Environmental Report for the Private Fuel Storage Facility, Revision 12*. Docket Number 72-22. September 25, 2000.

Safety Evaluation Report
Concerning the
Private Fuel Storage Facility

INTRODUCTION

On June 20, 1997, Private Fuel Storage Limited Liability Company (PFS or the applicant) submitted an application 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 (ISFSI). The proposed ISFSI is known as the Private Fuel Storage Facility (PFS Facility or the Facility). The Facility will be located on the Reservation of the Skull Valley Band of Goshute Indians (the Reservation) which is geographically located in Tooele County, Utah. The siting of the Facility on the Reservation has been approved by the tribal government of the Skull Valley Band of Goshute Indians.

In support of its application, PFS submitted the following documents, which contain the information specified in 10 CFR Part 72, Subpart B, License Application, Form, and Contents:

(1) the License Application, which contains:
- the general and financial information required by 10 CFR 72.22;
- the proposed technical specifications required by 10 CFR 72.26;
- the applicant's technical qualifications required by 10 CFR 72.28; and
- the preliminary decommissioning plan required by 10 CFR 72.30.

(2) the Safety Analysis Report (SAR) for the Private Fuel Storage Facility required by 10 CFR 72.24;

(3) the Emergency Plan for the Private Fuel Storage Facility required by 10 CFR 72.32;

(4) the Environmental Report for the Private Fuel Storage Facility required by 10 CFR 72.34; and

(5) the Security Plan for the Private Fuel Storage Facility, which includes the safeguards contingency plan, as required by 10 CFR 72.180 and 72.184.

This safety evaluation report (SER) documents the staff's review of the design, operation, and other safety aspects of the Facility, as described in the above submittals except for the Environmental Report. The Environmental Report is the subject of a separate Environmental Impact Statement (EIS), a draft of which was published in June 2000. A Final EIS is expected to be published in early 2001.

The staff's assessment in this SER is based on whether the Facility meets the requirements of 10 CFR Part 72. In its review, the staff evaluated: (1) the characteristics of the site; (2) the Facility operations and operation systems; (3) the design and design criteria for the Facility and its structures, systems, and components important to safety; (4) the programs that support protection of worker and public health and safety; (5) the impact of potential off-normal and

accident events on structures, systems, and components important to safety; (6) the financial qualifications of the applicant; and (7) the proposed Technical Specifications.

The applicant has identified the HI-STORM 100 Cask System as the dry cask storage system that will be used at the Facility. The HI-STORM 100 Cask System has been reviewed and approved by the U.S. Nuclear Regulatory Commission (NRC) for use under the general license provisions of 10 CFR Part 72, Subpart K. The staff's evaluation and approval of the PFS Facility is based, in part, on the use of the HI-STORM 100 Cask System, as approved, evaluated, and described in Certificate of Compliance No. 1014, Amendment No. 0 (Docket No. 72-1014), the NRC's "Holtec International HI-STORM 100 Cask System Safety Evaluation Report" which was issued with the certificate of compliance, and Holtec International's Final Safety Analysis Report (FSAR) for the HI-STORM 100 Cask System. In evaluating the use of this cask at the Facility, the staff reviewed the HI-STORM 100 FSAR and the related NRC SER to determine whether or not the Facility site parameters are enveloped by the cask design parameters considered in those reports and whether the HI-STORM 100 Cask System is acceptable for use at the PFS Facility site. The staff also verified that the Facility cask storage pads and areas are designed to adequately support the static load of the stored cask and that the radiological limits of 10 CFR 72.104 are met.

The staff has reviewed the proposed Private Fuel Storage Facility as described herein and in the documents specified above. Based on the information provided by the applicant, the proposed Technical Specifications, and the proposed license conditions established in this SER, the staff has reasonable assurance that the Facility meets the requirements of 10 CFR Part 72. Therefore, the staff concludes that the Private Fuel Storage Facility can be safely operated.

References

Holtec International. *Final Safety Analysis Report for the HI-STORM 100 Cask System*. Docket No. 72-1014. August 2000.

Nuclear Regulatory Commission. *Certificate of Compliance No. 1014, Amendment No. 0*. Docket No. 72-1014. Effective Date: May 31, 2000.

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