UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE L.L.C.	)	Docket No. 72-22
	)	
(Private Fuel Storage Facility)	)	

DECLARATION OF JEFFREY JOHNS

Jeffrey Johns states as follows under penalties of perjury:

1. I am a Licensing Engineer for Stone & Webster Engineering Corp. I am providing this declaration in support of a motion for partial summary disposition of Contention Utah R in the above captioned proceeding to show that a fire – even assuming no fire fighting by site personnel or fire suppression by any of the installed automatic fire suppression systems – would not cause a release of radioactivity at the Private Fuel Storage Facility (PFSF).

2. My professional and educational experience is summarized in the curriculum vitae attached as Exhibit 1 to this declaration. I have 21 years of experience in the nuclear power industry and nine years of experience with the licensing of independent spent fuel storage installations (ISFSIs). I have experience in performing accident analyses for nuclear power plants and ISFSIs and in preparing ISFSI emergency plans. For the PFS project I am responsible for the preparation of the PFSF Safety Analysis Report, including accident analysis and radiation protection for the spent fuel cask systems to be used at the PFSF. As part of my responsibilities, I have performed assessments of the effects of possible fires at the PFSF.

3. I am knowledgeable of the design and operation of the PFSF and the spent fuel casks that will be used there. I am knowledgeable of the means of estimating the duration of and maximum temperatures produced by diesel fuel fires. I am familiar with the affidavit of Jerry Cooper regarding the resistance of the PFSF to wildfires. I am also familiar with the affidavit of Krishna Singh and the declaration of Ram Srinivasan regarding the resistance to fires of the spent fuel cask systems that will be used at the PFSF.

4. The State of Utah has alleged in Contention Utah R that PFS has not provided reasonable assurance that the public health and safety will be adequately protected in the event of an emergency at the PFSF, in that PFS does not have adequate support capability to fight fires onsite. The State's claim is immaterial, however, in that the PFSF is designed to withstand the effects of credible fires without any firefighting by personnel or the operation of any automatic fire detection/suppression system such as a water sprinkler.

5. The only significant sources of combustible material near the spent fuel casks at the PFSF will be the diesel fuel tanks of the PFSF cask transporter vehicle (which will move storage casks from the Canister Transfer Building to the concrete storage pads) and the locomotive and the heavy haul truck tractors (which will bring spent fuel transportation casks from offsite to the Canister Transfer Building). PFS will have two diesel fuel storage tanks at the PFSF, but they will be too far away to pose a hazard to either the spent fuel storage casks on the storage pads or inside the Canister Transfer Building. Cooper Aff. at ¶¶ 9, 12. There will be no other significant sources of combustible material in the Restricted Area in which the spent fuel casks and the Canister Transfer Building are located at the PFSF. Safety Analysis Report (SAR) at 8.2-24 to –25. As described in the affidavit of Jerry Cooper the surface of the Restricted Area is covered with crushed rock 12 inches deep and the Canister Transfer and Security and Health Physics Buildings are of concrete construction. Cooper Aff. at ¶ 3-4, 7.

6. PFS analyzed the potential impact of fire on the PFSF and the spent fuel storage casks that would be located there in Section 8.2.5 of the PFS Safety Analysis Re-

port (SAR). SAR Section 8.2.5.2 considers fires involving 50 gallons of diesel fuel from a postulated rupture of the fuel tanks of the cask transporter vehicle (which contain a total of 50 gallons), and 300 gallons from a postulated rupture of the saddle tanks of a heavy haul vehicle tractor (which contain a total of 300 gallons). PFS evaluated the effects of cask transporter (i.e., 50-gallon) fires both outside the Canister Transfer Building and inside a canister transfer cell inside the Canister Transfer Building. SAR at 8.2-25 to –28. It evaluated the effects of a heavy haul truck (i.e., 300-gallon) fire inside the cask load/unload bay in the Canister Transfer Building. SAR at 8.2-25 to –27.

7. A 50-gallon diesel fuel spill (from the cask transporter) would not cause a radioactive release from a spent fuel storage cask. PFS assumes that the 50 gallons encircles a spent fuel storage cask, ignites, and burns until all of the fuel is expended, with no credit taken for fire fighting of any kind. As stated in the PFSF SAR:

> This scenario is analyzed in Section 11.2.4 of the HI-STORM SAR. From IAEA requirements (Reference 18), the "pool" of fuel is assumed to completely encircle a storage cask and extend 1 meter beyond the cask surface. Based on the minimum outer cask diameter of 132.5 inches (HI-STORM), this spill would result in a ring of fuel with a pool surface of about 21,260 sq in around the storage cask.

SAR at 8.2-25. Fifty gallons spread across this area would pool to a depth of 0.54 inch. PFSF SAR Section 8.2.5.2 states that:

> A fuel consumption rate of 0.15 in/min was assumed (Reference 19) based on gasoline/tractor kerosene experimental burning rates.

SAR at 8.2-25. As stated in the PFSF SAR, the 50 gallons of fuel would sustain a fire for about 3.6 minutes. Id. The maximum temperature produced by the fire would be less than 1475 °F. The temperature and duration of the fire are such that it would not cause a radioactive release from a spent fuel storage cask either outside the Canister Transfer Building or inside a canister transfer cell inside the building. SAR at 8.2-26, -28; Singh Aff. at ¶ 3; Srinivasan Aff. at ¶ 6.

8. On the other hand, the SAR's evaluation of a fire resulting from a postulated spill and ignition of 300 gallons of diesel fuel from the saddle tanks of a heavy haul vehicle tractor in the Canister Transfer Building cask load/unload bay did not estimate the burn time of this volume of diesel fuel. Rather, the evaluation relied on operation of the automatic fire detection and suppression systems to extinguish the postulated fire in less than 15 minutes. SAR § 8.2.5.2. Nevertheless, if no credit is taken for the automatic fire detection/suppression systems in the cask load/unload bay, the fire duration can be estimated by applying the same method that was used for the 50-gallon fire analysis (i.e., by assuming that the fuel pools on the floor of the cask load/unload bay and burns until it is consumed), and the resulting temperature can be evaluated based on information in the Fire Protection Handbook (Reference 1). Such an analysis of the 300-gallon fire shows that it would burn out in less than 10 minutes and would not threaten any systems, structures, or components (SSCs) important to safety even without the operation of automatic fire detection and suppression systems.

9. The cask load/unload bay is approximately 198 ft. long and 48 ft. wide. SAR Fig. 4.1-1. Diesel fuel spilled into this bay would tend to spread forming a relatively thin layer. In calculating a fuel burn time, it is conservative to assume that the diesel fuel forms a relatively deep pool, in that a deep pool burns longer than a shallow pool, and a 1 inch depth is considered to be a very conservative assumption. A 300-gallon volume of liquid at a depth of 1 inch would occupy an area of 481 sq. ft., represented by a circle with a 12.4 ft. radius. This surface area is only 5% of the total area of the cask load/unload bay, so the walls of the bay would not confine the spilled fuel within a smaller and deeper pool. Any drain sumps in the cask load/unload bay that could potentially collect diesel fuel from postulated rupture of the heavy haul tractor fuel tanks will be located so as to assure that burning of diesel fuel in these sumps will not threaten SSCs important to safety.

10. Assuming that this pool of 300 gallons of diesel fuel is ignited and burns, the duration of combustion can be calculated using the 0.15 inch/minute fuel consump-

tion rate specified in Section 8.2.5.2 of the PFSF SAR (Reference 2). A 1 inch deep pool of diesel fuel will be consumed in 1 in. / 0.15 in./min. = 6.67 minutes. Figure 7-9B of Reference 1 provides time-temperature curves for different types of fires from slight to moderate to severe. Temperature curve E of this figure is for the "standard exposure fire - severe", and includes fires fueled by flammable liquids. This standard fire time-temperature curve, which is also shown in Figure 7-9A of Reference 1, reaches a temperature of 1,000 °F at 5 minutes and a temperature of 1300 °F for a 10 minute burn duration. For the calculated 6.67 minute burn duration, a peak temperature of approximately 1200 °F would be reached. This fire would not threaten any SSCs important to safety at the PFSF in a way that could cause a radioactive release. The overhead crane is located approximately 70 ft above the floor of the Canister Transfer Building, and the semi-gantry crane is located approximately 55 ft above the floor of the Canister Transfer Building. SAR Fig. 4.7-1 (sheet 2). The only credible significant impact a fire might have is that it could cause a loss of electrical power to SSCs inside the Canister Transfer Building. SAR section 8.1.1.3 shows, however, that a loss of power would not cause an accident that would result in a release of radioactivity, even if it occurred while canister transfer operations were in progress.

11. It is not credible that the postulated 300-gallon diesel fuel fire discussed above would affect spent fuel storage casks or transfer casks containing loaded spent fuel canisters, since the spent fuel storage casks at the PFSF will be located either on the concrete storage pads or in a canister transfer cell, but not in the cask load/unload bay, and a loaded transfer cask would only be located in a canister transfer cell. The cask load/unload bay is physically separated from the transfer cells by a concrete wall, and will be constructed so that any spilled diesel fuel would remain in the bay and would not enter a transfer cell. See SAR at 8.2-26 to –27; id. at 5.1-4 to –6; id. Figs. 1.2-1, 4.7-1 (sheet 1).

12. Potential fires involving diesel fuel from the locomotive also would not cause a radioactive release at the PFSF. PFSF SAR section 8.2.5.1 states:

> For rail delivery/retrieval of shipping casks, the train locomotives are required by administrative procedure to stay out of the Canister Transfer Building. The design of the building and its surroundings will assure that any diesel fuel spilled outside the building will not flow into the building, which could create a fire hazard.

Thus, fuel from the locomotive could not cause a fire inside the Canister Transfer Building.

13. A locomotive fuel spill and associated fire at the PFSF is extremely unlikely given the low speeds at which the locomotives will operate at the PFSF and the difficulty of igniting spilled diesel fuel. Nevertheless, it could be postulated that the fuel tank(s) of a locomotive staged at the PFSF ruptures and diesel fuel spills onto the ground and ignites outside the Canister Transfer Building. The PFSF railroad line nearest the spent fuel storage pads is 107 ft from the closest pads, at the south end of the PFSF Restricted Area. SAR Fig. 1.2-1. Thus, a fire associated with a locomotive would be approximately 100 ft from the nearest spent fuel storage casks. As a result of the distance, the heat flux impinging on the storage casks (Section 21, Chapter 6 of Reference 1) and the effects of such a fire on the storage casks at the PFSF would be much less than those resulting from the postulated fire in which 50 gallons of diesel fuel is assumed to encircle a storage cask and burn, which is described above. Therefore, the storage casks would retain their integrity and there would be no release of radioactivity from storage casks, even in the highly unlikely event of a diesel fuel fire associated with a locomotive.

14. In addition to fire not threatening the integrity of the spent fuel casks at the PFSF, no credible fire at the PFSF would threaten any other SSCs important to safety in a way that could cause a radioactive release. The only credible significant impact a fire might have is that it could cause a loss of electrical power to SSCs inside the Canister Transfer Building. As indicated above, however, SAR section 8.1.1.3 shows that a loss of power would not cause an accident that would result in a release of radioactivity, even if it occurred while canister transfer operations were in progress.

15. In addition to a fire inside the PFSF Restricted Area not posing a threat to cause a radioactive release, a wildfire adjacent to the PFSF Restricted Area would also not cause a radioactive release. Because of the distance that would separate a wildfire from the Canister Transfer Building and the spent fuel storage casks at the PFSF, a wildfire would pose no direct threat to the spent fuel casks or the SSCs important to safety in the Canister Transfer Building, even without firefighting by personnel or the operation of any automatic fire suppression systems. Cooper Aff. at ¶ 8. Furthermore, a wildfire could not cause a fire or explosion on site that would threaten the spent fuel casks or the SSCs important to safety. Id. at ¶¶ 10-14.

16. In conclusion, a fire at the PFSF (or a wildfire adjacent to the PFSF Restricted Area) would not cause a radioactive release, even if no credit were taken for firefighting by personnel or for automatic fire detection/suppression systems.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 28, 1999.

Jeffrey R Johns

Jeffrey Johns

References

1. Fire Protection Handbook, Sixteenth Edition, National Fire Protection Association, 1986.

2. Gregory, J.J., et. al., Thermal Measurements in a Series of Large Pool Fires, SAND 85-1096, Sandia National Laboratories, August, 1987.