RAS 5493 72-22 ISFSI-applicant Exhibit 242 - Rec'd 6/26/02

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# *Radiation Shielding Analysis for the PFS*

FOR

*Private Fuel Storage*

**Holtec Report No: HI-971645**

**Holtec Project No: 70651**

**Report Class : SAFETY RELATED**

Released 6/26/02



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OFFICE OF THE SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

NUCLEAR REGULATORY COMMISSION

Docket No. 72-22 PFS Official Exh. No. PFS 242

In the matter of

Staff

Applicant ✓ IDENTIFIED ✓

Intervenor RECEIVED

Cont'g Off'r REJECTED

Contractor DATE 6-26-02

Other Witness

Reporter R. Davis

5. The cobalt-59 impurity level was assumed to be 1.0 gm/kg for the hardware above and below the active fuel region and for the grid spacers. This is a conservative value for the cobalt-59 impurity level as modern fuel is manufactured with cobalt impurity levels typically 0.3-0.5 gm/kg or less.
6. The grid spacers were assumed to be inconel. This is conservative as most modern PWR fuel have zircalloy grid spacers.
7. The calculation of scaling factors used in the ISFSI dose rate estimate are based on a previous model of the HI-STORM 100 overpack. These factors are assumed to be correct and the acceptability of using a previous model for these calculations is discussed in a later section.

Other assumptions are stated in the text as necessary. Since this report uses MCNP models from the HI-STAR (MPC models were originally developed for HI-STAR) and HI-STORM analyses, additional assumptions and discussion can be found in references [4], [5], and [6].

## 5. Input Data

The input data for generating the radiation source terms is provided in references [4] and [5] and can be found in Appendix E. The input data for the MCNP models of the overpack and the MPC, including the density and composition of all materials used in the models is available in these references.

### 5.1 Private Fuel Storage Facility Geometry

The only other input data needed was the arrangement of the PFSF. This data was provided in reference [7] and the geometry of the facility is illustrated in this report.

The PFSF consists of 4000 HI-STORM 100 overpacks arranged on 500 concrete pads with 8 overpacks per pad. A picture of a concrete pad with 8 overpacks is shown in Figure 1.

The pad dimensions are 30 feet by 67 feet. The spacing between the overpacks is 15 feet center to center along the short side of the pad and 16 feet center to center along the long side of the pad The spacing from the center of cask to the pad edge is 7.5 feet on the short side and 9.5 feet on the long side. An overpack is 11 feet 1/2 inch in diameter.

Figure 2 shows the configuration of concrete pads at the PFSF. The spacing between individual pads is 5 feet in the North-South direction and the spacing between columns of pads is 35 feet. The distance between the two halves of the ISFSI is 90 feet and the distance to the security fence (the dashed line in Figure 2) is 150 feet from the nearest concrete pad.

It is conservatively assumed that there are no obstructions (ex. earth berm) between the security fence and the site boundary which is 600 meters away from the fence.



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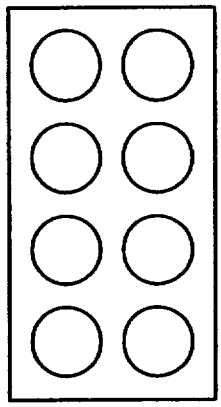

Figure 1. A concrete pad with eight HI-STORM 100 overpacks in place.

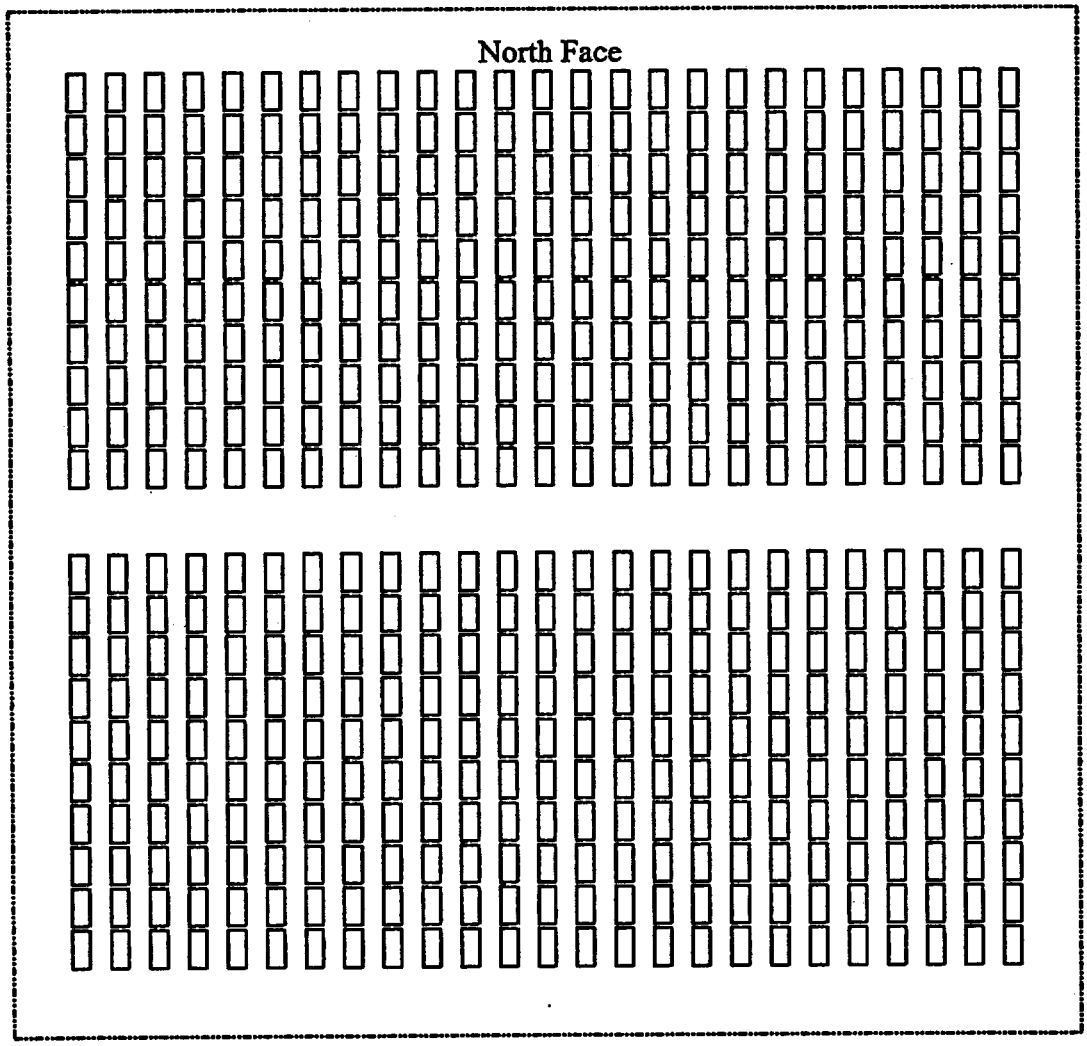


Figure 2. The Private Fuel Storage Facility concrete pad arrangement is shown. The distance between halves is 90 feet. The dashed line on the perimeter is the security fence and is located 150 feet from the casks.

Richard Solan 6/26/02

position along front of North face relative to Eastern most cask where dose locations begin
787.5 feet

distance from outer edge of casks along ISFSI North face

| | | neutron | neutron | total | total | mrem/2000 hr | | | mrem/hr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| feet | meters | side | top | side | top | neutron | gamma | total | neutron | gamma | total |
| **150.00** | **45.72** | **3.56E+02** | **6.12E+01** | **3.32E+03** | **7.16E+01** | **4.17E+02** | **2.97E+03** | **3.39E+03** | **2.09E-01** | **1.48E+00** | **1.69E+00** |
| 250.00 | 76.20 | 2.08E+02 | 3.77E+01 | 1.82E+03 | 4.46E+01 | 2.45E+02 | 1.62E+03 | 1.87E+03 | 1.23E-01 | 8.11E-01 | 9.33E-01 |
| 328.08 | 100.00 | 1.49E+02 | 2.66E+01 | 1.26E+03 | 3.17E+01 | 1.76E+02 | 1.12E+03 | 1.29E+03 | 8.80E-02 | 5.59E-01 | 6.47E-01 |
| 492.13 | 150.00 | 7.85E+01 | 1.32E+01 | 6.28E+02 | 1.60E+01 | 9.17E+01 | 5.52E+02 | 6.44E+02 | 4.59E-02 | 2.76E-01 | 3.22E-01 |
| 656.17 | 200.00 | 4.49E+01 | 6.86E+00 | 3.43E+02 | 8.44E+00 | 5.17E+01 | 2.99E+02 | 3.51E+02 | 2.59E-02 | 1.50E-01 | 1.76E-01 |
| 820.21 | 250.00 | 2.67E+01 | 3.64E+00 | 1.97E+02 | 4.55E+00 | 3.03E+01 | 1.71E+02 | 2.01E+02 | 1.52E-02 | 8.54E-02 | 1.01E-01 |
| 984.25 | 300.00 | 1.63E+01 | 1.99E+00 | 1.17E+02 | 2.53E+00 | 1.83E+01 | 1.01E+02 | 1.19E+02 | 9.13E-03 | 5.06E-02 | 5.97E-02 |
| 1148.29 | 350.00 | 1.04E+01 | 1.12E+00 | 7.17E+01 | 1.44E+00 | 1.15E+01 | 6.16E+01 | 7.31E+01 | 5.76E-03 | 3.08E-02 | 3.66E-02 |
| 1312.34 | 400.00 | 6.71E+00 | 6.24E-01 | 4.50E+01 | 8.23E-01 | 7.34E+00 | 3.85E+01 | 4.58E+01 | 3.67E-03 | 1.92E-02 | 2.29E-02 |
| 1476.38 | 450.00 | 4.47E+00 | 3.55E-01 | 2.87E+01 | 4.83E-01 | 4.83E+00 | 2.43E+01 | 2.92E+01 | 2.41E-03 | 1.22E-02 | 1.46E-02 |
| 1640.42 | 500.00 | 3.15E+00 | 2.08E-01 | 1.86E+01 | 2.93E-01 | 3.36E+00 | 1.55E+01 | 1.89E+01 | 1.68E-03 | 7.75E-03 | 9.43E-03 |
| 1804.46 | 550.00 | 2.18E+00 | 1.24E-01 | 1.22E+01 | 1.81E-01 | 2.31E+00 | 1.01E+01 | 1.24E+01 | 1.15E-03 | 5.04E-03 | 6.19E-03 |
| 1968.50 | 600.00 | 1.49E+00 | 7.49E-02 | 8.18E+00 | 1.14E-01 | 1.57E+00 | 6.73E+00 | 8.30E+00 | 7.83E-04 | 3.37E-03 | 4.15E-03 |
| **2118.50** | **645.72** | **1.06E+00** | **4.74E-02** | **5.78E+00** | **7.64E-02** | **1.10E+00** | **4.75E+00** | **5.85E+00** | **5.52E-04** | **2.37E-03** | **2.93E-03** |
| 2132.55 | 650.00 | 1.02E+00 | 4.55E-02 | 5.60E+00 | 7.37E-02 | 1.07E+00 | 4.61E+00 | 5.67E+00 | 5.34E-04 | 2.30E-03 | 2.84E-03 |
| 2296.59 | 700.00 | 7.06E-01 | 2.85E-02 | 3.93E+00 | 4.94E-02 | 7.34E-01 | 3.25E+00 | 3.98E+00 | 3.67E-04 | 1.62E-03 | 1.99E-03 |
| 2460.63 | 750.00 | 5.09E-01 | 1.80E-02 | 2.86E+00 | 3.44E-02 | 5.27E-01 | 2.37E+00 | 2.90E+00 | 2.64E-04 | 1.19E-03 | 1.45E-03 |
| 2624.67 | 800.00 | 3.82E-01 | 1.15E-02 | 2.18E+00 | 2.49E-02 | 3.94E-01 | 1.82E+00 | 2.21E+00 | 1.97E-04 | 9.08E-04 | 1.10E-03 |
| 2788.71 | 850.00 | 3.03E-01 | 8.30E-03 | 1.76E+00 | 1.98E-02 | 3.11E-01 | 1.47E+00 | 1.78E+00 | 1.55E-04 | 7.35E-04 | 8.91E-04 |
| 2952.76 | 900.00 | 2.50E-01 | 6.68E-03 | 1.51E+00 | 1.71E-02 | 2.56E-01 | 1.27E+00 | 1.53E+00 | 1.28E-04 | 6.35E-04 | 7.64E-04 |
| 3116.80 | 950.00 | 2.17E-01 | 5.83E-03 | 1.39E+00 | 1.58E-02 | 2.23E-01 | 1.18E+00 | 1.40E+00 | 1.11E-04 | 5.90E-04 | 7.01E-04 |
| 3280.84 | 1000.00 | 2.07E-01 | 5.62E-03 | 1.35E+00 | 1.55E-02 | 2.12E-01 | 1.15E+00 | 1.37E+00 | 1.06E-04 | 5.77E-04 | 6.83E-04 |

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6/26/02