Department of Energy
Idaho Operations Office
1955 Fremont Avenue
Idaho Falls, ID 83401

February 24, 2005

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Submittal of the Annual Radiological Environmental Monitoring Report per 10 CFR 72.44(d) (3), for the Three Mile Island Unit 2 Independent Spent Fuel Storage Installation (TMI-2 ISFSI) (Docket 72-20), and for the Ft. St. Vrain ISFSI (Docket 72-09) (EM-FMDP-06-008)

Dear Sir or Madam:

DOE-ID hereby submits the Annual Radiological Environmental Monitoring Report per 10 CFR 72.44(d) (3) for the Three Mile Island Unit 2 Independent Spent Fuel Storage Installation (TMI-2 ISFSI) (Docket 72-20), and the Ft. St. Vrain (FSV) ISFSI (Docket 72-09). These reports cover operations at both ISFSIs for calendar year 2005.

If you have any questions please call me at (208) 526-5655.

Sincerely,

Mark D. Gardner
FSV/TMI-2 Facility Director

Enclosures

cc: U.S. NRC Region IV (TMI-2 and FSV ISFSI Reports)
D. A. Butcher, Colorado Dept. of Public Health (FSV ISFSI Report)
U.S. EPA – Region 8, Denver Co (FSV ISFSI Report)

HMSS01

DOE/ID-10742 (2005)

Annual Radiological Environmental Monitoring Program Report for the Fort St. Vrain Independent Spent Fuel Storage Installation

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Prepared for the
U. S. Department of Energy
Assistant Secretary for
Environmental Management
Under DOE Idaho Operations Office
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ABSTRACT

This report presents the results of the 2005 Radiological Environmental Monitoring Program conducted in accordance with 10 CFR 72.44 for the Fort St. Vrain Independent Spent Fuel Storage Installation. A description of the facility and the monitoring program is provided. The results of monitoring the predominant radiation exposure pathway, direct radiation exposure, indicate the facility operation has not contributed to any increase in the estimated maximum potential dose commitment to the general public.

SUMMARY

The purpose of this report is to present the results of the Radiological Environmental Monitoring Program (REMP) conducted during 2005 for the Fort St. Vrain (FSV) Independent Spent Fuel Storage Installation (ISFSI). The results of the thermoluminescent dosimetry network did not indicate an increase in radiation levels above post-loading ambient background attributed to the facility operation. The monitoring program results support the conclusion reached in the Safety Analysis Report that operation of the facility will not result in a significant dose commitment greater than 0.15 mrem/y to the nearest resident.

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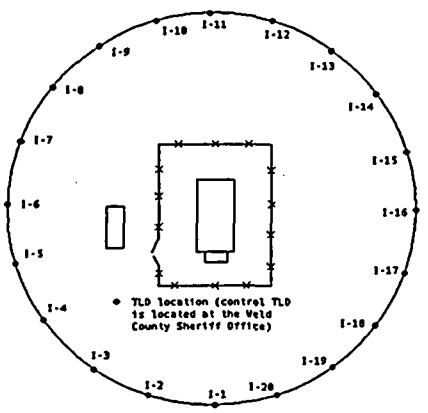
INTRODUCTION

The Fort St. Vrain (FSV) Independent Spent Fuel Storage Installation (ISFSI) is a spent fuel dry storage facility located near Platteville, Colorado. The FSV ISFSI is operated by CH2M - WG Idaho, LLC (CWI) for the Department of Energy (DOE). The FSV ISFSI is licensed (SNM-2504) by the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 72 for authorization to store spent nuclear fuel from the Fort St. Vrain Nuclear Generating Station.[1] Spent fuel from the FSV reactor was transferred to the FSV ISFSI between December 26, 1991 and June 10, 1992. The FSV ISFSI license was transferred from Public Service Company of Colorado (PSCo) to the U.S. Department of Energy, Idaho Operations Office (DOE-ID) on June 4, 1999. A Radiological Environmental Monitoring Program (REMP) has been implemented for the FSV ISFSI in accordance with 10 CFR 72.44. This report presents the REMP results for 2005.

PROGRAM DESCRIPTION

The REMP is designed to monitor the predominant radiation exposure pathway inherent with the facility design: direct radiation. The direct radiation exposure pathway is monitored using thermoluminescent dosimetry (TLD) located along the 100 meter perimeter fence of the FSV ISFSI. Monitoring locations are identified in Figure 1. A control station is located at the Weld County Sheriff Office in Greeley, Colorado, approximately 17 miles NNE from the FSV ISFSI. Twenty TLDs are located around the 100 meter perimeter fence to monitor direct radiation from the FSV ISFSI. One third of the TLDs are changed out and processed each month.

Figure 1. FSV ISFSI Radiological Environmental Monitoring Locations



RESULTS

TLD results for the FSV ISFSI are presented in Table 1 in units of mR/d. Dosimetry processing services were provided by the Idaho National Laboratory (INL). Although statistical analyses show the perimeter fence dosimeter responses to be significantly higher than the control dosimeter responses, the mean daily exposure rate of 0.38 +/- 0.03 mR/d measured at the ISFSI perimeter fence is not significantly different than the five-year historical operation mean of 0.39 +/- 0.05 mR/d measured at the ISFSI perimeter fence and last reported by Colorado State University (CSU).[2] Additionally, the control dosimeter responses are consistent with historical values associated with the current dosimeter location. Therefore, both the perimeter fence dosimeter and control dosimeter responses are consistent with historical values. Previous annual REMP reports (preceding 1999) have indicated that the historical operation mean exposure rates were not significantly above preoperational and background levels for eastern Colorado.

A control TLD is located in Greeley, CO, approximately 17 miles NNE from the FSV ISFSI. The results show the mean daily exposure rate at the control station to be 0.34 +/- 0.03 mR/d.

Table 1. FSV ISFSI Exposure Rates (mR/d)

Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
I-1	0.44	-	-	0.40	-	-	0.38	-	-	0.41	-	-	0.41
I-2	-	0.40	-	-	0.37	-	-	0.42	-	-	0.31	-	0.38
I-3	-	-	0.38	-	-	0.40	-	-	0.39	-	-	0.36	0.38
I-4	0.41	-	-	0.38	-	-	0.38	-	-	0.39	-	-	0.39
I-5	-	0.40	-	-	0.38	-	-	0.44	-	-	0.31	-	0.38
I-6	-	-	0.38	-	-	0.37	-	-	0.38	-	-	0.34	0.37
I-7	0.40	-	-	0.39	-	-	0.35	-	-	0.39	-	-	0.38
I-8	-	0.39	-	-	0.36	-	-	0.44	-	-	0.32	-	0.38
I-9	-	-	0.42	-	-	0.37	-	-	0.41	-	-	0.36	0.39
I-10	0.44	-	-	0.37	-	-	0.37	-	-	0.39	-	-	0.39
I-11	-	0.40	-	-	0.38	-	-	0.42	-	-	0.33	-	0.38
I-12	-	-	0.40	-	-	0.37	-	-	0.39	-	-	0.34	0.38
I-13	0.43	-	-	0.37	-	-	0.38	-	-	0.39	-	-	0.39
I-14	-	0.39	-	-	0.37	-	-	0.44	-	-	0.31	-	0.38
I-15	-	-	0.42	-	-	0.38	-	-	0.39	-	-	0.34	0.38
I-16	0.43	-	-	0.38	-	-	0.37	-	-	0.37	-	-	0.39
I-17	-	0.39	-	-	0.38	-	-	0.42	-	-	0.33	-	0.38
I-18	-	-	0.42	-	-	0.37	-	-	0.40	-	-	0.35	0.39
I-19	0.43	-	-	0.36	-	-	0.37	-	-	0.36	-	-	0.38
I-20	-	0.40	-	-	0.37	-	-	0.42	-	-	0.32	-	0.38
Mean	0.43	0.40	0.40	0.38	0.37	0.38	0.37	0.43	0.39	0.39	0.32	0.35	0.38
Control	0.38	0.37	0.35	0.34	0.34	0.34	0.33	0.38	0.36	0.33	0.28	0.31	0.34

DISCUSSION

The FSV ISFSI REMP was successfully implemented during 2005. There was no loss of radiological monitoring data. There were no sampling location changes. There were no deviations from the established sampling schedule. The radiation dosimetry results indicate there continues to be a less than 15 mrem/y increase in ambient background radiation levels inside the FSV ISFSI perimeter fence, and there has been no measurable increase in ambient background radiation levels beyond the FSV ISFSI perimeter fence attributed to storage of the FSV fuel. There were no radioactive liquid effluents released from the facility, hence no radionuclides to report. There are no sources of radioactive material that may become airborne during normal operations, hence no radionuclides to report.

CONCLUSION

Direct radiation exposure from the facility during 2005 did not contribute to any increase in the maximum potential dose commitment (0.15 mrem/y) to the nearest resident (located 797 meters from the ISFSI) projected in the FSV ISFSI Safety Analysis Report.[3]

REFERENCES

1. 10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste", *Code of Federal Regulations*, Office of the Federal Register, August 1988.

2. Fort St. Vrain Independent Spent Fuel Storage Installation (ISFSI) Radiological Environmental Monitoring Program (IREMP), Summary Report for the Period January 1 to December 31, 1997, Department of Radiological Health Sciences, Colorado State University, February 26, 1998.

3. Fort St. Vrain Independent Spent Fuel Storage Installation Safety Analysis Report, Section 7.5, Estimated Offsite Collective Dose Assessment.

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Annual Radiological Environmental Monitoring Program Report for the Three Mile Island, Unit 2, Independent Spent Fuel Storage Installation

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Assistant Secretary for
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ABSTRACT

This report presents the results of the 2005 Radiological Environmental Monitoring Program conducted in accordance with 10 CFR 72.44 for the Three Mile Island, Unit 2, Independent Spent Fuel Storage Installation. A description of the facility and the monitoring program is provided. The results of monitoring the two predominant radiation exposure pathways, potential airborne radioactivity releases and direct radiation exposure, indicate the facility operation has not contributed to any increase in the estimated maximum potential dose commitment to the general public.

SUMMARY

The purpose of this report is to present the results of the Radiological Environmental Monitoring Program (REMP) conducted during 2005 for the Three Mile Island, Unit 2, (TMI-2), Independent Spent Fuel Storage Installation (ISFSI). TMI-2 core debris was transferred to the ISFSI between March 1999 and April 2001 and remains in interim storage at the ISFSI.

The REMP was implemented from January through December 2005. Results of the loose surface radioactive contamination surveys indicated no increase in either beta or Cs-137 radioactivity attributed to the facility operation. The results of the airborne radioactivity sampling did not indicate releases of airborne particulate radioactivity from the loaded Horizontal Storage Modules (HSM) that would contribute to an increase in the estimated maximum potential dose commitment to the general public. The results of the thermoluminescent dosimetry network did not indicate an increase in radiation levels above pre-operational background attributed to the facility operation.

The monitoring program results support the conclusion reached in the Final Environmental Impact Statement that operation of the facility would not result in a significant dose commitment to the Maximum Exposed Individual.

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Annual Radiological Environmental Monitoring Program Report for the Three Mile Island, Unit 2, Independent Spent Fuel Storage Installation

INTRODUCTION

The Three Mile Island, Unit 2, Independent Spent Fuel Storage Installation (TMI-2 ISFSI) is a spent fuel dry storage facility designed for interim storage of the TMI-2 core debris. The TMI-2 ISFSI, located within the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Laboratory (INL), is operated by CH2M - WG Idaho, LLC for the Department of Energy (DOE). The TMI-2 ISFSI was licensed on March 19, 1999 by the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 72 for authorization to receive, possess, store, and transfer spent fuel and fuel debris, resulting from the 1979 TMI-2 accident, for a twenty-year term.[1,2]

The TMI-2 ISFSI is a modified NUHOMS spent fuel storage system, designated NUHOMS-12T. Each of the thirty NUHOMS-12T modules within the facility provide for the horizontal dry storage of up to twelve TMI-2 stainless steel canisters inside a dry shielded canister (DSC) which is placed inside a concrete horizontal storage module (HSM). The NUHOMS-12T modification includes venting of the DSC through high efficiency particulate air (HEPA) grade filters during storage. The vent system allows for release of hydrogen gas, generated due to radiolysis, and monitoring and/or purging of the system during operation.

The TMI-2 core debris, which had been stored in stainless steel canisters in a fuel pool at the Test Area North (TAN) site within the INL, has been transferred to the TMI-2 ISFSI for interim storage. A Settlement Agreement entered into by the State of Idaho, the Department of Energy, and the Department of the Navy in October 1995 established a schedule for commencing core debris transfers by March 31, 1999, and completing such transfers by June 1, 2001.[3] The first core debris transfer was completed on March 31, 1999. Nine additional transfers were completed during 2000. The remaining nineteen transfers were completed during 2001, with the last one completed on April 20, 2001.

A Radiological Environmental Monitoring Program (REMP) was developed for the TMI-2 ISFSI and implemented in accordance with 10 CFR 72.44. This report presents the REMP results during the TMI-2 ISFSI operation in 2005.

PROGRAM DESCRIPTION

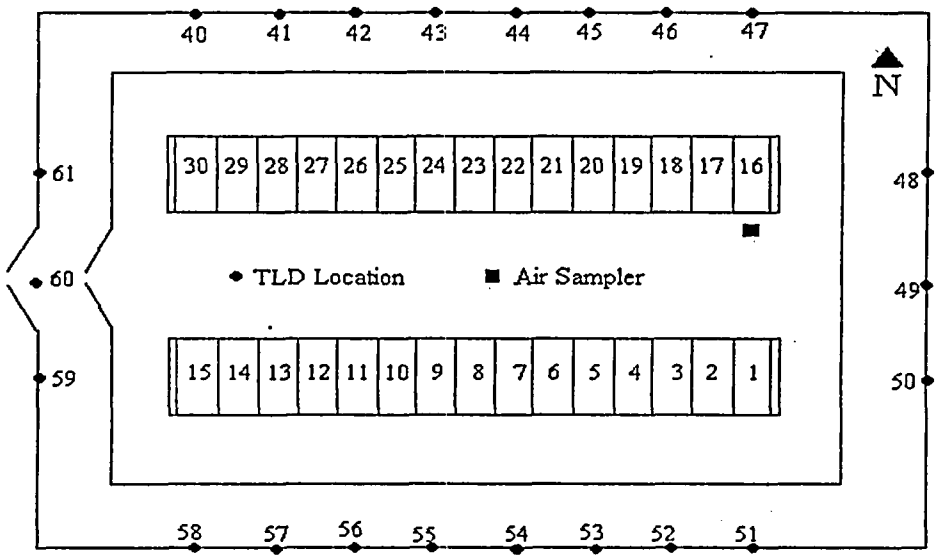
The REMP is designed to monitor the two predominant radiation exposure pathways inherent with the facility design: potential airborne radioactivity releases and direct radiation. The airborne radioactivity release pathway is monitored using a combination of loose surface radioactive contamination surveys and periodic airborne radioactivity sampling. The direct radiation exposure pathway is monitored using thermoluminescent dosimetry (TLD) located along the outer perimeter fence of the TMI-2 ISFSI. Contact radiation levels on the HSM rear panel doors and DSC purge and vent port filter housings are also measured during regularly scheduled surveillances performed in accordance with the Technical Specifications.

Loose surface radioactive contamination surveys are performed at the vent and purge ports of each DSC as well as the drain port of each loaded HSM. The survey frequency is monthly during the first

year, quarterly during the second through fifth years, and annually thereafter. The survey frequency for each DSC and loaded HSM begins after DSC insertion into the HSM. The frequency coincides with the radiation monitoring surveillance schedule required by the TMI-2 ISFSI Technical Specifications.[4] Sample media is analyzed for beta radioactivity. Depending on the amount of beta radioactivity detected, gamma isotopic analysis is either performed for each sample or for an annual sample composite. The presence of Cs-137 is determined and quantified during the gamma isotopic analysis with a required Lower Limit of Detection (LLD) no greater than 5 nCi/sample.

Twenty-two TLD stations are located and maintained along the outer perimeter fence of the TMI-2 ISFSI. The TLD station locations are noted in Figure 1. Dosimetry is changed out on a monthly frequency. The minimum detectable dose is no greater than 10 mrem.

Figure 1. TMI-2 ISFSI TLD Station Locations.



A low-volume air sampler is used to collect approximately 5.0E5 liters of air through a particulate filter during a seven-day period each month. The air sampler is located between the two rows of HSMs inside the TMI-2 ISFSI. Each air particulate sample is analyzed for beta radioactivity with an LLD no greater than 0.01 pCi/m^3. Depending on the amount of beta radioactivity detected, gamma isotopic analysis is either performed for each air particulate sample or for an annual sample composite. The presence of Cs-137 is determined and quantified during the gamma isotopic analysis with a required LLD no greater than 0.01 pCi/m^3.

RESULTS

The radiation levels measured on the HSM rear panel doors remain less than 5 mrem/h; well below the Technical Specification limit of 100 mrem/h. The highest gamma radiation levels measured on the DSC purge and vent port filter housings during 2005, summarized in Appendix A, Table 1, remain well below the Technical Specification limit of 1,200 mrem/h. Radiation levels for HSMs 4, 22 and 30 include 2 to 4 mrem/h neutron radiation attributed to either spontaneous fission of Pu-240 or AmBeCm neutron startup source material.

The loose surface contamination survey results for the purge, vent, and drain ports are summarized in Appendix A, Table 2. Except for contamination surveys performed in February 2005, analytical beta and alpha results were less than the Minimum Detectable Activity (MDA) calculated in accordance with NUREG/CR-1507.[5] Individual contamination survey samples collected in February 2005 for HSMs 9, 10, 11, 12, 13, 24, 25, 26, 27, and 28 were characterized as having detectable beta radioactivity ranging between 27 and 53 dpm/100 cm^2. Gamma spectroscopy analysis of these samples indicated no detectable levels of Cs-137, with MDAs ranging between 3.1E-2 and 4.1E-2 nCi/sample. The detected beta radioactivity was within the range of MDA observed during the year (25 to 87 dpm/100 cm^2) with detectability attributed to a low MDA (26 dpm/100 cm^2) calculated during February.

The gamma isotopic results for the purge, vent, and drain port contamination survey composite samples from each HSM are summarized in Appendix A, Table 3 in units of radioactivity per sample. No fission product (Cs-137) radioactivity was identified in any of the composite samples. The average MDA of 3.87E-2 +/- 0.44E-2 nCi/sample was well below the required LLD of 5 nCi/sample.

TLD results are presented in Appendix A, Table 4 in units of mrem/d. TLD results include an artificial phantom backscatter correction of 3% to express the results in dose equivalent units. Seven TLDs were unaccounted for during the first half of the year as indicated in Table 4. Monthly standard deviations were generally 0.1 mrem/d. Analysis of variance results indicated monthly variances were different than the pre-operational baseline variance measured in March 1999. T-test results indicated monthly mean TLD responses were significantly lower than the pre-operational baseline mean measured in March 1999 due to introduction of a new environmental dosimeter and processing system in June 1999.[6] It was also noted that mean TLD responses for locations in the south southwest perimeter of the TMI-2 ISFSI were generally the highest with a mean response of 0.9 mrem/d. This is attributed to direct radiation from outdoor mixed waste storage areas in CPP-1617, which are located 200 meters from the TMI-2 ISFSI. All other TLD locations had mean responses of 0.6 to 0.8 mrem/d. Radiation monitoring at other locations within the 100 meter perimeter was not performed due to extremely low building occupancy factors.

Monthly air sampling beta radioactivity results for the TMI-2 ISFSI are presented in Appendix A, Table 5. Beta radioactivity detected above the established threshold of 4E-14 µCi/cc on the January and February air samples warranted gamma spectroscopy analysis for Cs-137. Gamma spectroscopy results indicated no detected Cs-137 with MDAs of 8.7E-3 and 7.2E-3 pCi/m^3 for January and February respectively, therefore indicating that the detected airborne beta radioactivity was not attributed to TMI-2 ISFSI operation. Gamma spectroscopy results of the composited air samples collected throughout the year did not indicate the presence of fission or activation product activity. The MDA of 3.7E-3 pCi/m^3 for Cs-137 (the quotient MDA of 31.6 pCi/sample divided by a composite air sample volume of 8.6E3 m^3) was well below the required LLD of 0.01 pCi/m^3.

DISCUSSION

The TMI-2 ISFSI REMP was conducted in accordance with established procedures. Analytical results of composited loose surface contamination survey media indicated no fission or activation product activity. There were no changes in sampling locations during the monitoring period. Seven TLDs could not be accounted for during monthly exchanges. The air sample collected from August 22 to August 29, 2005 was lost prior to analysis.

The loose surface radioactive contamination survey and vent port radiation survey results (stable trends) neither indicate a build up of radioactivity in the vent port HEPA filters, nor a breach of DSC

containment. The loose surface radioactive contamination surveying and airborne radioactivity sampling results indicate there has been no measurable release of radioactive material from the DSCs stored in the HSMs at the ISFSI above and beyond that projected in the Final Environmental Impact Statement (EIS), estimated for 40 CFR 61 reporting purposes, and summarized in Appendix A, Table 6.[7,8,9] Radioanalytical results are not significantly different from pre-operational results as well as those projected in the EIS and reported in accordance with 40 CFR 61.

The radiation dosimetry results indicate there has been no measurable increase in ambient background radiation levels outside the TMI-2 ISFSI perimeter fence attributed to storage of the TMI-2 core debris, however the results do indicate an influence from an outdoor mixed waste storage facility adjacent to the ISFSI. The absence of any significant increase in radiation levels outside the TMI-2 ISFSI perimeter fence is also supported by conclusions reached in the EIS.

Calibration and quality control of instrumentation used for beta analysis of surface contamination and airborne radioactivity sample media is maintained in accordance with procedures used by the INL Radiological Control Program.[10] Radioactive sources used for instrumentation calibration and quality control are traceable to the National Institute of Standards and Technology (NIST).

The radioanalytical laboratory that provides gamma spectroscopy services for composite sample analysis participated in the Mixed Analyte Performance Evaluation Program (MAPEP) conducted by the DOE Radiological and Environmental Sciences Laboratory (RESL) in 2005. The intercomparison results for the sample geometry used for composite samples of surface contamination survey and air sample media conducted during 2005 are summarized in Appendix A, Table 7. The evaluation criteria are described at the MAPEP website (www.inel.gov/resl/mapep). The evaluation results for Cs-137 identification indicate the INL had an average negative reporting bias of 9%.

CONCLUSION

Airborne radioactivity releases and direct radiation exposure from the facility during 2005 did not contribute to any increase in the estimate of maximum potential dose commitment to the general public; characterized as 2.7E-3 mrem/y to the Maximum Exposed Individual reported in the EIS. There were no radioactive liquid effluents released from the facility, hence no radionuclides to report.

REFERENCES

1. Materials License SNM-2508 for the Three Mile Island, Unit 2, Independent Spent Fuel Storage Installation (TAC No's L22283 and L22800), March 19, 1999, Docket No. 72-20.

2. 10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste", *Code of Federal Regulations*, Office of the Federal Register, October 2004.

3. Settlement Agreement between the State of Idaho, Department of the Navy, and the Department of Energy, October 16, 1995.

4. Technical Specifications and Bases for the INL TMI-2 Independent Spent Fuel Storage Installation.

5. NUREG/CR-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", December 1997.

6. P. E. Ruhter, *New Environmental Dosimeter Response*, letter PER-17-99, July 29, 1999.

7. NUREG-1626, "Final Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation to Store the Three Mile Island Unit 2 Spent Fuel at the Idaho National Engineering and Environmental Laboratory", Docket No. 72-20, March 1998.

8. 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants", Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities", *Code of Federal Regulations*, Office of the Federal Register, October 2002.

9. G. G. Hall, *Projected Radionuclide Emissions from the TMI-2 ISFSI,* Engineering Design File 3420, February 25, 2003.

10. INL, *Radiological Control Manuals 15B and 15C.*

APPENDIX A

Table 1. TMI-2 ISFSI Highest Filter Housing Radiation Level Summary (mrem/h)[1].

HSM/DSC	Dose Rate	HSM/DSC	Dose Rate	HSM/DSC	Dose Rate
1/29	27	11/12	29	21/9	25
2/28	23	12/19	44	22/5	103
3/26	19	13/15	27	23/16	11
4/1	24	14/17	50	24/11	25
5/24	10	15	Empty	25/13	40
6/23	32	16/2	<1	26/7	32
7/22	17	17/3	12	27/8	12
8/21	22	18/20	60	28/10	5
9/25	37	19/18	65	29/27	11
10/6	24	20/4	90	30/14	102

Table 2. TMI-2 ISFSI Port Survey Beta/Alpha Results (dpm/100 cm^2).

HSM	Beta	Alpha	HSM	Beta	Alpha	HSM	Beta	Alpha
1	<83	<17	11	<87	<16	21	<84	<14
2	<83	<17	12	<87	<16	22	<38	<17
3	<83	<17	13	<87	<16	23	<83	<17
4	<83	<17	14	<83	<17	24	<87	<16
5	<84	<19	15	Empty		25	<87	<16
6	<84	<19	16	<81	<16	26	<87	<16
7	<84	<19	17	<84	<14	27	<87	<16
8	<84	<19	18	<84	<19	28	<87	<16
9	<87	<16	19	<83	<17	29	<83	<17
10	<87	<16	20	<84	<14	30	<83	<17

Table 3. TMI-2 ISFSI HSM Composite Port Survey Gamma Isotopic Results (nCi/sample).

HSM	Cs-137	HSM	Cs-137	HSM	Cs-137
1	<3.04E-2	11	<4.16E-2	21	<4.27E-2
2	<4.12E-2	12	<4.23E-2	22	<4.45E-2
3	<4.01E-2	13	<3.81E-2	23	<3.93E-2
4	<4.31E-2	14	<3.57E-2	24	<3.07E-2
5	<4.08E-2	15	Empty	25	<4.08E-2
6	<4.01E-2	16	<4.01E-2	26	<4.20E-2
7	<4.05E-2	17	<4.38E-2	27	<3.25E-2
8	<3.06E-2	18	<4.12E-2	28	<3.13E-2
9	<4.08E-2	19	<3.89E-2	29	<4.01E-2
10	<3.85E-2	20	<2.92E-2	30	<4.05E-2

[1] Gamma and neutron.

Table 4. TMI-2 ISFSI TLD Results (mrem/d).[2]

LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
40	0.7	0.5	0.7	0.6	0.7	0.7	0.9	0.7	0.5	0.6	0.6	0.8	0.7
41	0.7	0.5	0.7	0.6	0.7	0.7	0.8	0.7	0.5	0.6	0.6	0.8	0.7
42	0.7	0.5	0.6	0.6	0.6	0.7	0.8	0.7	0.5	0.6	0.6	0.8	0.6
43	0.6	0.5	0.7	0.6	0.6	0.7	0.8	0.6	0.5	0.6	0.6	0.8	0.6
44	0.6	0.5	0.6	0.6	0.6	0.6	0.8	0.6	0.5	0.6	0.6	0.8	0.6
45	0.7	0.5	0.7	0.6	0.6	0.7	0.8	0.6	0.5	0.6	0.6	0.7	0.6
46	0.6	0.5	0.6	0.6	0.6	0.7	0.8	0.6	0.5	0.6	0.6	0.8	0.6
47	n/a	0.5	0.6	0.6	0.6	0.6	0.8	0.6	0.5	0.6	0.6	0.7	0.6
48	0.6	0.5	0.6	0.6	0.6	0.6	0.8	0.6	0.5	0.6	0.6	0.8	0.6
49	0.7	0.5	0.6	0.7	0.6	0.7	0.8	0.7	0.5	0.6	0.6	0.8	0.6
50	0.7	0.5	0.7	0.7	0.7	0.7	0.8	0.7	0.5	0.6	0.6	0.8	0.7
51	0.8	0.6	0.8	0.8	0.7	0.8	1.0	0.7	0.6	0.7	0.7	0.9	0.8
52	n/a	0.6	0.8	0.8	0.8	0.8	0.9	0.8	0.6	0.7	0.7	0.9	0.8
53	0.8	0.6	0.8	0.9	0.8	0.8	1.0	0.8	0.6	0.7	0.7	0.9	0.8
54	0.8	0.6	0.8	0.8	0.8	0.8	1.0	0.8	0.6	0.7	0.7	0.9	0.8
55	0.8	0.6	0.9	0.8	0.8	0.9	1.0	0.8	0.6	0.7	0.8	0.9	0.8
56	n/a	0.6	0.9	0.9	0.8	0.9	1.0	0.8	0.7	0.8	0.8	0.9	0.8
57	0.9	0.7	0.9	0.9	0.9	n/a	1.0	0.9	0.8	0.8	0.8	1.0	0.9
58	n/a	0.7	1.0	0.9	0.9	0.9	1.1	0.8	0.7	0.8	0.8	1.0	0.9
59	0.9	0.8	n/a	n/a	0.8	0.8	1.0	0.8	0.7	0.8	0.8	1.0	0.8
60	0.9	0.7	0.9	0.8	0.8	0.8	1.0	0.8	0.7	0.8	0.7	0.9	0.8
61	0.8	0.6	0.8	0.8	0.8	0.9	1.0	0.8	0.7	0.7	0.7	0.9	0.8
MEAN	0.7	0.6	0.8	0.7	0.7	0.8	0.9	0.7	0.6	0.7	0.7	0.8	0.7

Table 5. TMI-2 ISFSI Air Sample Results (pCi/m^3).

Sample Date	Beta	Sample Date	Beta
January	0.14	July	0.017
February	0.1	August	0.024
March	0.014	September	0.035
April	0.013	October	0.013
May	0.019	November	0.042
June	0.018	December	0.031

[2] TLDs unaccounted for are signified by "n/a".

Table 6. TMI-2 ISFSI Estimated Airborne Radioactive Material Releases (Ci/y).

Radionuclide	Release	Radionuclide	Release	Radionuclide	Release
Cs-137	3.2E-2	Co-60	2.8E-4	H-3	5.0E+2
Sr-90	2.5E-2	Pu-239	5.8E-4	Eu-155	6.2E-5
Pu-241	1.5E-2	Sm-151	4.5E-4	Pu-238	1.4E-4
Kr-85	3.8E+3	Pu-240	3.0E-4	Sb-125	1.7E-5
Pm-147	2.0E-4	Ni-63	2.7E-4	Cs-134	3.8E-6
Am-241	9.7E-8	Eu-154	1.3E-4	I-129	5.5E-2

Table 7. Gamma Spectroscopy Intercomparison Results (Bq/sample).

Sample (Date)	Radionuclide	INL Value	RESL Value	Bias (%)	Evaluation[3]
MAPEP-05-RdF13	Cs-134	3.43	3.51	-2.3	Acceptable
(May 2005)	Cs-137	2.35	2.26	+4.0	Acceptable
	Co-57	4.8	4.92	-2.4	Acceptable
	Co-60	3.09	3.03	-2.0	Acceptable
	Mn-54	3.23	3.33	-3.0	Acceptable
	Zn-65	2.43	3.14	-22.6	Acceptable
MAPEP-05-RdF14	Cs-134	2.90	3.85	-24.7	Acceptable
(November 2005)	Cs-137	2.52	3.23	-22.0	Acceptable
	Co-57	4.96	6.20	-20.0	Acceptable
	Co-60	2.44	2.85	-14.4	Acceptable
	Mn-54	3.59	4.37	-17.8	Acceptable
	Zn-65	3.68	4.33	-15.0	Acceptable

[3] May Zn-65 and November Cs-134 and Cs-137 evaluations were acceptable with warning (bias exceeded 20%, but less than 30%).