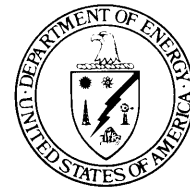


18

Eighteenth Annual Report

**Radiation Exposures for
DOE and DOE Contractor
Employees - 1985**

December 1986



**Prepared for:
U.S. Department of Energy
Assistant Secretary for
Environment, Safety and Health
Office of Nuclear Safety**

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Assistant Secretary for
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Office of Nuclear Safety

Under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington, 99352

EIGHTEENTH ANNUAL REPORT RADIATION EXPOSURES FOR DOE AND DOE CONTRACTOR EMPLOYEES 1985

PREFACE

This report is one of a series of annual reports provided by the U.S. Department of Energy (DOE) summarizing occupational radiation exposures received by DOE and DOE contractor employees. These reports provide an overview of radiation exposures received each year, as well as identification of trends in exposures being experienced over the years.

In 1968, the U.S. Atomic Energy Commission (AEC) established a program for reporting certain occupational radiation exposure information to a central radiation records repository. At the same time, a contract was established with Union Carbide Corporation at Oak Ridge, Tennessee, to computerize the processing of the radiation exposure reporting system. Annual summary reports were published from 1969 through 1973 (WASH-1350-R1 through WASH-1350-R6), which included information on AEC contractor employees and visitors, as well as employees and visitors of companies in the private sector licensed by the AEC.

In January 1975, with the separation of the AEC into the Energy Research and Development Administration (ERDA) and the U.S. Nuclear Regulatory Commission (NRC), each agency assumed responsibility for collecting and maintaining occupational radiation exposure information reported by the facilities under its jurisdiction. Former AEC licensees reported to the NRC while contractors reported to ERDA. At the same time, a contract was established with Union Carbide Corporation at Oak Ridge, Tennessee, to computerize the reporting and processing of both the ERDA and NRC radiation exposure reporting systems. On October 1, 1977, DOE was formed and assumed the responsibilities of ERDA. Processing and programming of exposure information continued at Oak Ridge until October 1978, when the management and further development of the DOE radiation exposure reporting system was assigned to the System Safety Development Center, EG&G Idaho, Inc.; the NRC system remained at Oak Ridge.

Radiation exposure data for ERDA and ERDA contractor employees and visitors for 1974 through 1976 were reported in ERDA 76/119, ERDA 77-29, and DOE/EV-0011/9. The DOE and DOE contractor radiation exposure data for 1977-1979 were presented in DOE/EV-0066/10, 11, and 12, respectively. A revised version of the 1979 report was issued as DOE/EP-0039. The data for 1980-1982 were presented in DOE/EP-0040, DOE/EP-0040/1, and DOE/EP-0040/2. The data for 1983 and 1984 were presented in DOE/PE-0072 and DOE/EH-0011, respectively. This report contains 1985 radiation exposure data for DOE and DOE contractor employees and visitors.

Previous reports for AEC/ERDA/DOE government and contractor employees and visitors may be obtained from the DOE Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830.

SUMMARY

All U.S. Department of Energy (DOE) and DOE contractors are required by DOE Order 5484.1, Chapter IV, to submit occupational radiation exposure records to a central repository. The data required include a summary of whole-body exposures to ionizing radiation, a summary of internal depositions of radioactive materials above specified limits, and occupational exposure reports for terminating employees. This report is a summary of the data submitted by DOE and DOE contractors for 1985.

A total of 95,806 DOE and DOE contractor employees were monitored for whole-body ionizing radiation exposures in 1985. This represents 58.1% of all DOE and DOE contractor employees and is an increase (4,203) from the number of employees monitored in 1984. In addition to the employees, 96,665 visitors were monitored.

Of all employees monitored, 58.4% received a dose equivalent that was less than measurable, 39.8% a measurable exposure less than 1 rem, and 1.9% an exposure greater than 1 rem. One employee received a dose equivalent greater than 5 rem (8.66 rem). The exposure received by 91.9% of the visitors to DOE facilities was less than measurable. Only 8.1% of the visitors received a measurable exposure less than 1 rem, and 0.01% of the visitors received an exposure greater than 1 rem. No visitors received a dose equivalent greater than 2 rem.

The collective dose equivalent for DOE and DOE contractor employees was 8,223 person-rem. The collective dose equivalent for visitors was 461 person-rem. The total dose equivalent for employees and visitors combined was 8,684 person-rem. The average dose equivalent for all individuals (employees and visitors) monitored was 45 mrem, and the average dose equivalent for all individuals who received a measurable exposure was 182 mrem. The highest average dose equivalent for all monitored individuals was observed at reactor facilities (205 mrem), and the lowest was observed for visitors (5 mrem) to DOE facilities. These averages are significantly less than the DOE 5-rem/year radiation protection standard for whole-body exposures.

Ten new cases of internal depositions were reported in 1985 that exceeded 50 percent of the pertinent annual dose-equivalent standard. Of these ten cases, eight occurred in a previous year and are reported now because recent revisions in the dose calculations established these cases as reportable depositions. Twenty-six other cases reported during 1985 were considered to be the continued tracking of previous depositions.

A total of 6,856 monitored employees terminated their employment in 1985. The average cumulative dose equivalent for terminated employees who worked one to two years was 0.29 rem; two to four years, 0.29 rem; four to six years, 0.44 rem; and longer than six years, 2.56 rem. The average cumulative dose equivalent for employees who terminated with more than six years of employment appears high in comparison with the other data. However, this average includes the cumulative exposure of some individuals who worked for DOE or DOE contractors for over 20 years.

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EIGHTEENTH ANNUAL REPORT
RADIATION EXPOSURES FOR DOE AND
DOE CONTRACTOR EMPLOYEES
1985

INTRODUCTION

One of the basic U.S. Department of Energy (DOE) radiation protection policy objectives is that radiation exposures be maintained as low as is reasonably achievable (ALARA) and within the occupational exposure guidelines provided in DOE Order 5480.1, Chapter XI (Table 1). Assurance that occupational exposures do not exceed the guidelines is not considered, in itself, sufficient. All operations are to be conducted in a manner to assure that radiation exposures to individuals and population groups are limited to the lowest levels technically and economically feasible.

TABLE 1. Radiation Protection Standards for External and Internal Dose Equivalents for Individuals in Controlled Areas

Type of Exposure	Exposure Period	Dose Equivalent (Dose or Dose Commitment) ^(a) (rem)
Whole body, head and trunk, gonads, lens of the eye, ^(b) red bone marrow, active blood-forming organs	Year	5(c)
	Calendar quarter	3
Unlimited areas of the skin (except hands and forearms), other organs, tissues, and organ systems (except bone)	Year	15
	Calendar quarter	5
Bone	Year	30
	Calendar quarter	10
Forearms ^(d)	Year	30
	Calendar quarter	10
Hands ^(d) and feet	Year	75
	Calendar quarter	25

- (a) To meet the dose commitment standards above, operations must be conducted in such a manner that it would be unlikely that an individual would assimilate in a critical organ, by inhalation, ingestion, or absorption, a quantity of radionuclide(s) that would commit the individual to an organ dose that exceeds the standards specified in this table.
- (b) A beta exposure below a maximum energy of 700 keV will not penetrate the lens of the eye; therefore, the applicable standard for these energies would be that for the skin (15 rem/year).
- (c) In special cases, with the approval of the Deputy Assistant Secretary for Safety, Health, and Quality Assurance, a worker may exceed 5 rem/year provided his/her average exposure per year since age 18 will not exceed 5 rem/year. This does not apply to emergency situations.
- (d) All reasonable effort shall be made to keep exposure of forearms and hands to the general standard for the skin.

To assist in the determination that exposures to individuals are maintained at the lowest level reasonably achievable, DOE requires the submittal of occupational radiation exposure records to a central repository. The data required include a summary of whole-body exposures to ionizing radiation, a summary of internal depositions of radioactive materials, and occupational exposure reports for terminating employees. The central data base also includes occupational radiation exposure information for the Atomic Energy Commission (AEC) and the Energy Research and Development Administration (ERDA).

This report includes a summary of the data submitted for 1985 by DOE and DOE contractor facilities. Data from previous years are also included so that trends can be analyzed. Appendices A, B, and C present whole-body exposure data for 1985.

SUMMARY OF WHOLE-BODY IONIZING RADIATION EXPOSURES

Monitoring is required by DOE Order 5480.1, Chapter XI, where the potential exists for an individual to receive a dose or dose commitment in any calendar quarter in excess of 10 percent of the quarterly or annual occupational radiation exposure standards shown in Table 1. Depending on the administrative policy of the contractor, monitoring may also be provided to individuals, such as clerical workers, for whom the exposure potential is extremely low.

The number of individuals who received an occupational whole-body exposure in one of 16 dose-equivalent intervals ranging from "less than measurable" to "greater than 10 rem" is provided annually by each DOE and DOE contractor facility. A positive, measurable exposure is any recorded exposure greater than the minimum sensitivity of a personnel monitoring device. The data are further subdivided into one of 10 facility types.

Contractors have the option of reporting the distribution of whole-body occupational dose equivalents only for those individuals for whom monitoring is provided. Many contractors choose to report the latter, thus increasing the number of individuals who are considered to be radiation workers. To account for this effect, the average dose equivalent per individual receiving a measurable exposure is calculated as well as the average dose equivalent per individual monitored.

The annual collective dose equivalent is expressed in units of person-rem and is calculated by multiplying the number of individuals in each dose range by the numerical midpoint of the range, and then summing the products. This procedure allows an estimate of the collective dose equivalent to be calculated without knowledge of each individual's annual dose. However, a source of error is introduced into the calculation by the assumption that the midpoint of the dose-equivalent range is the mean dose equivalent of the individuals reported in each dose-equivalent range. Frequently, the actual mean dose equivalent in each range is less than the assumed arithmetic mean. Thus, collective dose equivalents presented in this report may be slightly higher than the actual collective dose equivalents.

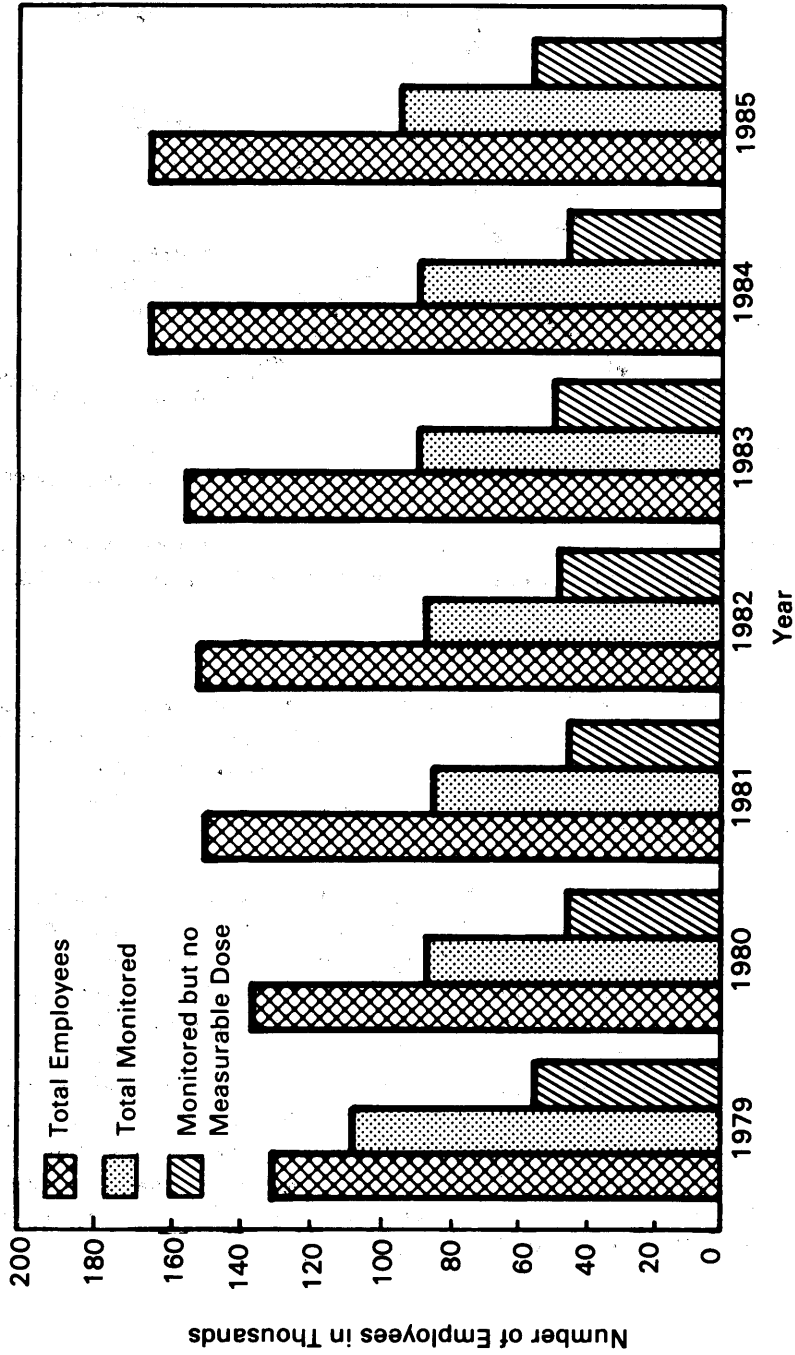


FIGURE 1. Comparison of Number of Employees, Number of Employees Monitored, and Number of Employees Monitored Who Received No Measurable Dose Equivalent

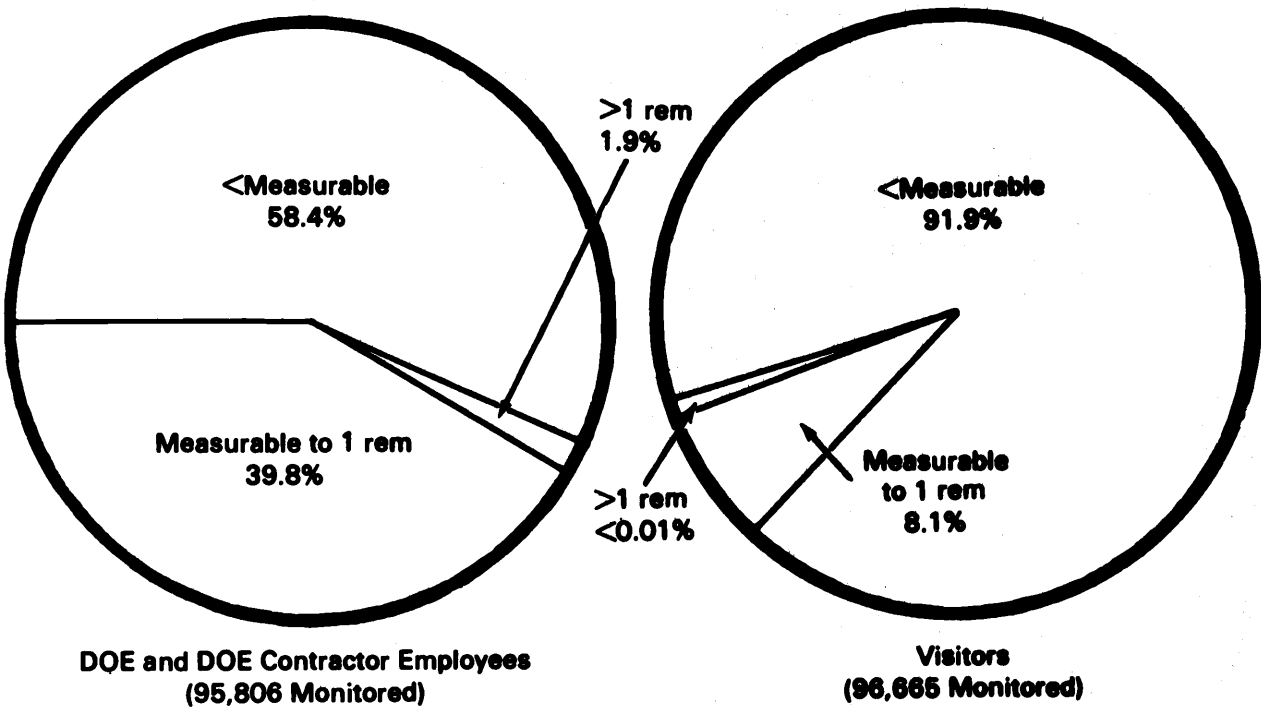


FIGURE 2. Percentage of Monitored Employees and Percentage of Monitored Visitors Who Received a Dose Equivalent Less Than Measurable, Measurable to 1 Rem, or Greater Than 1 Rem, 1985

The collective dose equivalent was 8,223 person-rem for all DOE and DOE contractor employees, and 461 person-rem for visitors to DOE facilities, for a total collective dose equivalent of 8,684 person-rem. The contribution of the individuals in each dose-equivalent interval to the collective dose equivalent is shown in Figure 3. Individuals whose exposure was less than 1 rem contributed the greatest portion (63.4%) of the total person-rem.

The distribution of whole-body exposures for the years 1965-1985 is presented in Table 3. As can be observed in Table 3, the fraction of all monitored workers who received a dose equivalent greater than 1 rem has gradually declined since 1965, starting at about 5% and leveling off at about 2% for the last eight years. This general downward trend in occupational radiation exposures can be observed in Figure 4, which shows the collective dose equivalent for all individuals from 1965 to 1985 who received an exposure greater than 1 rem. The collective dose equivalent for individuals who received an exposure less than 1 rem was not included because before 1974, less-than-measurable exposures were not distinguished from measurable exposures in the reporting system. This decrease in the collective dose equivalent has been achieved even though some work was performed in older facilities which were not constructed using current design criteria. This trend reflects both changes in the nature of the work performed at DOE facilities and the consistent application of ALARA practices throughout all DOE operations.

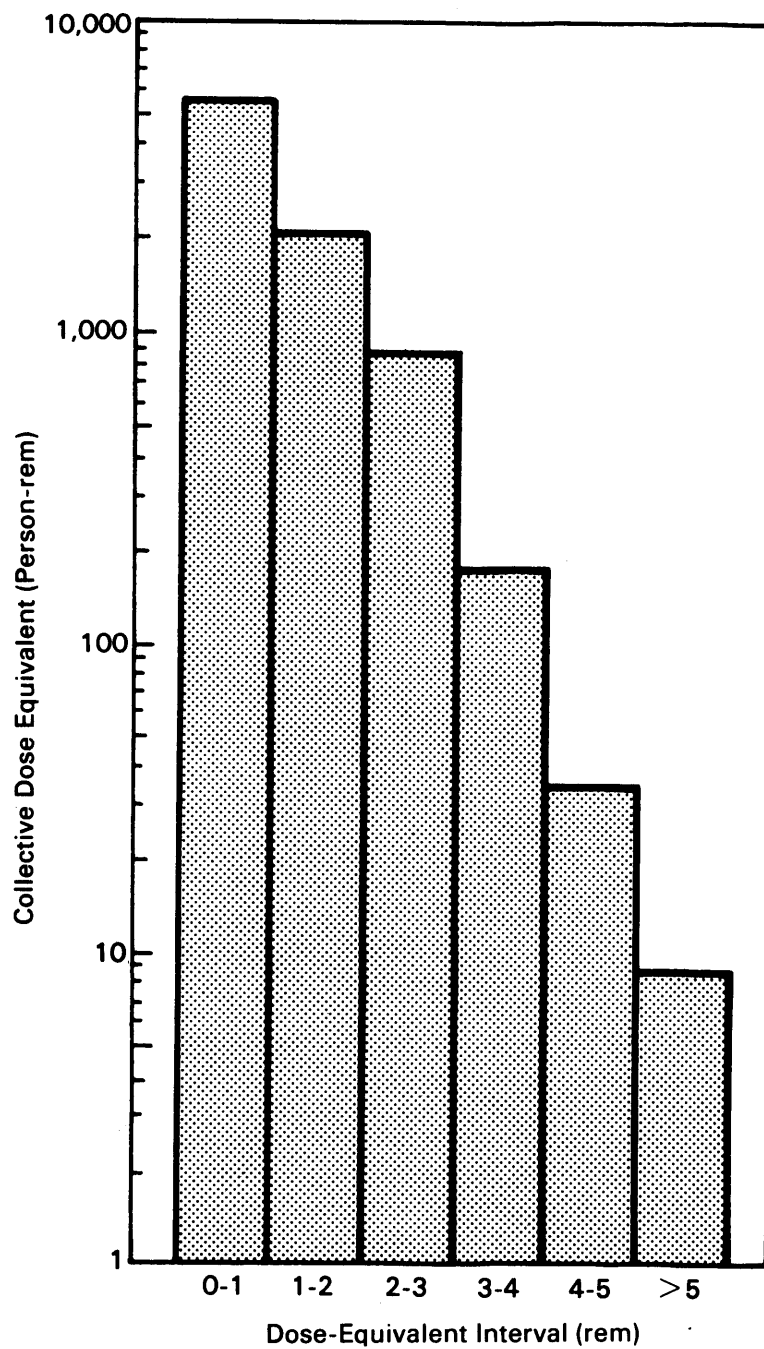


FIGURE 3. Contribution of Each Dose-Equivalent Interval to the Total Collective Dose Equivalent, 1985

TABLE 3. Distribution of Whole-Body Ionizing Radiation Exposures for DOE/DOE Contractor Employees, 1965-1985

Year	Number of Employees Receiving Exposures in Each Dose-Equivalent Range (rem)												Total Monitored		
	<Meas.	0-1(a) Meas.-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11		11-12	>12
1965	128,360	4,158	1,704	1,704	515	294	70	32	26	25	22	6	2		135,214
1966	131,522	3,706	1,630	1,630	593	313	88	47	24	6	2			1	137,932
1967	102,510	3,472	1,572	1,572	555	168	35	29	23	17	4	1			108,386
1968	103,206	2,799	1,408	1,408	425	144	3	1							107,986
1969	98,625	2,554	1,313	1,313	335	86	4					1			102,918
1970	92,185	2,698	1,329	1,329	279	158	5	4	2	1					96,661
1971	90,640	2,380	888	888	275	118	8	3				1	2		94,315
1972	86,077	2,130	929	929	219	95	8	2							89,460
1973	89,071	1,944	727	727	172	60	2	1							91,977
1974	43,184	32,500	1,667	688	149	40	4								78,232
1975	43,310	42,141	1,846	753	232	142			1						88,425
1976	40,083	47,886	1,679	475	70	6	1								90,200
1977	43,017	49,948	1,579	545	103	23			1	2			2		95,220
1978	44,898	55,296	1,323	439	53	11									102,020
1979(b)	50,003	53,235	1,286	416	33	10	1						2		104,986
1980	45,054	38,895	1,113	387	16										85,465
1981(b)	45,224	36,561	967	263	29	5									83,049
1982	48,968	34,949	1,010	313	56	28									85,324
1983	49,871	36,768	1,270	294	49	31									88,283
1984(b)	47,327	42,696	1,226	312	31	11									91,603
1985	55,939	38,085	1,366	356	51	8				1					95,806

(a) Separation of data before 1974 is unavailable.

(b) The data differ slightly from those listed in previous reports because of errors reported by individual contractors after publication of the annual report.

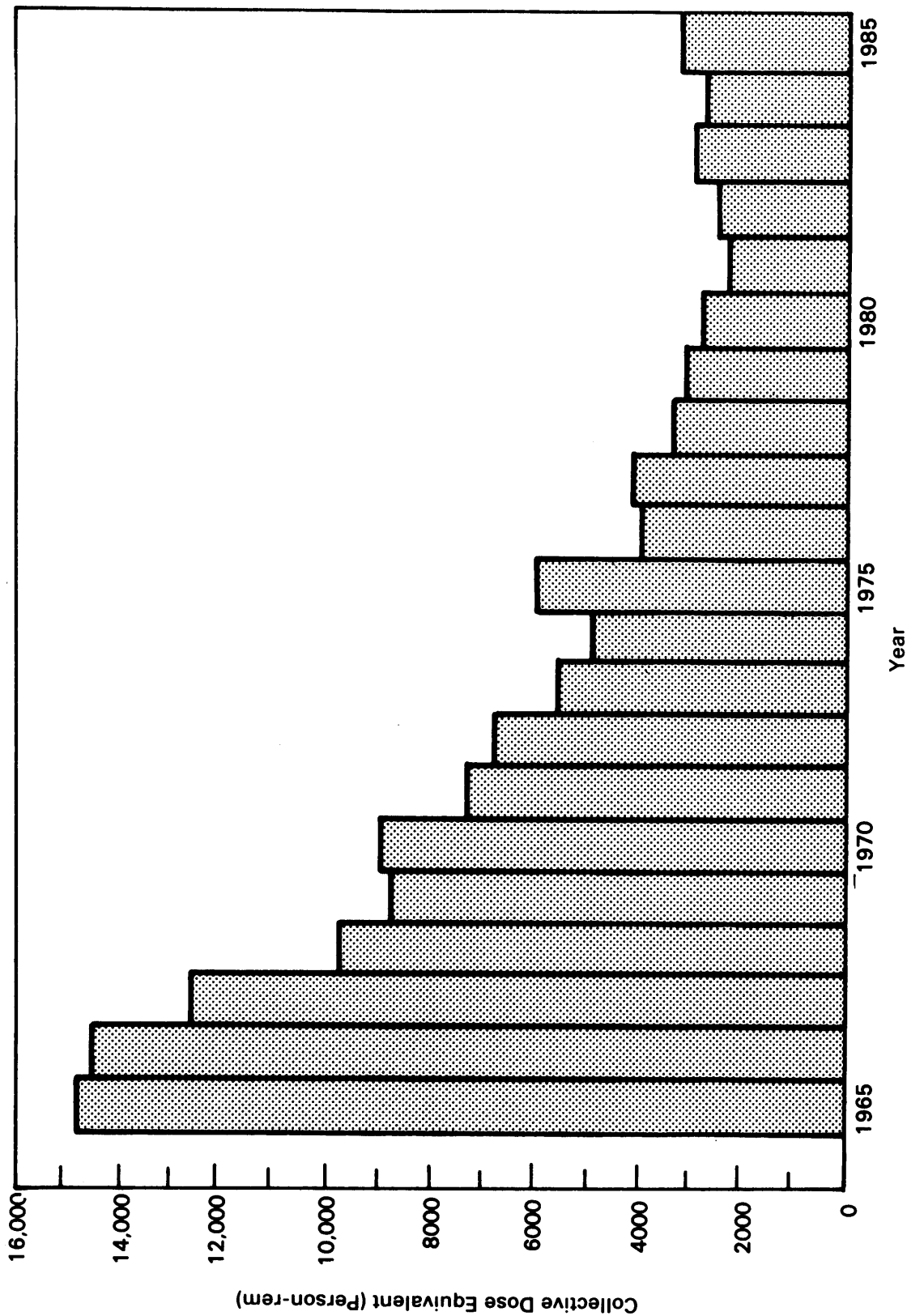


FIGURE 4. Total Collective Dose Equivalent for all DOE/DOE Contractor Employees Who Received an Exposure Greater Than 1 Rem, 1965-1985

DISTRIBUTION BY FACILITY TYPE

The number of individuals and the distribution of the annual whole-body exposures in each of 10 facility categories were reported to the central repository. The assignment of exposures to a given facility type is a policy decision of each field organization. For this report, visitors were considered a facility type. The contribution of each facility type to the collective dose equivalent is shown in Figure 5. The largest percentage of the total collective dose equivalent was in the category "Other." Examples of facilities included in the "Other" category are radioactive waste handling, construction, and irradiation facilities. The smallest contribution was from DOE Offices. A summary of the data is presented in Table 4.

The average dose equivalent by facility type per individual monitored and per individual monitored with measurable exposure is shown in Table 5. The average dose equivalent per individual monitored for all facilities combined was 45 mrem. The highest average dose equivalent per individual monitored was observed at reactor facilities (205 mrem), and the lowest was observed for visitors to DOE facilities (5 mrem). The average dose equivalent per individual monitored with a measurable exposure was 182 mrem. The highest average dose equivalent for individuals monitored with a measurable exposure was observed at reactor facilities (323 mrem), and the lowest was observed for visitors (59 mrem).

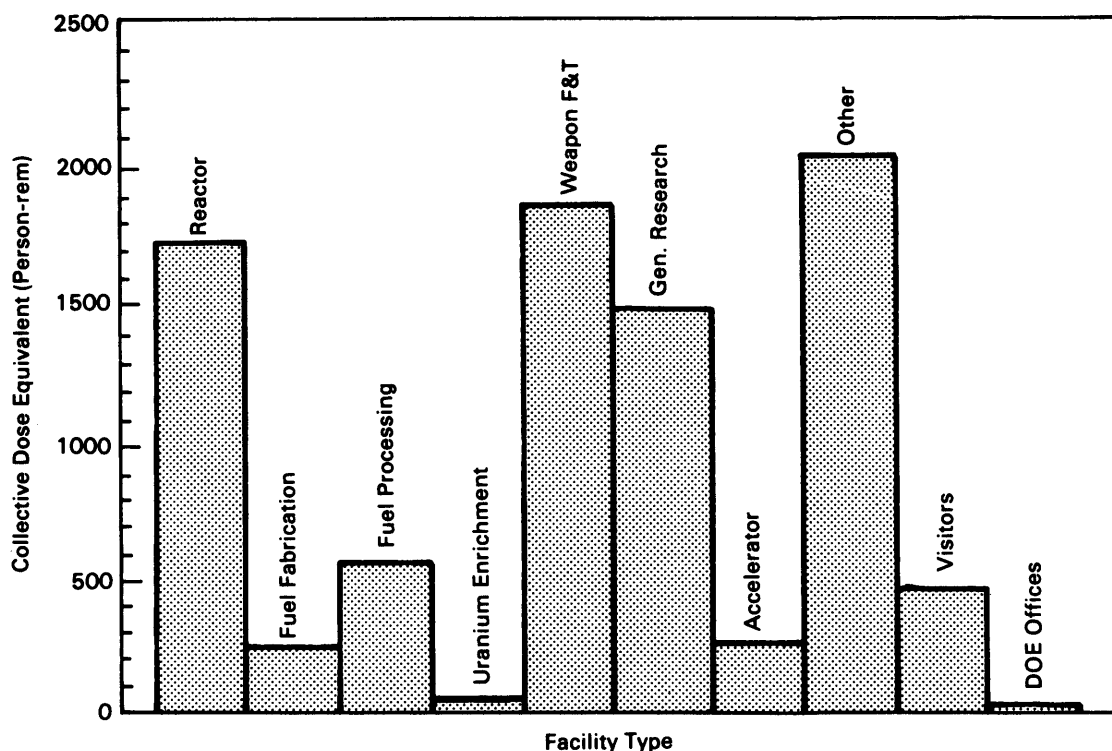


FIGURE 5. Contribution of Each Facility Type to the Total Collective Dose Equivalent, 1985

TABLE 4. Distribution of Annual Whole-Body Exposures for DOE/DOE Contractor Employees and Visitors by Facility Type, 1985(a)

Facility Type	Total Persons Monitored	Number of Persons Receiving Exposures in Each Dose-Equivalent Range (rem)													Total Person-rem					
		<Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9		9-10	10-11	11-12	>12	
Reactor	8,352	3,033	2,924	937	573	252	123	349	161											1,716
Fuel Fabrication	1,363	188	436	317	326	81	12	3												265
Fuel Processing	3,082	1,275	779	382	273	157	95	118	3											574
Uranium Enrichment	1,059	653	373	27	6															26
Weapon F&T	21,591	10,729	8,130	1,252	603	317	176	319	64						1					1,851
Gen. Research	30,801	23,102	5,780	848	453	205	101	185	70	49	8									1,484
Accelerator	3,591	2,095	1,104	161	109	47	23	42	10											262
Other	23,777	12,990	7,590	1,375	776	413	233	350	48	2										2,025
Visitors	96,665	88,795	7,585	203	57	10	6	9												461
DOE Offices	2,190	1,874	295	13	8															20
TOTAL PERSONS	192,471	144,734	34,996	5,515	3,184	1,482	769	1,375	356	51	8			1						
TOTAL PERSON-REM																				8,684

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

Facility Type	No. Individuals Monitored	No. Individuals With Measurable Exposure	Collective Dose Equivalent (Person-rem)	Average Dose Equivalent (mrem) Per Individual Monitored	Average Dose Equivalent (mrem) Per Individual Monitored With Measurable Exposure
Reactor	8,352	5,319	1,716	205	323
Fuel Fabrication	1,363	1,175	265	195	226
Fuel Processing	3,082	1,807	574	186	318
Uranium Enrichment	1,059	406	26	24	63
Weapon F&T	21,591	10,862	1,851	86	170
Gen. Research	30,801	7,699	1,484	48	193
Accelerator	3,591	1,496	262	73	175
Other	23,777	10,787	2,025	85	188
Visitors	96,665	7,870	461	5	59
DOE Offices	2,190	316	20	9	63
TOTAL	192,471	47,737	8,684	45	182

DISTRIBUTION BY FIELD ORGANIZATION

For each field organization, the number of employees monitored and the collective dose equivalent are shown in Table 6. Differences in the collective dose equivalent at each field organization reflect differences in the nature of the work performed and the administrative policy concerning whether the dose distribution is reported for all employees or only for those for whom monitoring is required. Table 7 provides an indication of the work done at each field organization by showing the fraction of the collective dose equivalent at each field organization attributed to each facility type. Trends in collective dose equivalent from 1979 to 1985 for each field organization are shown in Table 8.

TABLE 6. Collective Dose Equivalent for DOE/DOE Contractor Employees and Visitors by Field Organization, 1985

Field Organization	No. Individuals Monitored	No. Individuals With Measurable Exposure	Collective Dose Equivalent (Person-rem)	Average Dose Equivalent (mrem) Per Individual Monitored	Average Dose Equivalent (mrem) Per Individual Monitored With Measurable Exposure
Albuquerque	32,385	19,138	2,900	90	152
Chicago	16,546	3,705	502	30	136
Idaho	43,843	1,931	420	10	218
Nevada	28,877	284	34	1	121
Oak Ridge	3,762	1,751	353	94	202
Pittsburgh Naval Reactor	2,393	1,860	180	75	97
Richland	14,760	6,016	2,548	173	424
San Francisco	27,178	1,777	187	7	105
Savannah River	19,983	9,363	1,394	70	149
Schenectady Naval Reactor	2,736	1,912	165	60	86
TOTAL(a)	192,471	47,737	8,684	45	182

(a) Energy Technology Centers report 8 persons were monitored with no measurable exposure; included in total individuals monitored.

TABLE 7. Fraction of Collective Dose Equivalent for DOE/DOE Contractor Employees and Visitors Attributed to a Facility Type Within Each Field Organization, 1985

Field Organization	Facility Type									
	Reactor	Fuel Fab.	Fuel Proc.	Uran. Enrich.	Weapon F&T	Gen. Research	Acceler.	Other	Visitors	DOE Offices
Albuquerque					0.61	0.28		0.01	0.10	<0.01
Chicago	0.06					0.20	0.51	0.09	0.14	<0.01
Idaho	0.39		0.40					0.20		<0.01
Nevada					0.65			0.06	0.28	<0.01
Oak Ridge		0.38		0.07	0.14	0.33		0.07	<0.01	
Pittsburgh Naval Reactor	0.30					0.66		<0.01	0.02	0.01
Richland	0.46	0.02				0.07		0.44	<0.01	<0.01
San Francisco					0.01	0.53	0.03	0.34	0.09	<0.01
Savannah River	0.10	0.05	0.29		0.01	0.03		0.47	0.04	<0.01
Schenectady Naval Reactor	0.84					0.14		<0.01	0.01	<0.01
ALL FIELD ORGANIZATIONS COMBINED	0.20	0.03	0.07	<0.01	0.06	0.17	0.03	0.39	0.05	<0.01

TABLE 8. Collective Dose Equivalent for DOE/DOE Contractor Employees and Visitors by Field Organization, 1979-1985 (person-rem)

Field Organization	1979(a)	1980	1981(a)	1982	1983	1984(a)	1985
Albuquerque	1,873	1,700	2,024	2,285	2,332	2,738	2,900
Chicago	1,061	918	758	587	623	615	502
Idaho	876	593	302	363	353	441	420
Nevada	55	50	36	29	25	24	34
Oak Ridge	1,332	604	437	401	371	419	353
Pittsburgh Naval Reactor	196	186	185	194	220	180	180
Richland	2,571	2,256	2,093	2,272	2,458	2,399	2,548
San Francisco	264	240	171	289	267	195	187
Savannah River	1,343	1,391	1,401	1,310	1,293	1,283	1,394
Schenectady Naval Reactor	114	79	76	147	217	130	165
TOTAL	9,693	8,024	7,483	7,879	8,158	8,423	8,684

(a) The data differ slightly from those listed in previous reports because of errors reported by individual contractors after publication of the annual report.

SUMMARY OF INTERNAL EXPOSURES

Internal body depositions of radioactive material result from accidental, not planned, exposures. A report of internal body deposition of radioactive materials is required when:

1. any uptake of radioactive material occurred during the reporting year that either independently or when added to a current burden was estimated to result in a dose commitment to the critical organ in excess of 50 percent of the pertinent annual dose-equivalent standard set forth in DOE Order 5480.1, Chapter XI; or when
2. any previously unreported uptake of radioactive material was determined to have been reportable according to the above criteria by reason of the most recent dose-equivalent estimates.

Ten new cases of internal body depositions were reported which exceeded 50 percent of the pertinent annual dose-equivalent standard. Of these ten cases, eight occurred in a previous year and are reported now because recent revisions in the dose calculations established these cases as reportable depositions. Of these eight cases, five occurred before 1980 and are not listed in Table 9.

Table 9 lists the first year known in which the dose-equivalent exceeded 50 percent of the annual standard, the radionuclide(s) involved, the organ showing the highest percent of the annual standard, and the number of individuals in each dose-equivalent range. Revisions to previously reported cases are included.

TABLE 9. Dose Distributions for Cases of Internal Body Depositions, 1980-1985

Year	Radionuclide	Critical Organ	Dose-Equivalent Interval (rem)					
			7.5-10	10-15	15-25	25-50	50-100	100-200
1980	²³⁸ Pu	Bone			2	2(a)		
	²³⁴ U, ²³⁵ U, ²³⁸ U	Lung	1					
1981	²³⁸ Pu, ²³⁹ Pu, ²⁴⁰ Pu	Bone		1	1			
	²³⁴ U, ²³⁵ U, ²³⁸ U	Lung	3					
1982	²³⁸ Pu	Bone			3(b)	1		
	²³⁸ Pu, ²³⁹ Pu, ²⁴⁰ Pu	Bone Liver	1					1
1983	²³⁹ Pu, ²⁴⁰ Pu, ²⁴¹ Am	Bone			1			
	²³⁴ U, ²³⁵ U	Lung	4					
1984	²³⁹ Pu, ²⁴¹ Am	Lung					1(c)	
1985	²³⁴ U, ²³⁵ U, ²³⁸ U	Lung	2					

(a) One of these cases was formerly reported in the 15-25 rem dose-equivalent interval, but was placed in the 25-50 rem interval after a revision of the dose calculation.

(b) Two of these cases were previously not reported and are reported now because recent revisions of the dose calculations established them as reportable depositions.

(c) Not included in the previous annual report because it was recently determined that this deposition was reportable.

SUMMARY OF WORKER TERMINATIONS

A total of 6,856 monitored workers terminated their employment with DOE or DOE contractors in 1985. Table 10 gives the length of employment as well as the average cumulative dose equivalent for the workers in each time interval. These data indicate that the average cumulative dose equivalent for workers terminating in 1985 after 1 to 365 days of employment was significantly less than the 5 rem/year radiation protection standard for the whole body.

The average cumulative dose equivalent for workers who terminated after more than six years of employment was 2.56 rem. This average appears high in comparison with the average cumulative dose equivalent for employees who terminated with less than six years of employment. However, this average includes the cumulative exposure of some individuals who worked for DOE or DOE contractors for more than 20 years.

TABLE 10. Average Cumulative Dose Equivalent for Individuals Terminating in 1985

Length of Employment	Number of Terminated Employees	Total Cumulative Dose Equivalent (person-rem)	Average Cumulative Dose Equivalent Per Terminated Employee (rem)
1-90 days	1,530	803	0.52
90-180 days	1,233	613	0.50
180-365 days	789	345	0.44
1-2 years	642	187	0.29
2-4 years	627	181	0.29
4-6 years	373	163	0.44
>6 years	1,662	4,258	2.56
Total	6,856	6,550	0.96

APPENDIX A

**DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES
BY FACILITY TYPE FOR EACH DOE FIELD ORGANIZATION, 1985**

TABLE A.2
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
CHICAGO FIELD ORGANIZATION
1985

Facility Type	Total Monitored	Dose-Equivalent Ranges (rem)											Total Person-rem				
		< Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Reactor	454	223	144	59	23	3	1	1									30
Fuel Fabrication																	
Fuel Processing																	
Uran. Enrichment																	
Weapon F&T																	
Gen. Research	3,606	2,825	607	93	40	24	6	11									98
Accelerator	3,355	1,891	1,081	155	108	47	22	41	10								257
Other	2,116	1,687	405	8	4		2	6	3	1							45
Visitors	6,980	6,185	694	59	28	3	4	7									71
DOE Offices	35	30	5														
TOTAL	16,546	12,841	2,936	374	203	77	35	66	13	1							
TOTAL PERSON-REM																	501

TABLE A.3
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
IDAHO FIELD ORGANIZATION
1985

Facility Type	Total Monitored	< Meas.	Dose-Equivalent Ranges (rem)											Total Person-rem				
			<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Reactor	2,211	1,481	345	189	120	40	14	22										166
Fuel Fabrication																		
Fuel Processing	1,705	1,038	322	160	82	50	31	19	3									169
Uran. Enrichment																		
Weapon F&T																		
Gen. Research																		
Accelerator																		
Other	1,326	836	336	61	46	25	16	6										83
Visitors	38,442	38,442																
DOE Offices	159	115	44															2
TOTAL	43,843	41,912	1,047	410	248	115	61	47	3									
TOTAL PERSON-REM			52	72	93	72	53	71	7									420

TABLE A.4
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
NEVADA FIELD ORGANIZATION
1985

Facility Type	Total Monitored	Dose-Equivalent Ranges (rem)											Total Person-rem				
		< Meas.-	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Reactor																	
Fuel Fabrication																	
Fuel Processing																	
Uran. Enrichment																	
Weapon F&T	9,589	9,407	137	24	11	9	1										22
Gen. Research																	
Accelerator																	
Other	839	813	22	2	2												2
Visitors	17,752	17,678	52	14	5	2	1										10
DOE Offices	697	695	2														
TOTAL	28,877	28,593	213	40	18	11	2										
TOTAL PERSON-REM			11	7	7	7	3										34

TABLE A.5
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
OAK RIDGE FIELD ORGANIZATION
1985

Facility Type	Total Monitored	< Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Total Person-rem
Reactor																	133
Fuel Fabrication	539	21	135	142	200	39	2										
Fuel Processing																	
Uran. Enrichment	1,059	653	373	27	6												26
Weapon F&T	385	112	98	120	45	7	2	1									50
Gen. Research	599	287	66	90	92	27	17	19	1								116
Accelerator																	
Other	782	558	173	33	11	3		4									26
Visitors	398	380	15	1	2												2
DOE Offices																	
TOTAL	3,762	2,011	860	413	356	76	21	24	1								
TOTAL PERSON-REM			43	72	134	48	18	36	2								353

TABLE A.6
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
PITTSBURGH NAVAL REACTOR FIELD ORGANIZATION
1985

Facility Type	Total Monitored	Dose-Equivalent Ranges (rem)											Total Person-rem					
		< Meas.	< 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
Reactor	669	85	456	91	28	9												55
Fuel Fabrication																		
Fuel Processing																		
Uran. Enrichment																		
Weapon F&T																		
Gen. Research	1,442	290	915	154	50	18	11	4										118
Accelerator																		
Other	36	21	15															1
Visitors	200	124	74	2														4
DOE Offices	46	13	31	2														2
TOTAL	2,393	533	1,491	249	78	27	11	4										180
TOTAL PERSON-REM			75	44	29	17	10	6										180

TABLE A.7
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
RICHLAND FIELD ORGANIZATION
1985

Facility Type	Total Monitored	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Total Person-rem
Reactor	2,336	822	421	199	169	140	99	325	161								1,183
Fuel Fabrication	304	79	76	62	47	28	9	3									62
Fuel Processing																	
Uran. Enrichment																	
Weapon F&T																	
Gen. Research	2,063	1,349	462	92	60	44	15	27	9	5							183
Accelerator																	
Other	7,804	4,303	1,826	625	362	246	134	262	45	1							1,116
Visitors	2,118	2,077	41														2
DOE Offices	135	114	21														1
TOTAL	14,760	8,744	2,847	978	638	458	257	617	215	6							
TOTAL PERSON-REM			142	171	239	286	225	925	538	21							2,547

TABLE A.9
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
SAVANNAH RIVER FIELD ORGANIZATION
1985

Facility Type	Total Monitored	< Meas.	Meas. < 0.10	Dose-Equivalent Ranges (rem)										Total Person-rem				
				0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Reactor	1,176	305	483	190	154	41	2	1										144
Fuel Fabrication	520	88	225	113	79	14	1											70
Fuel Processing	1,377	237	457	222	191	107	64	99										405
Uran. Enrichment																		
Weapon F&T	300	162	118	10	2	1	2	5										18
Gen. Research	905	602	239	27	16	11	5	5										41
Accelerator																		
Other	9,451	3,942	4,320	602	340	132	68	47										661
Visitors	6,041	5,114	905	14	3	4	1											52
DOE Offices	213	170	43															2
TOTAL	19,983	10,620	6,790	1,178	785	310	143	157										
TOTAL PERSON-REM			339	206	294	194	125	235										1,393

TABLE A.10
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE
SCHENECTADY NAVAL REACTOR FIELD ORGANIZATION
1985

Facility Type	Total Monitored	< Meas. < 0.10	Meas. 0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Total Person-rem
Reactor	1,506	117	1,075	209	79	19	7										138
Fuel Fabrication																	
Fuel Processing																	
Uran. Enrichment																	
Weapon F&T																	
Gen. Research	1,011	549	459	3													23
Accelerator																	
Other	41	22	19														1
Visitors	156	126	30														2
DOE Offices	22	10	11	1													1
TOTAL	2,736	824	1,594	213	79	19	7										
TOTAL PERSON-REM			80	37	30	12	6										165

APPENDIX B

**DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES
TO PERSONNEL FOR EACH DOE FIELD ORGANIZATION, 1985**

**TABLE B.1
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
ALBUQUERQUE FIELD ORGANIZATION
1985**

Contractor	< Meas.	Meas.- <0.10	Dose-Equivalent Ranges (rem)										Total Person-rem									
			0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10					
Albuquerque Misc.																						
Subcontractors																						
Employees		1,684	45	13	3																	99
Visitors		1,684	45	13	3																	99
Total																						
Chem-Nuclear Systems																						
Employees	24	30																				2
Visitors	24	30																				2
Total																						
General Electric Co.																						
Employees	244	114	11	4																		9
Visitors	1	3																				9
Total	245	117	11	4																		
Inhalation Toxicology																						
Employees	321	44	4	2																		4
Visitors	180																					4
Total	501	44	4	2																		
Jacobs Engineering																						
Employees	12	10	1																			1
Visitors																						1
Total																						
Jacobs Engineering (UMTRA Subcontractors)																						
Employees	29	15	1																			1
Visitors																						1
Total																						
Los Alamos National Lab																						
Employees	3,690	1,044	197	119	62	33	103	58	43	8												685
Visitors	1,152	300	41	15		1																29
Total	4,842	1,344	238	134	62	34	103	58	43	8												714

TABLE B.1 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
ALBUQUERQUE FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)													Total Person-rem									
	< Meas.	Meas.- <0.10	0.10-		0.25-		0.50-		0.75-		1-2	2-3	3-4		4-5	5-6	6-7	7-8	8-9	9-10	>10		
			0.10-	0.25	0.25-	0.50	0.50-	0.75	0.75-	1.00													
Mason & Hanger-Silas (Amarillo, TX)																							
Employees	738	153	96	56	32	18	37	1															139
Visitors	511	28																					1
Total	1,249	181	96	56	32	18	37	1															141
Mason & Hanger-Silas (Los Alamos, NM)																							
Employees	305	65																					3
Visitors																							
Total	305	65																					3
Monsanto Research Co.																							
Employees	21	1,561	212	28	18	1	1																139
Visitors	153	1,399	7	1																			72
Total	174	2,960	219	29	18	1	1																211
Morrison-Knudsen Co.																							
Employees	9	18																					1
Visitors																							
Total	9	18																					1
Morrison-Knudsen UMTRA Subcontractors																							
Employees	250	77	2																				4
Visitors																							
Total	250	77	2																				4
Rockwell International																							
Employees		4,334	739	447	247	153	274	63															1,370
Visitors		3,511	32																				181
Total		7,845	771	447	247	153	274	63															1,551

TABLE B.1 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
ALBUQUERQUE FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.- <0.10	Dose-Equivalent Ranges (rem)										Total				
			0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Person-rem
Roy F. Weston, Inc.																	
Employees	8	4															
Visitors			8														
Total	8	4	8														
Sandia Laboratories (Albuquerque, NM)																	
Employees	1,935	342		33	15	6	2	5	2	1							50
Visitors	968	227		20	3	1	1										18
Total	2,903	569		53	18	7	2	6	2	1							68
Sandia Laboratories (Livermore, CA)																	
Employees	476	28		2													2
Visitors																	
Total	476	28		2													2
Teledyne Isotopes																	
Employees	13	5		5	1												2
Visitors																	
Total	13	5		5	1												2
The Bendix Corp.																	
Employees	172	40		1													11
Visitors																	
Total	172	40		1													11
The Zia Company																	
Employees	1,347	451		40	31	4	7	7									60
Visitors																	
Total	1,347	451		40	31	4	7	7									60

TABLE B.1 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
ALBUQUERQUE FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem						
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	
Utah State Health Dept. Employees	4	31	2														2	
Visitors																		
Total	4	31	2														2	
Utah State Health Dept. Subcontractors																		
Employees	27	34	12	1														4
Visitors																		
Total	27	34	12	1														4
TOTAL ALBUQUERQUE	12,590	15,552	1,503	736	.373	215	428	124	44	8	1	1	1	1	1	1	2,888	

TABLE B.2
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
CHICAGO FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)													Total			
	< Meas.	Meas.-<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Person-rem
Ames Laboratory																	
Employees	129	31															2
Visitors																	2
Total	129	31															
Argonne National Lab.																	
Employees	2,253	277	112	51	19	7	7										81
Visitors	2,633	65	4	1	1	1											6
Total	4,886	342	116	52	20	8	7										87
Brookhaven National Lab.																	
Employees	789	705	112	82	49	20	42	9									219
Visitors	183	359	31	19	2	3	7										45
Total	972	1,064	143	101	51	23	49	9									264
Chicago Misc.																	
Employees	318	130	13	12	2	2	7	4	1								39
Visitors	183	12	2														1
Total	501	142	15	12	2	2	7	4	1								40
Fermi National Lab.																	
Employees	1,316	604	54	22	3	1	2										54
Visitors	1,500	235	22	8													19
Total	2,816	839	76	30	3	1	2										72
Massachusetts Institute of Technology																	
Employees	219	152	21	8	3	1	1										19
Visitors	1,669	23															1
Total	1,888	175	21	8	3	1	1										20

TABLE B.2 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
CHICAGO FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
Princeton University	1,520	333	2														17
Employees	1,520	333	2														17
Visitors																	
Total	12,712	2,926	373	203	77	35	66	13	1								501

TABLE B.3
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
IDAHO FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.-<0.10	Dose-Equivalent Ranges (rem)								Total							
			0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5		5-6	6-7	7-8	8-9	9-10	>10	Person-rem
American Protective Service																		
Employees	157	147	4	1													8	
Visitors																		8
Total	157	147	4	1														8
Bendix Field Eng.																		
Employees	228	65	4															4
Visitors																		4
Total	228	65	4															4
Biggers Const.																		
Employees	1																	
Visitors																		
Total	1																	
Bingham Mechanical																		
Employees	2	1	4	1					1									3
Visitors																		
Total	2	1	4	1					1									3
EG & G Idaho, Inc.																		
Employees	1,145	302	182	119	40	12	21											159
Visitors	25,422																	159
Total	26,567	302	182	119	40	12	21											159
Exxon Nuclear Co.																		
Employees	99	16	4	2		1												3
Visitors																		
Total	99	16	4	2		1												3

TABLE B.3 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
IDAHO FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.-<0.10	Dose-Equivalent Ranges (rem)										Total Person-rem						
			0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10		
Westinghouse Idaho Nuclear	973	212	123	64	34	14	5											97	
Employees	12,623																		
Visitors	13,596	212	123	64	34	14	5												97
TOTAL IDAHO	41,400	1,003	410	248	115	61	47	3											418

TABLE B.4
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
NEVADA FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem				
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10
Air Resources Lab.																
Employees	56															
Visitors	1															
Total	57															
Defense Nuclear Agency																
Employees	894	24	2	2	1											3
Visitors	3,924	8				1										2
Total	4,818	32	2	2	1	1										5
EG&G, Inc.																
(Las Vegas)																
Employees	1,343	13	1													1
Visitors	72															
Total	1,415	13	1													1
Environmental Protection Agency																
Employees	86															
Visitors	32															
Total	118															
Fenix & Scisson, Inc.																
Employees	351	18	2													1
Visitors	543															
Total	894	18	2													1

TABLE B.4 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
NEVADA FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem				
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10
Holmes & Narver, Inc.																
Employees	611	9	6	3												3
Visitors	262															
Total	873	9	6	3												3
Nevada Misc.																
Employees	429															
Visitors	255															
Total	684															
Reynolds Electrical																
Employees	5,828	93	14	8	8					1						17
Visitors	5,876															
Total	11,704	93	14	8	8					1						17
U.S. Department of Interior																
Employees	152	1	1													
Visitors	18															
Total	170	1	1													
Wackenhut Services																
Employees	417	1														
Visitors	106															
Total	523	1														

TABLE B.4 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
NEVADA FIELD ORGANIZATION
1965

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
Westinghouse Electric																	
Employees	53																
Visitors	34																
Total	87																
TOTAL NEVADA	21,343	167	26	13	9	2											26

**TABLE B.6
 DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
 PITTSBURGH NAVAL REACTOR FIELD ORGANIZATION
 1985**

Contractor	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Total Person-rem
Westinghouse Electric/BAPL																	
Employees	282	721	44	34	18	11	4										83
Visitors	24	22															1
Total	306	743	44	34	18	11	4										84
Westinghouse Electric/NRF																	
Employees	93	650	201	44	9												90
Visitors	100	52	2														3
Total	193	702	203	44	9												93
Westinghouse Plant Apparatus																	
Employees	21	15															1
Visitors																	
Total	21	15															1
TOTAL PITTSBURGH	520	1,460	247	78	27	11	4										178

TABLE B.7
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
RICHLAND FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.-<0.10	Dose-Equivalent Ranges (rem)										Total				
			0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Person-rem
BCS Richland Inc.																	
Employees	9	7															
Visitors	2																
Total	11	7															
General Electric Co.																	
Employees	92	95	14	9	4	2											15
Visitors																	
Total	92	95	14	9	4	2											15
Hanford Eng. Dev. Lab.																	
Employees	753	256	56	30	21	5	4										57
Visitors	140	1															
Total	893	257	56	30	21	5	4										57
Hanford Environ. Health Found.																	
Employees	5	6															
Visitors																	
Total	5	6															
J. A. Jones Const. Co.																	
Employees	592	156	87	95	105	69	176	29									521
Visitors	22																
Total	614	156	87	95	105	69	176	29									521
Kaiser Engineers-Hanford																	
Employees	242	72	7	3	7	2											12
Visitors	4																
Total	246	72	7	3	7	2											12

TABLE B.7 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
RICHLAND FIELD ORGANIZATION
1985

Contractor	Dose-Equivalent Ranges (rem)													Total								
	< Meas.	Meas. < 0.10	0.10-0.25		0.25-0.50		0.50-0.75		0.75-1.00		1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Person-rem	
			Meas.	Meas.	Meas.	Meas.	Meas.	Meas.														
Pacific Northwest																						
Laboratory																						
Employees	767	249	44	31	23	10	26	9	6													137
Visitors	280	7																				
Total	1,047	256	44	31	23	10	26	9	6													138
Rockwell Hanford Oper.																						
Employees	3,184	1,424	500	249	127	58	81	16														544
Visitors	864	14																				1
Total	4,048	1,438	500	249	127	58	81	16														544
United Nuclear Ind. Inc.																						
Employees	908	520	270	221	171	111	330	161														1,258
Visitors	257	17																				1
Total	1,165	537	270	221	171	111	330	161														1,258
TOTAL RICHLAND	8,121	2,824	978	638	458	257	617	215	6													2,547

TABLE B.8
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
SAN FRANCISCO FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.-<0.10	Dose-Equivalent Ranges (rem)								Total Person-rem				
			0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5		5-6	6-7	7-8	8-9
Rockwell International															
Rocketdyne															
Employees	109	132	9	4	7	13	25								63
Visitors	410	110													6
Total	519	242	9	4	7	13	25								68
Stanford Linear Accel. Center															
Employees	204	23	5												2
Visitors															
Total	204	23	5												2
University of California/LBL															
Employees	593	624	61	10	1										46
Visitors															
Total	593	624	61	10	1										46
University of California/LLNL															
Employees	8,450	425	51	18	7	5	4								52
Visitors	12,743	186	11												11
Total	21,193	611	62	18	7	5	4								63
University of California/LEHR															
Employees	79	4	1	1											1
Visitors	1,400														
Total	1,479	4	1	1											1

TABLE B.8 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
SAN FRANCISCO FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.- <0.10	Dose-Equivalent Ranges (rem)										Total Person-rem					
			0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	
University of California/LNM	47	9	2	1	1	1	1										4	
Employees																		
Visitors																		
Total	47	9	2	1	1	1	1											4
University of California/MC	34																	
Employees																		
Visitors																		
Total	34																	
University of California/NIS	117	5	5	1														2
Employees																		
Visitors	1,151	10	2															1
Total	1,268	15	7	1														2
TOTAL SAN FRANCISCO	25,337	1,528	147	35	16	19	30											187

TABLE B.9
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
SAVANNAH RIVER FIELD ORGANIZATION
1985

Contractor	< Meas.	Meas.- <0.10	Dose-Equivalent Ranges (rem)										Total Person-rem		
			0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9
E. I. Du Pont/SRP-Opns.															
Employees	3,573	3,379	730	579	246	121	134								974
Visitors	5,114	905	14	3	4	1									52
Total	8,687	4,284	744	582	250	122	134								1,027
E. I. Du Pont/SRP-Const.															
Employees	1,681	2,404	432	203	60	21	23								362
Visitors															
Total	1,681	2,404	432	203	60	21	23								362
Savannah River Ecol. Lab.															
Employees	49	34	2												2
Visitors															
Total	49	34	2												2
Southern Bell Tel.															
Employees	8	18													1
Visitors															
Total	8	18													1
U. S. Forest Service															
Employees	25	7													
Visitors															
Total	25	7													
TOTAL SAVANNAH RIVER	10,450	6,747	1,178	785	310	143	157								1,392

**TABLE B.10
 DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
 SCHENECTADY NAVAL REACTOR FIELD ORGANIZATION
 1985**

Contractor	< Meas.	Meas.- <0.10	Dose-Equivalent Ranges (rem)										Total Person-rem				
			0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
General Electric Company	666	1,534	212	79	19	7											161
Employees	126	30															2
Visitors	792	1,564	212	79	19	7											163
Total																	
General Electric/MAO	22	19															1
Employees																	
Visitors	22	19															1
Total																	
TOTAL SCHENECTADY	814	1,583	212	79	19	7											164

TABLE B.11
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES TO PERSONNEL
MORGANTOWN ENERGY TECHNOLOGY CENTERS
1985

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
EG&G WASC, Inc.																	
Employees																	2
Visitors																	2
Total																	2
TOTAL MORGANTOWN																	2

APPENDIX C

**DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES
FOR DOE GOVERNMENT EMPLOYEES AND VISITORS
BY DOE FIELD ORGANIZATION, 1985**

TABLE C.1
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES FOR
DOE GOVERNMENT EMPLOYEES AND VISITORS
BY DOE FIELD ORGANIZATION
1985

Organization	< Meas.	Meas.- <0.10	Dose-Equivalent Ranges (rem)										Total Person-rem						
			0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10		
Albuquerque Operations	262	7	3															1	
Amarillo Area Office	37	4																	1
Dayton Area Office	1	20	2																1
Kansas City Area Office	10	7																	2
Los Alamos Area Office	111	12	1	4															1
Pinellas Area Office	8	10																	5
Rocky Flats Area Office		56	4	4															1
Sandia Area Office	222	11																	
UMTRA Project Office	6	9																	
SUBTOTAL	657	136	10	8															12
Chicago Operations	30	5																	
Environmental Meas. Lab.	32	1																	
New Brunswick Lab.	67	4	1																
SUBTOTAL	129	10	1																1
Idaho Operations Office	508	44																	
West Valley Nuclear	4																		
SUBTOTAL	512	44																	2
Nevada Operations	7,250	46	14	5	2														
SUBTOTAL	7,250	46	14	5	2														8
Pittsburgh Naval Reactors	13	31	2																
SUBTOTAL	13	31	2																2

TABLE C.1 (Continued)
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES FOR
DOE GOVERNMENT EMPLOYEES AND VISITORS
BY DOE FIELD ORGANIZATION

1985

Dose-Equivalent Ranges (rem)

Organization	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
Richland Operations	623	23															1
SUBTOTAL	623	23															1
San Francisco Operations	64	2															
SUBTOTAL	64	2															
Savannah River Operations	170	43															2
SUBTOTAL	170	43															2
Schenectady Naval Reactors	9	8															
West Milton Field Office	1	2	1														
Windsor Field Office		1															
SUBTOTAL	10	11	1														1
Energy Technology Centers	6																
SUBTOTAL	6																
TOTAL DOE	9,434	346	28	13	2												28

**UNITED STATES
DEPARTMENT OF ENERGY
WASHINGTON, D.C. 20545**

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